



WATER RESILIENCE: UPPER SAN PEDRO RIVER BASIN, ARIZONA

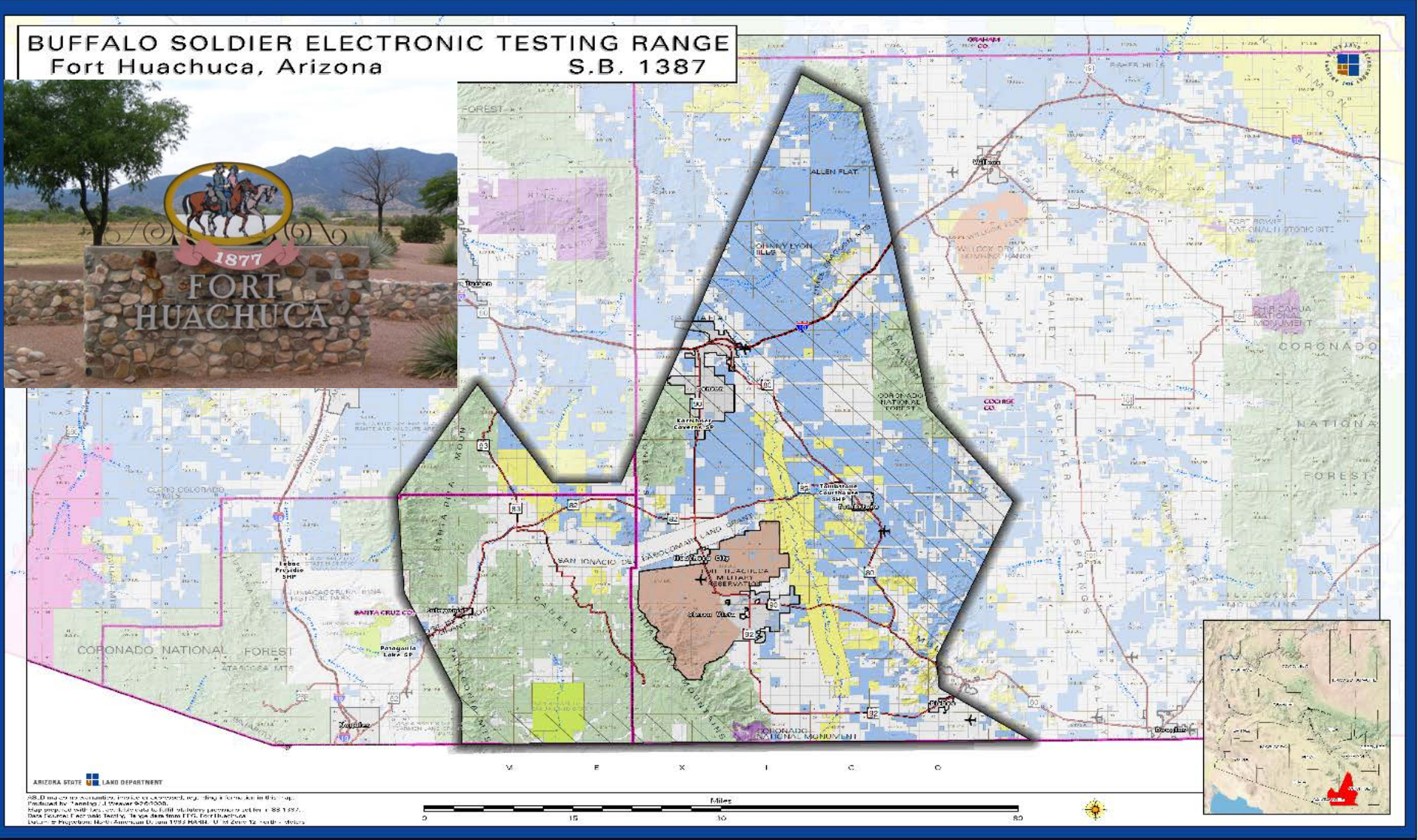
University of Arizona-Water Resource Research Center
December 2, 2020

The Upper San Pedro Challenge: Balancing Water Needs

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Fort Huachuca Sentinel Landscape



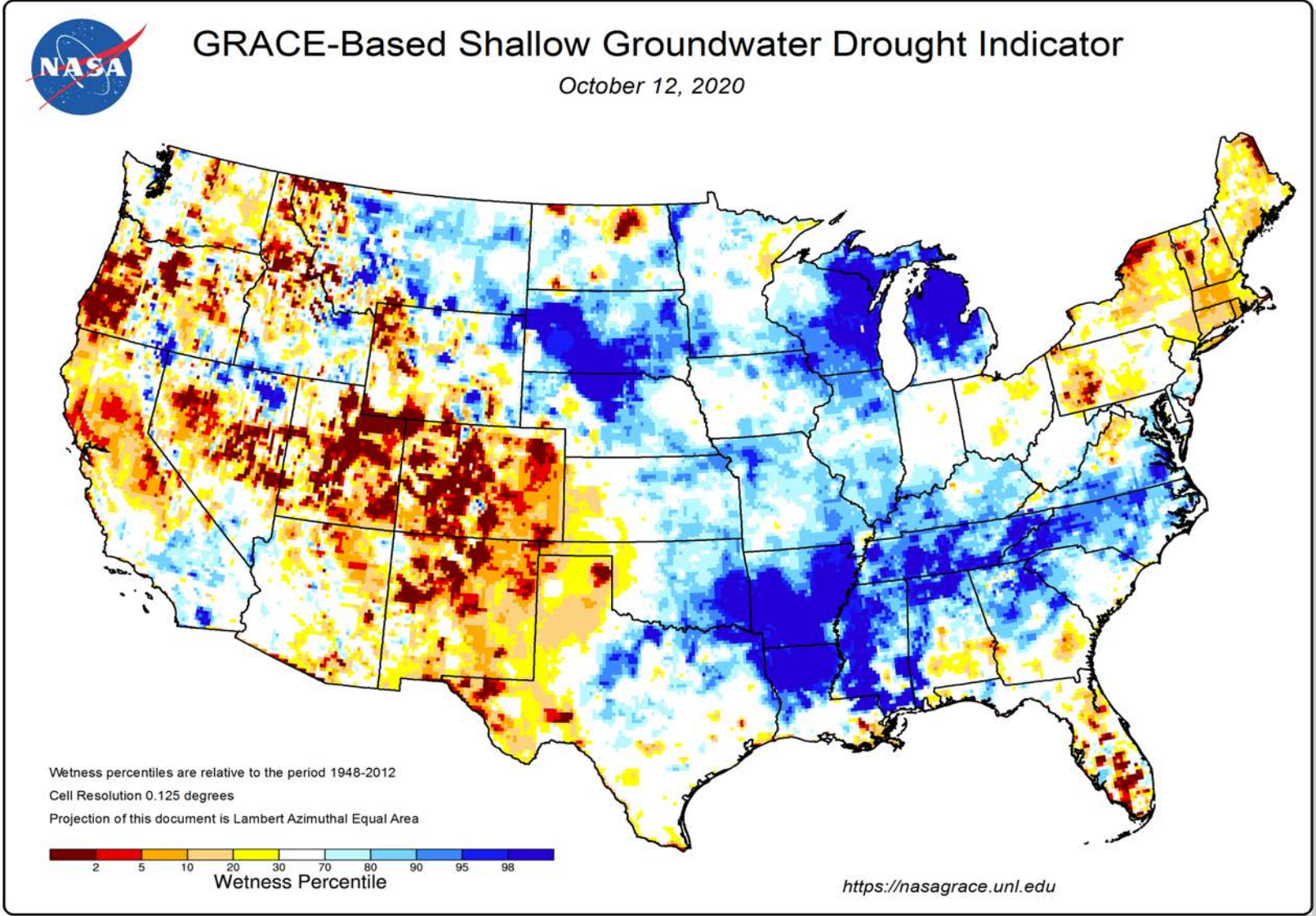
San Pedro Riparian National Conservation Area

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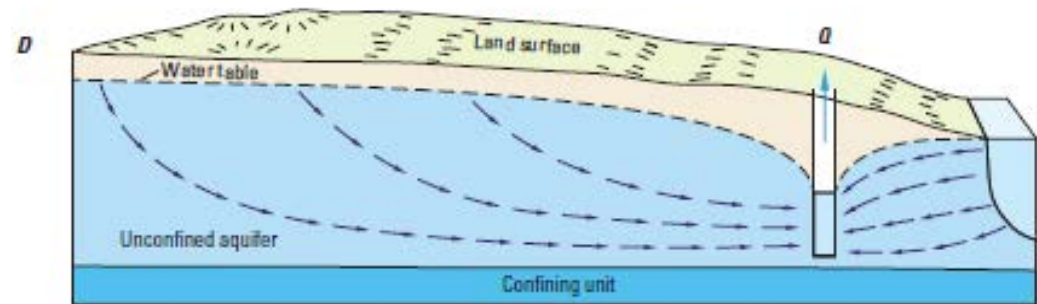
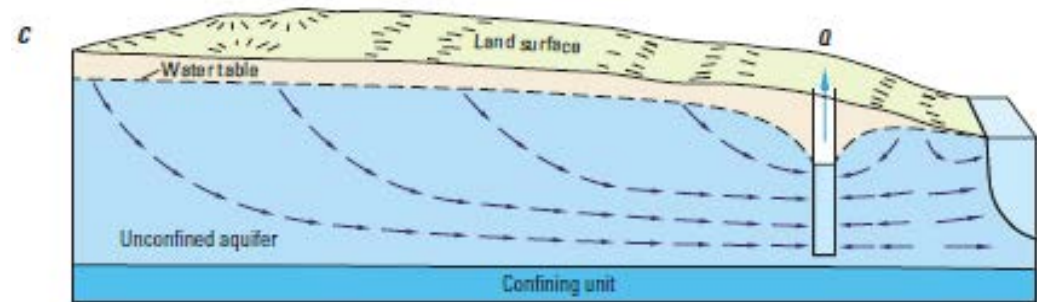
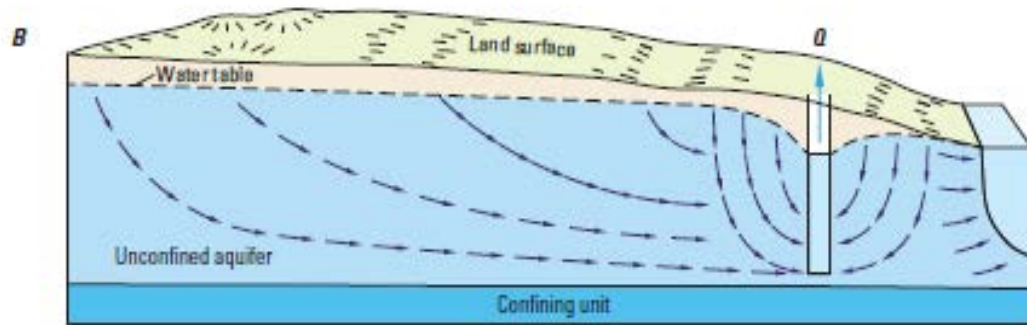
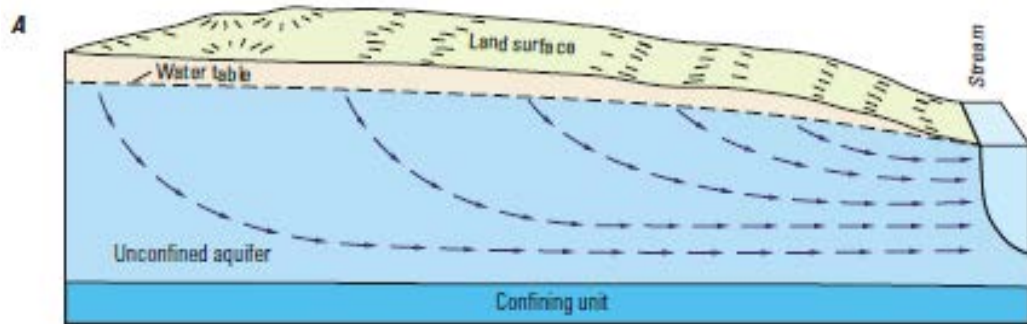
- The **first National Riparian Conservation Area** designated by Congress in the nation in 1988, managed by the U.S. Bureau of Land Management
- Purpose is to protect the riparian area and the aquatic, wildlife, archeological, paleontological, scientific, cultural, educational, and recreational resources



U.S. Groundwater Depletion



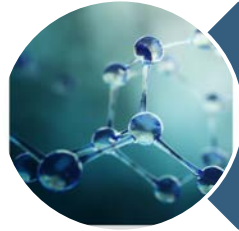
How Pumping Impacts a River



Our Story...

7

- THREE congressionally recognized PARTNERSHIPS. TWO DECADES.
 - ▣ ***Upper San Pedro Partnership (Data)***
 - Hydrologic science: Monitoring, modeling and research
 - ▣ ***Sentinel Landscape (Policy planning/implementation)***
 - Landscape scale conservation
 - ▣ ***Cochise Conservation and Recharge Network (Water Management)***
 - Implementation of groundwater management projects



Data



Planning Policy and
Implementation



Water Resource
Management Strategies



Laws and Regulations

UPPER SAN PEDRO PARTNERSHIP (#1)- Science

MISSION AND PURPOSE

1. The purpose of the Partnership is to coordinate and cooperate in the identification, development and utilization of science and technical information to assist in meeting water needs in the Sierra Vista Subwatershed of the Upper San Pedro River Basin

uppersanpedropartnership.org



Upper San Pedro Partnership Members

10

AZ Antelope Foundation
AZ Assoc of Conservation Districts
AZ Department of Agriculture
AZ Department of Environmental Quality
AZ Department of Water Resources
AZ Dept of Forestry and Fire Mgmt
AZ Game and Fish Department
AZ Land and Water Trust
AZ State Land Department
Appleton-Whittell Research Ranch/Audubon
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US Army/ Fort Huachuca
US Bureau of Land Management
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US Fish and Wildlife Service
US Forest Service
US Geological Survey
Watershed Management Group
Western Regional Partnership

San Pedro River, Palominas

Regional Hydrologic Monitoring Framework

11



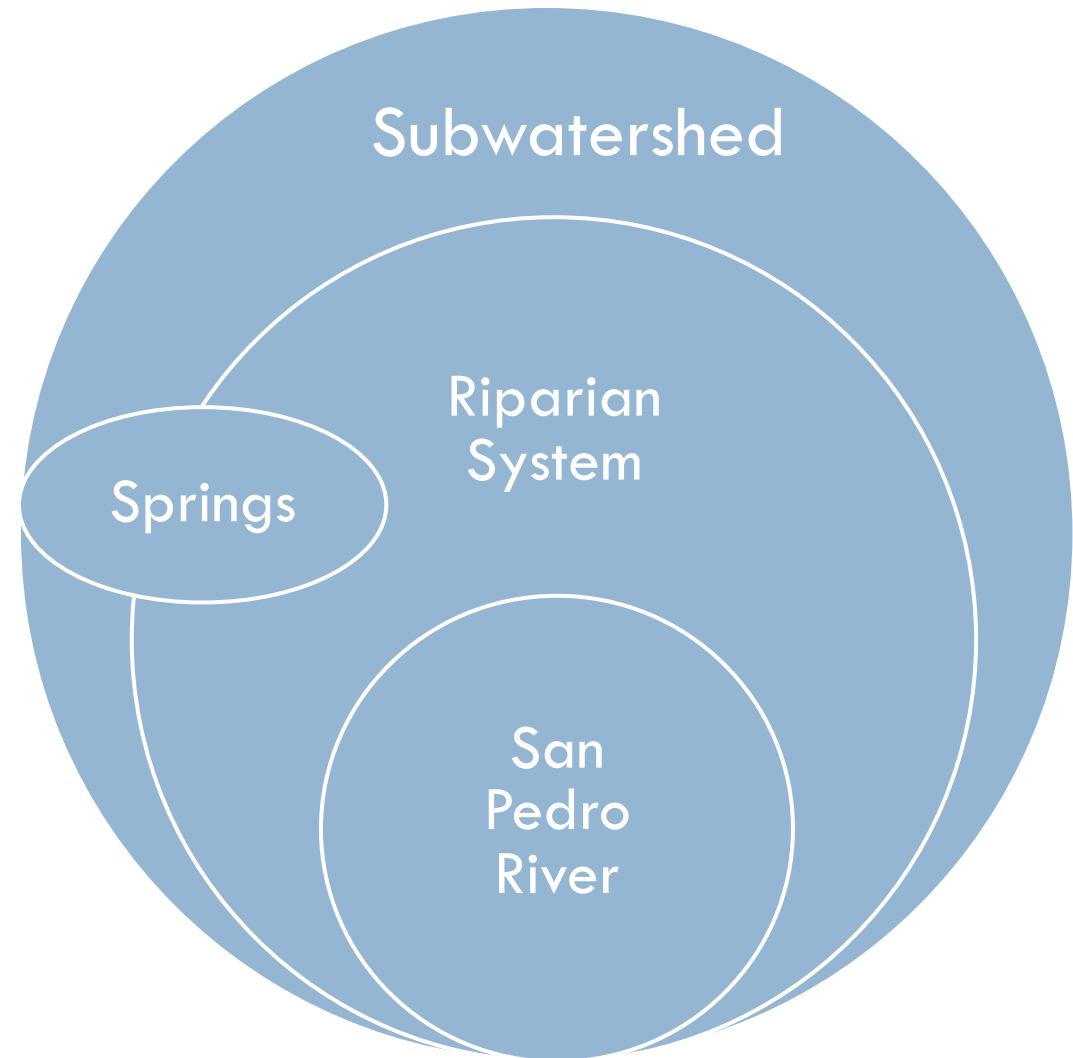
Prepared in cooperation with The Nature Conservancy, the Bureau of Land Management, Cochise County, the City of Sierra Vista, and the U.S. Department of Defense

Hydrological Conditions and Evaluation of Sustainable Groundwater Use in the Sierra Vista Subwatershed, Upper San Pedro Basin, Southeastern Arizona

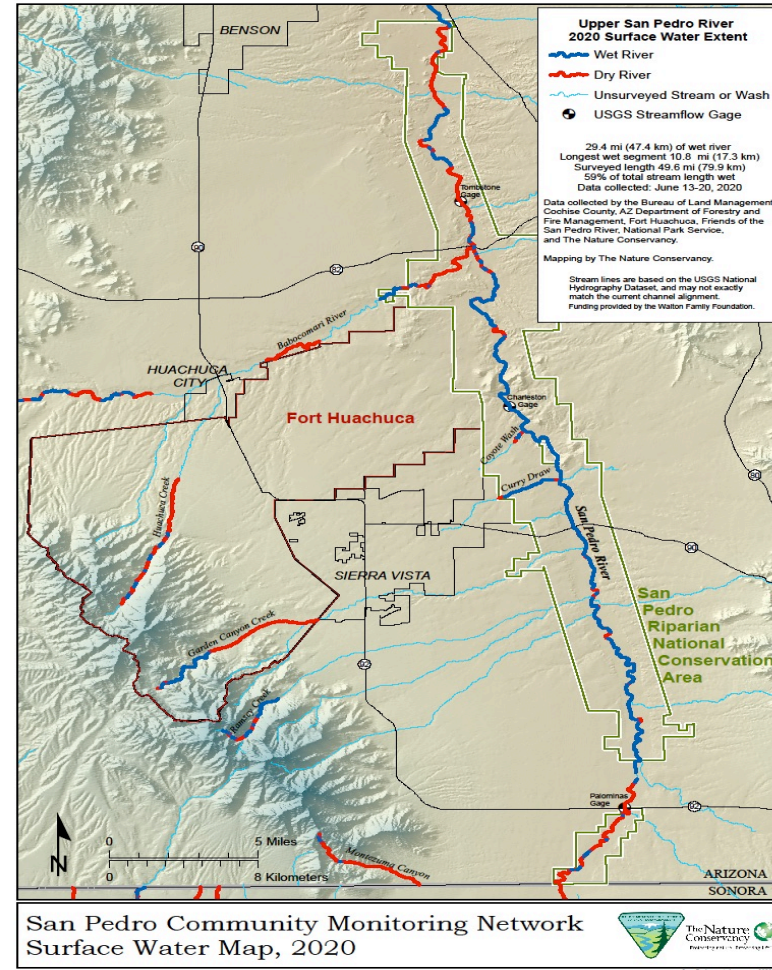
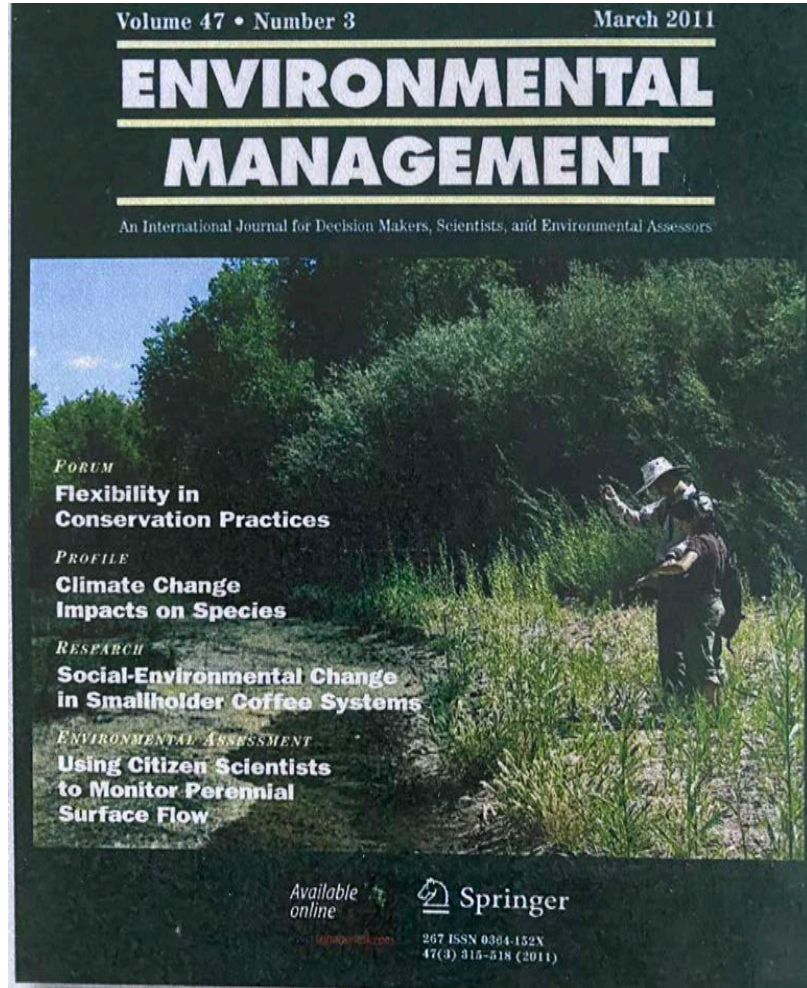


Scientific Investigations Report 2016–5114
Version 1.3, April 2019

U.S. Department of the Interior
U.S. Geological Survey



Participatory Citizen Science



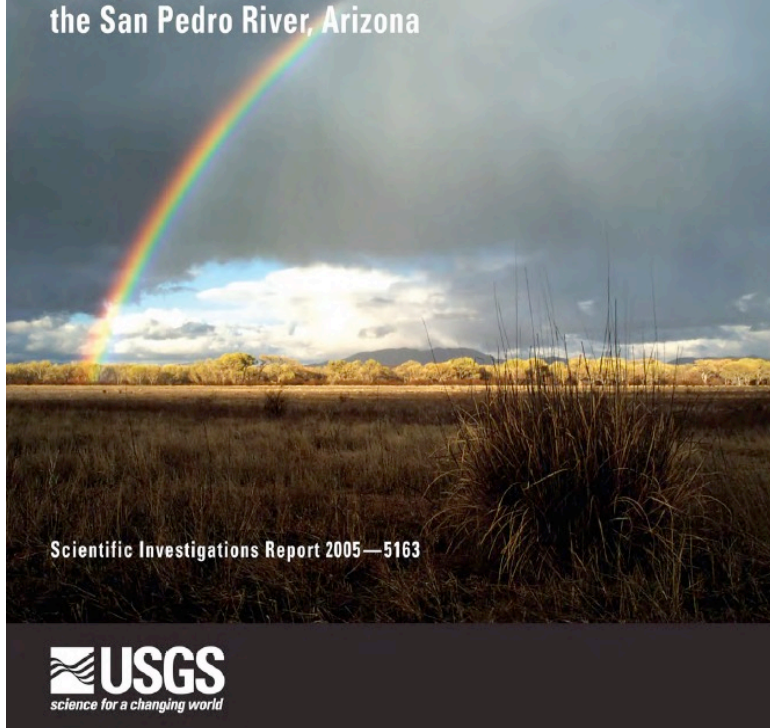
Maps online at: azconservation.org

Ecosystem Health and Water Needs

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the BUREAU OF LAND MANAGEMENT,
ARIZONA DEPARTMENT OF WATER RESOURCES, CITY OF SIERRA VISTA,
U.S. DEPARTMENT OF DEFENSE and the U.S. ENVIRONMENTAL PROTECTION AGENCY

Hydrologic Requirements of and Consumptive Ground-Water Use by Riparian Vegetation along the San Pedro River, Arizona



Scientific Investigations Report 2005—5163


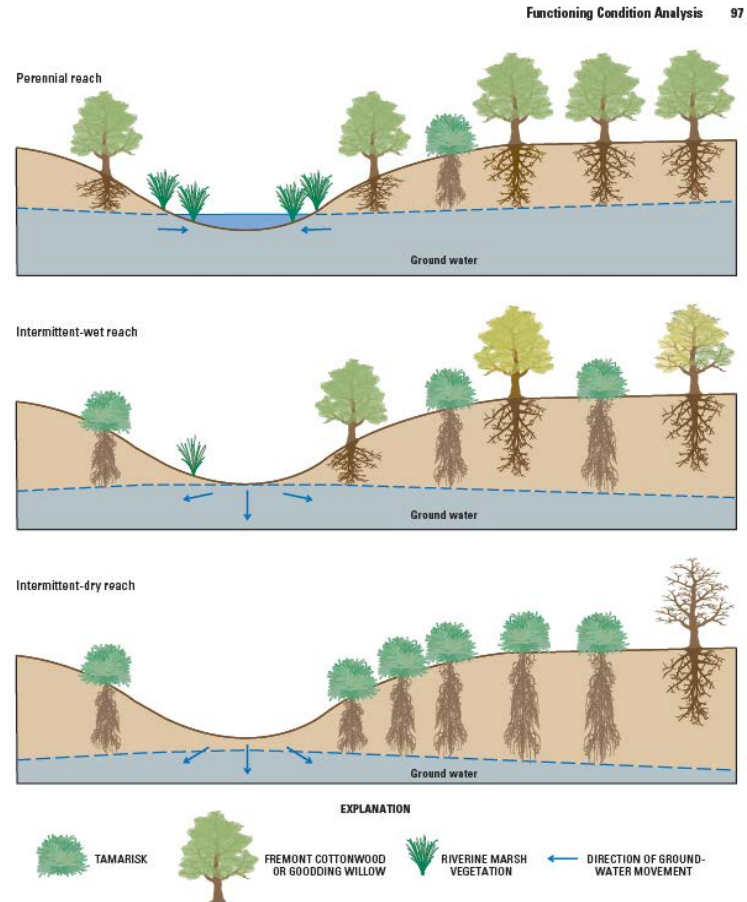



Figure 41. Schematic diagram depicting the three major hydrologic reach types and corresponding vegetation patterns along the Upper San Pedro River, Upper San Pedro Basin, Arizona.

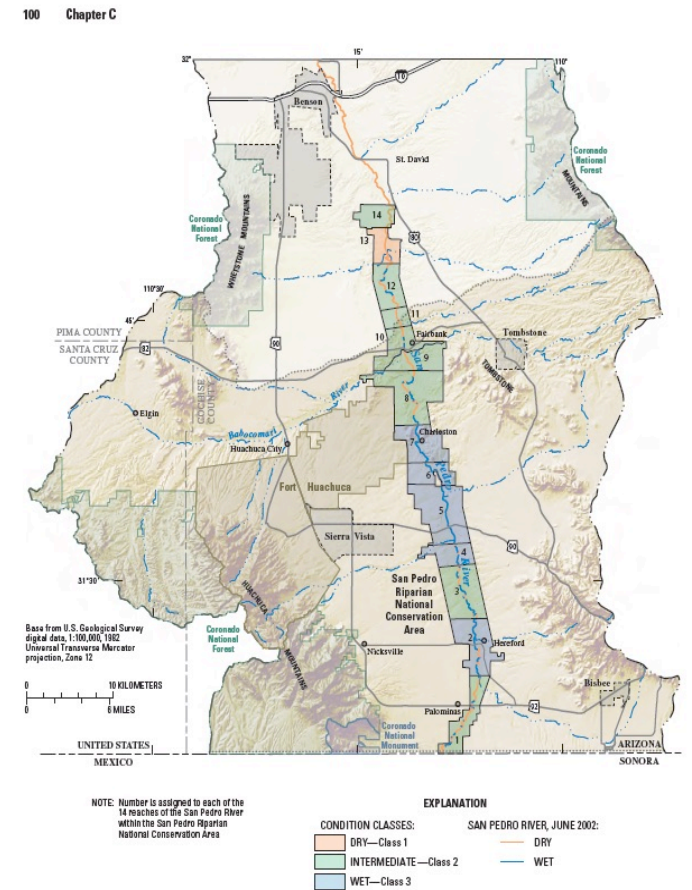


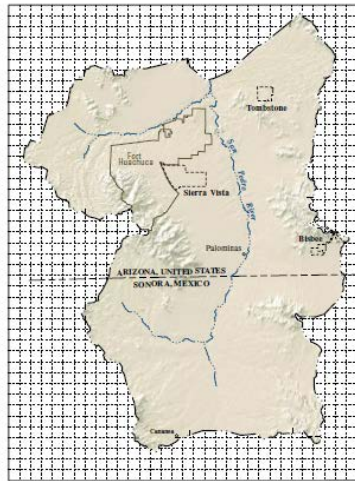
Figure 42. Riparian ecological condition classes for 14 reaches and streamflow presence for June 2002 within the San Pedro Riparian National Conservation Area, Upper San Pedro Basin, Arizona.

Predictive Groundwater Model



Prepared in cooperation with the
UPPER SAN PEDRO PARTNERSHIP and BUREAU OF LAND MANAGEMENT

Ground-Water Flow Model of the Sierra Vista Subwatershed and Sonoran Portions of the Upper San Pedro Basin, Southeastern Arizona, United States, and Northern Sonora, Mexico



Scientific Investigations Report 2006-5228

U.S. Department of the Interior
U.S. Geological Survey

6 Ground-Water Flow Model, Sierra Vista and Sonoran Portions of the Upper San Pedro Basin, Arizona and Mexico

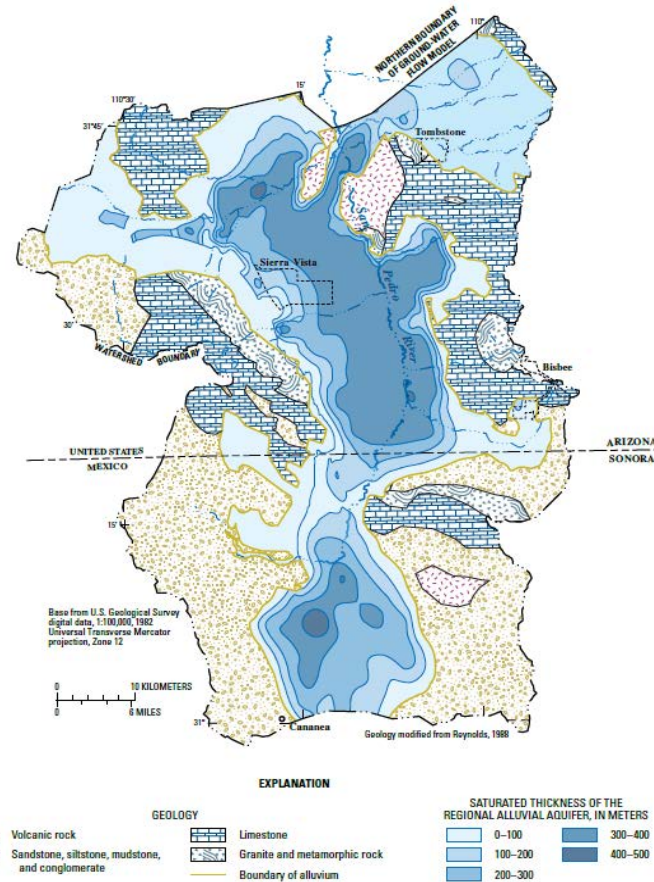
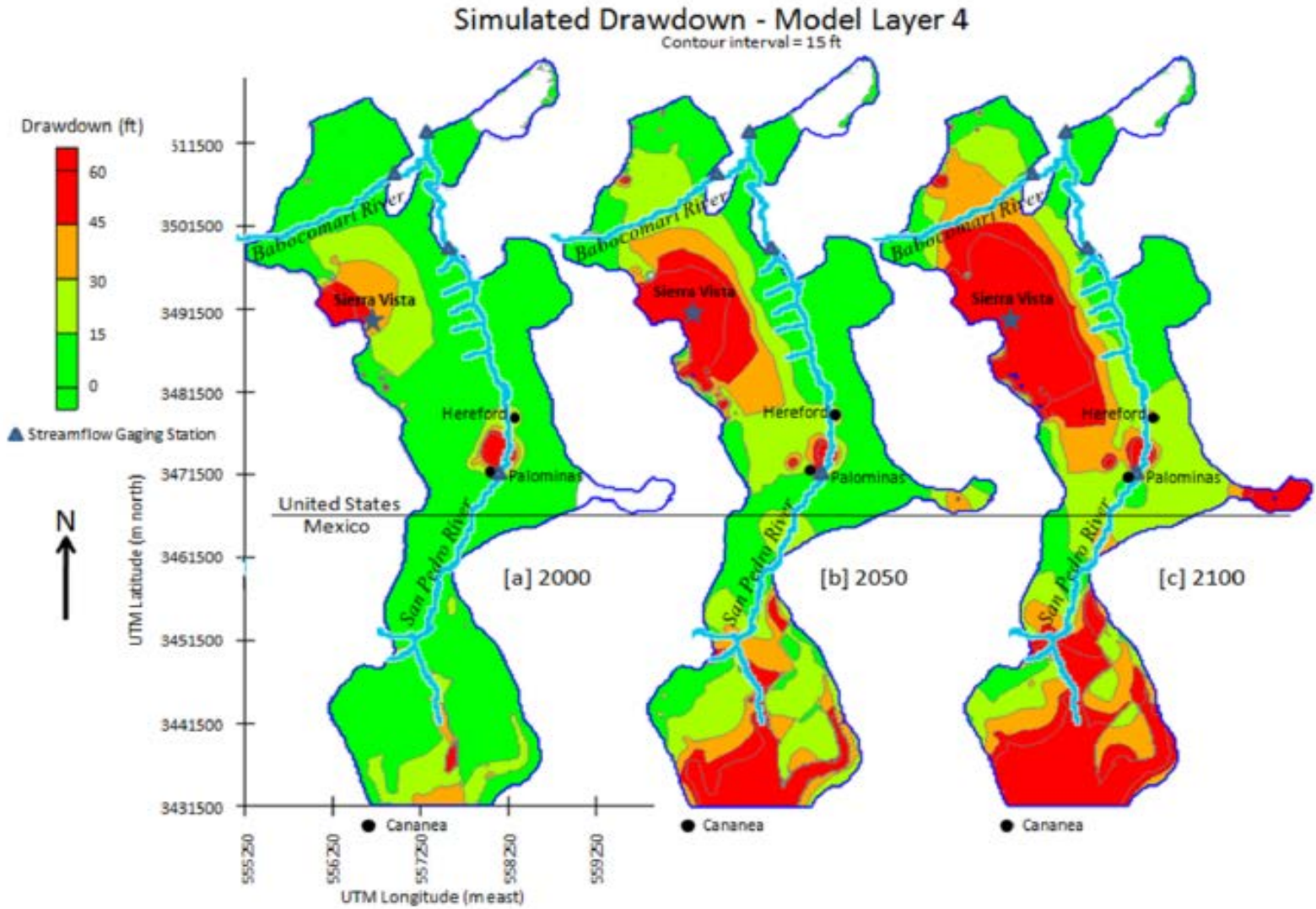


Figure 2. Geology and saturated thickness of the regional aquifer, Upper San Pedro Basin, United States and Mexico.

Groundwater Management Scenarios



Groundwater Capture Maps



Prepared in cooperation with the Upper San Pedro Partnership

Simulated Effects of Ground-Water Withdrawals and Artificial Recharge on Discharge to Streams, Springs, and Riparian Vegetation in the Sierra Vista Subwatershed of the Upper San Pedro Basin, Southeastern Arizona



Scientific Investigations Report 2008–5207

U.S. Department of the Interior
U.S. Geological Survey

12 Simulated Effects of Ground-Water Withdrawals and Artificial Recharge of the Upper San Pedro Basin, Arizona

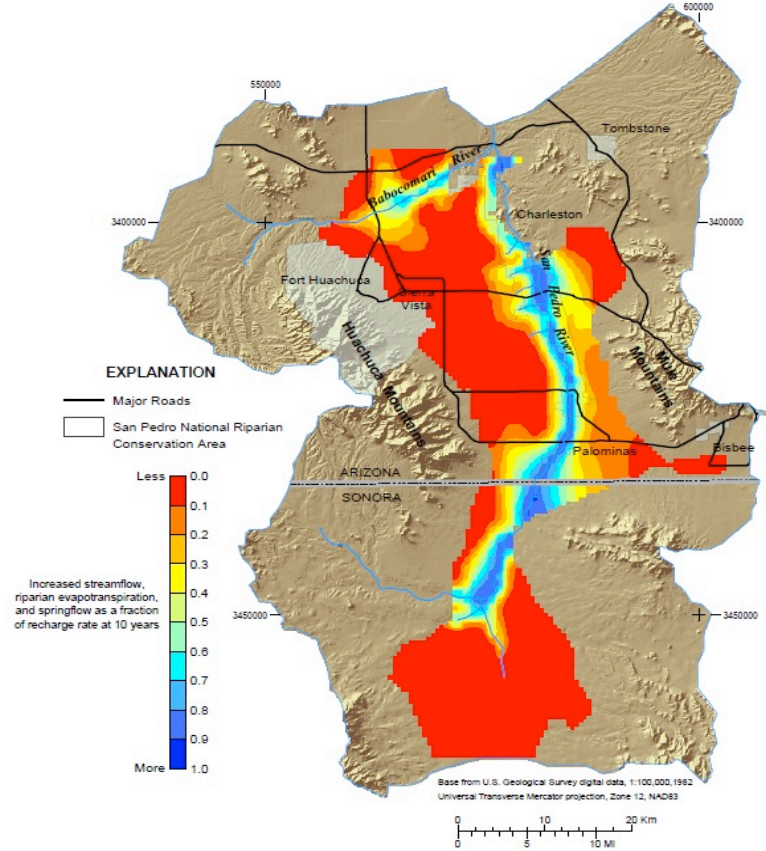


Figure 54. Computed increase of streamflow, riparian evapotranspiration, and springflow that would result for recharge of water to the uppermost model layer at a constant rate for 10 years. The color at any location represents the fraction of the recharge rate at that location that can be accounted for as changes in outflow to model boundaries representing streams, riparian vegetation, and springs.

Web-based Hydrologic Information Portal for the Upper San Pedro Basin (July 2020 – June 2022)

*The **WHIP** will make the wealth of hydrologic information gathered from the Upper San Pedro Basin **readily accessible and useful** to the decision-makers, project managers, scientists, and general public who need it and in formats they can use.*



Funded By:

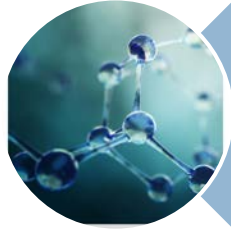
Bureau of Reclamation (\$99K)

WaterSMART Applied Science Grant

Local Match (\$99K)

Cochise County, AZ Department of Water Resources, Sierra Vista, The Nature Conservancy

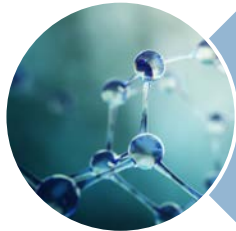




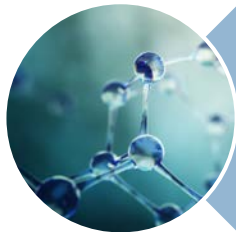
Data



Planning Policy and
Implementation



Water Resource
Management Strategies



Laws and Regulations

Fort Huachuca Conservation Projects

Fort Huachuca has pledged to reduce its impact on groundwater resources through a four-pronged strategy: Reduce, Reuse, Recharge and Educate. The trend is clear, Fort Huachuca has reduced its pumping of groundwater. Here are the facts:

- *Fort Huachuca has reduced groundwater withdrawals from the regional aquifer by over 65 percent through aggressive water conservation measures*
- *Groundwater withdrawals by the Fort have declined from 3,028 acre-feet per year in 1993 to 1025 acre-feet in 2014*
- *During this period, population has varied by several thousand people.*
- *Fort Huachuca accomplished this water conservation by implementing a water conservation policy for all water use on the installation including on-post residents*

SOURCE: <https://waterwise.arizona.edu/fort-huachuca-conservation-projects>

Cochise County Water Policies



Comprehensive, Subwatershed and Area Plans:

- Prohibit increases in residential density within two miles of SPRNCA
- Discourage lot-splitting in lieu of subdivision process
- Thresholds for density requests to not exceed the projected water use under existing zoning.
- Discourage commercial high water uses unless off-set by conservation or re-use measures.
- Encourage new development near existing wastewater treatment and water providers

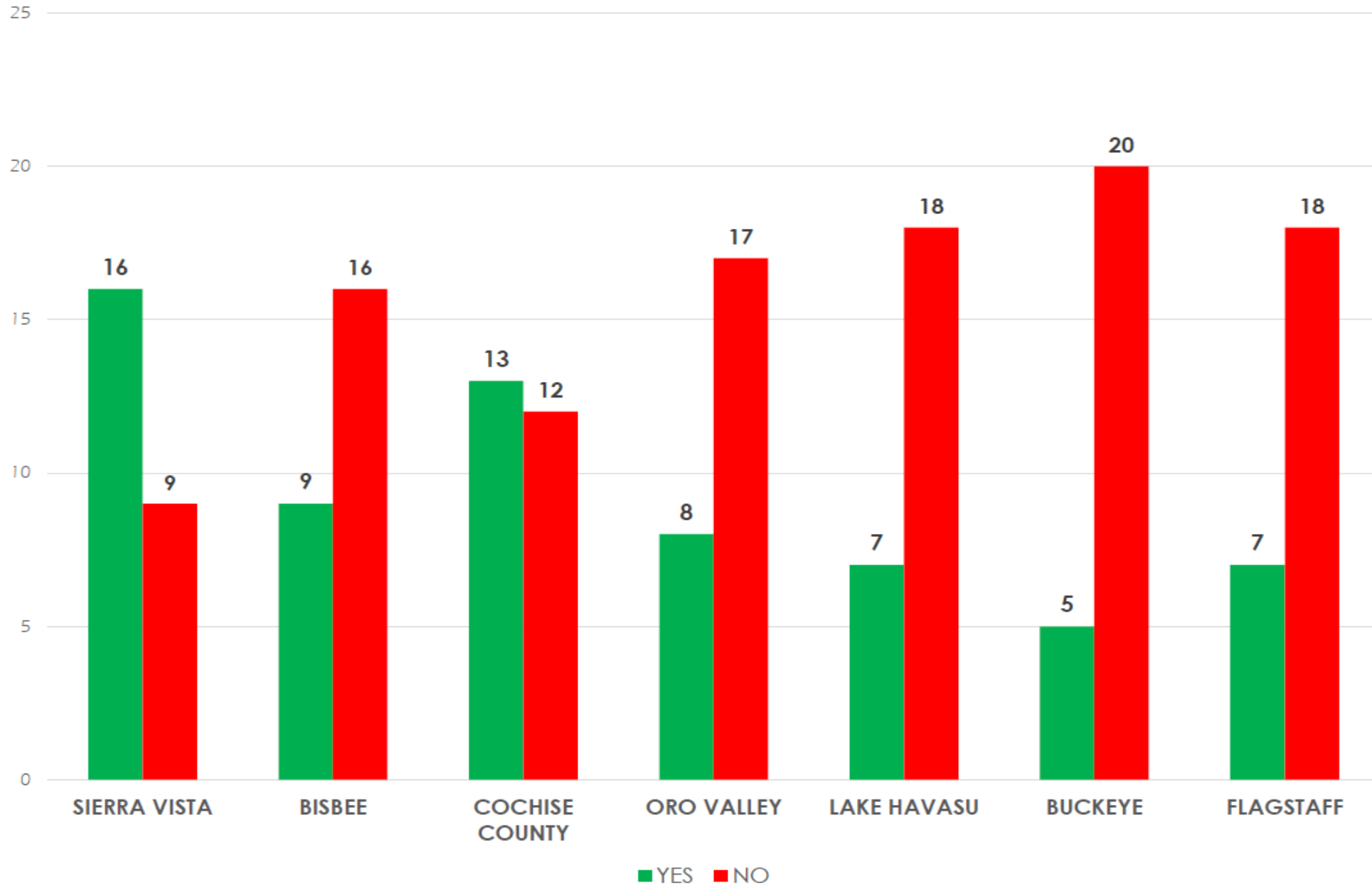
Subdivision Regulations

- “Conservation subdivisions” that require a 50% set-aside through conservation easements

Water Codes by Jurisdiction

Water Conservation Code by Jurisdiction	Sierra Vista	Bisbee	Cochise County (Unincorporated)	Oro Valley (TCSN Metro)	Lake Havasu City	Buckeye (PHX Metro)	Flagstaff
Population	43,585	5,192	49,877	44,350	54,411	68,453	71,975
Regional Water Supply Stress Index Level	0.5 - 0.6	0.5 - 0.6	0.5 - 0.6	0.7 - 0.8	0.7 - 0.8	0.3 - 0.4	0.1 - 0.2
"Reduced-turf" policy in commercial, industrial, and multi-family residential zones	✓	✓	✓	✓	✓	✗	✓
"Reduced-turf" policy in single-family residential zones	✓	✗	✗	✓	✗	✗	✓
"No-turf" policy in commercial and industrial zones	✓	✓	✓	✓	✓	✗	✗
"No-turf" policy in multi-family residential zones ★	✗	✗	✗	✓	✓	✗	✗
Designated Water Conservation Office	✓	✓	✓	✓	✓	✓	✓
Offers water conservation rebate/discount programs	✓	✓	✓	✗	✓	✓	✓
EPA WaterSense Partner City	✓	✗	✗	✗	✓	✓	✓
EPA WaterSense standards officially adopted to code	✓	✗	✗	✗	✗	✗	✗
Automatic shutoff nozzles required for hoses	✗	✗	✗	✗	✗	✓	✗
Car wash facilities required to recycle at least 75% of their water	✓	✗	✓	✗	✗	✗	✗
Self-closing faucets required in non-office commercial zones	✗	✗	✗	✓	✗	✓	✗
Smart control systems required for irrigation	✗	✓	✓	✓	✗	✗	✓
New subdivisions w/ landscaping must have xeriscape model option	✗	✓	✗	✗	✗	✗	✗
Water-impermeable ground covers or barriers shall not be used under landscaping, mulch, or rock	✗	✓	✗	✗	✗	✗	✗
New pools will be required to have a cover	✓	✓	✓	✗	✗	✗	✗
Mandatory greywater-ready plumbing installation in new residential zones	✗	✗	✓	✗	✗	✗	✗
Misters are prohibited in commercial and industrial zones	✓	✗	✓	✗	✗	✗	✗
Flowing waters used in fountains must be recirculated and/or use non-potable water sources	✓	✗	✓	✗	✗	✗	✓
Construction of fountains prohibited in commercial and industrial zones	✓	✗	✗	✗	✓	✗	✗
Site plans are required to list water usage of proposed landscaping ★	✗	✓	✗	✓	✗	✗	✗
Restrictions on new residential air conditioning (no exclusive evaporative cooling systems)	✓	✗	✗	✗	✗	✗	✗
Requires new dishwashers/clotheswashers to be EnergyStar certified	✓	✗	✗	✗	✗	✗	✗
Requires whole-house manifold or on-demand hot water recirculating systems	✓	✗	✓	✗	✗	✗	✗
SFR - New water softeners/drinking water treatment systems must meet NSF/ANSI efficiency standards	✓	✗	✓	✗	✗	✗	✗

ADOPTION OF WATER CONSERVATION CODE PROVISIONS



FORT HUACHUCA SENTINEL LANDSCAPE (#2)

MISSION AND PURPOSE...

Preserve the rural and working character of the landscape, strengthen the economics of farms, ranches, and forests, conserve habitats and natural resources, and protect vital test and training missions on Fort Huachuca



sentinellandscapes.org/landscapes/fort-huachuca/

Fort Huachuca Sentinel Landscape Members

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AZ Antelope Foundation

AZ Assoc of Conservation Districts

AZ Department of Agriculture

AZ Department of Environmental Quality

AZ Department of Water Resources

AZ Dept of Forestry and Fire Mgmt

AZ Game and Fish Department

AZ Land and Water Trust

AZ State Land Department

Appleton-Whittell Research Ranch/Audubon

Audubon Arizona

Borderlands Restoration Group

Castle & Cooke Arizona

City of Sierra Vista

City of Bisbee

Cochise County

Cochise Conservation and Recharge Network

Friends of the San Pedro River

Fry Fire District

Hereford Natural Resource Cons District

Huachuca City

National Park Service

Natural Resource Conservation District

Santa Cruz Natural Resource Cons District

San Pedro Natural Resource Cons District

Sky Island Alliance

Southeast AZ Assoc of Realtors

Southwest Decision Resources

The Nature Conservancy

The Trust for Public Land

The Wilderness Society

Town of Tombstone

University of Arizona

USDA Agricultural Research Service

US Army/ Fort Huachuca

US Bureau of Land Management

US Bureau of Reclamation

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US Geological Survey

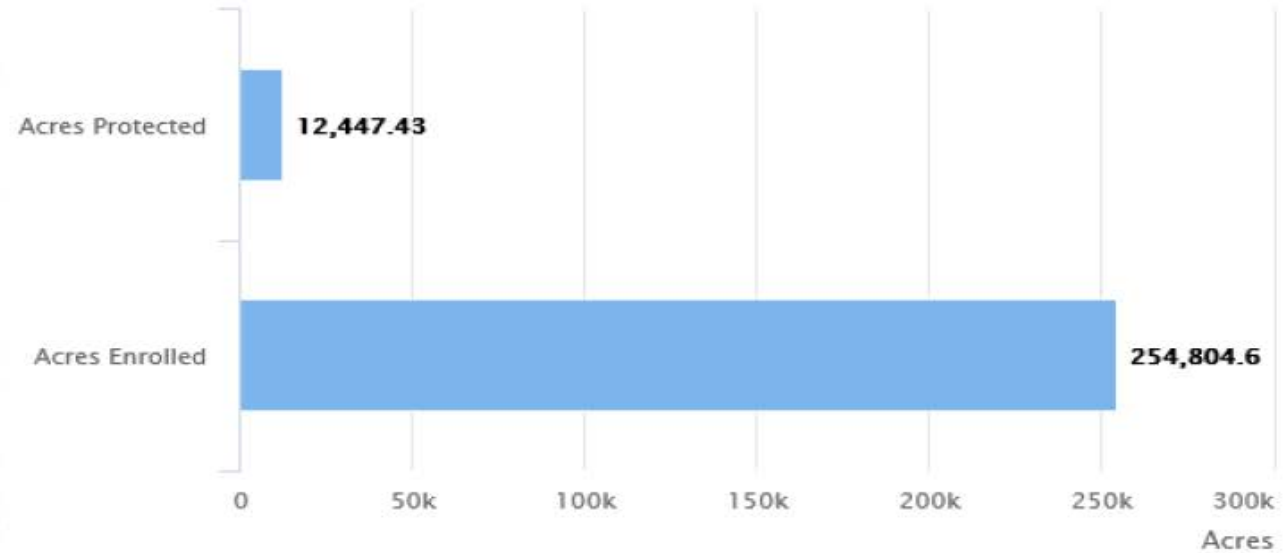
Watershed Management Group

Western Regional Partnership

San Pedro River, Palominas

Fort Huachuca Conservation Projects

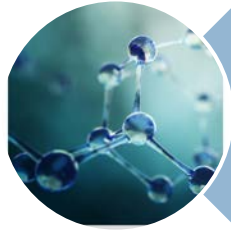
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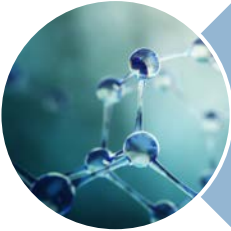
FORT HUACHUCA SENTINEL LANDSCAPE PARTNERSHIP (FHSLP) STRATEGIC PLAN

This Fort Huachuca Sentinel Landscape Partnership (FHSLP) Strategic Plan for 2019 – 2024 outlines objectives to help the Partnership preserve the working and rural character of the landscape, strengthen the economies of farms, ranches, and forests, conserve habitats and natural resources, and protect vital test and training missions conducted on Fort Huachuca.

SOURCE: https://sentinellandscapes.org/media/qsffn2xw/fort_huachuca_strategic-plan.pdf



Data



Planning Policy and
Implementation



Water Management
Resource Strategies



Laws and Regulations

Conservation Easements

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- Keep private landowners managing lands
- Custom restrictions relative to land and water use based on science to benefit habitats and regional water security
- Can include permanent retirement of historic pumping, preclude future water use, and allow for construction of aquifer recharge facilities



Cochise Conservation & Recharge Network (#3)

MISSION AND PURPOSE...

1. The mission of the Cochise Conservation & Recharge Network (CCRN) is to implement a regional network of land and water management projects that result in a healthy watershed, flowing San Pedro River, conservation of water resources, and a vibrant local economy.



ccrnsanpedro.org

Cochise Conservation and Recharge Network Members

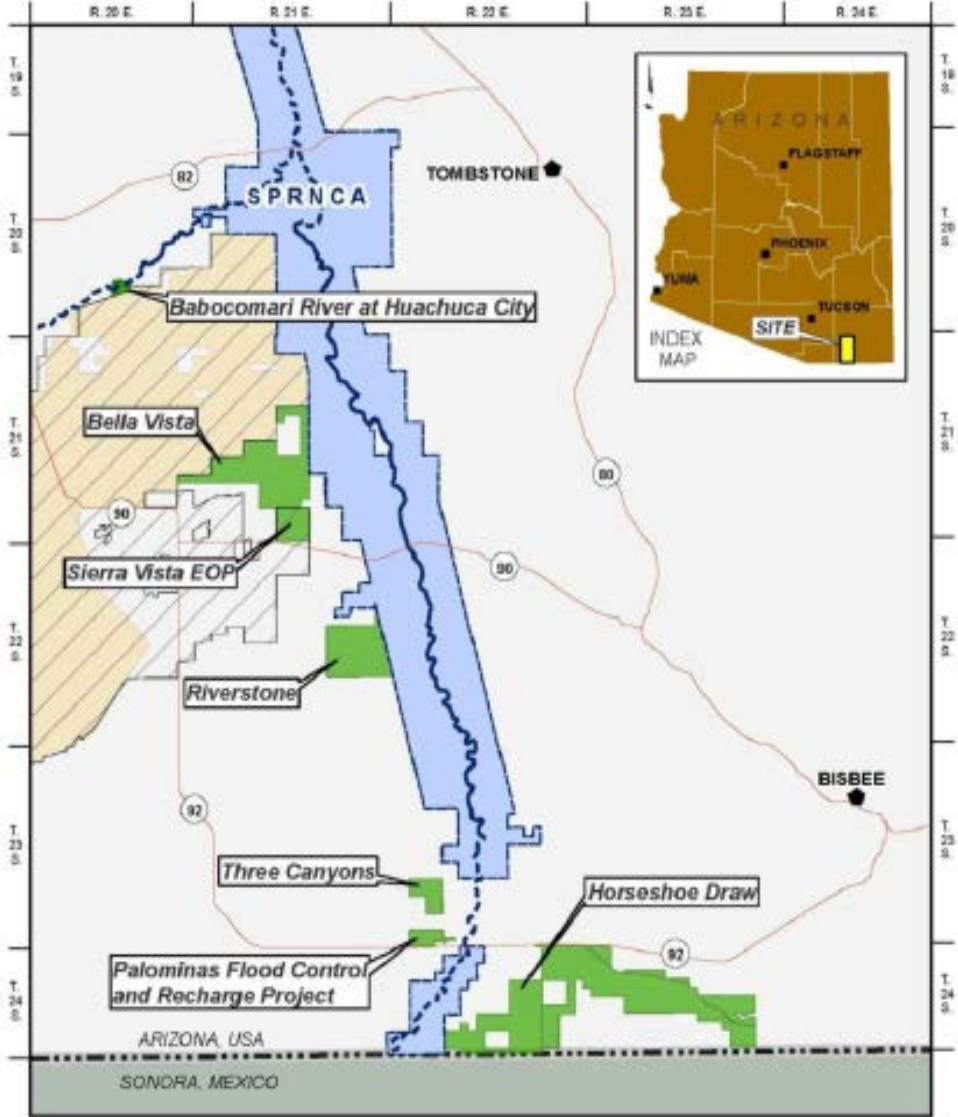
29

AZ Antelope Foundation
AZ Assoc of Conservation Districts
AZ Department of Agriculture
AZ Department of Environmental Quality
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Cochise Conservation and Recharge Network

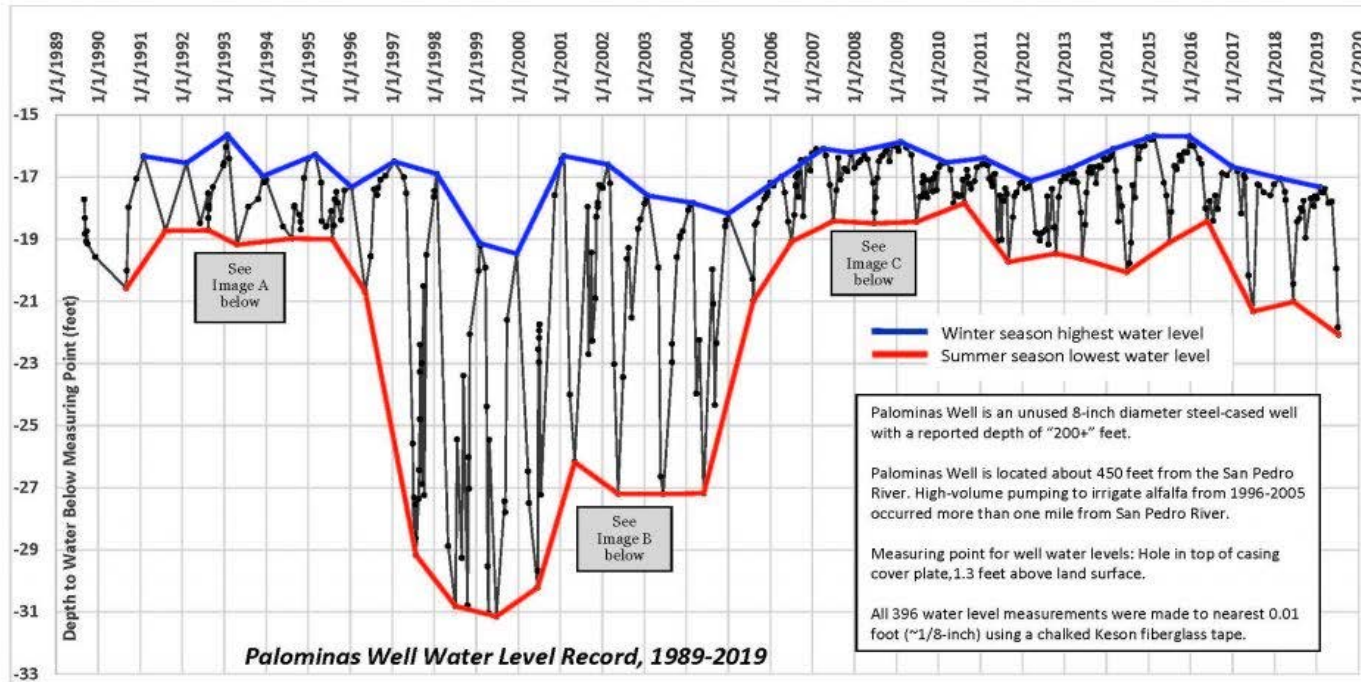


EXPLANATION

Recharge Network Site

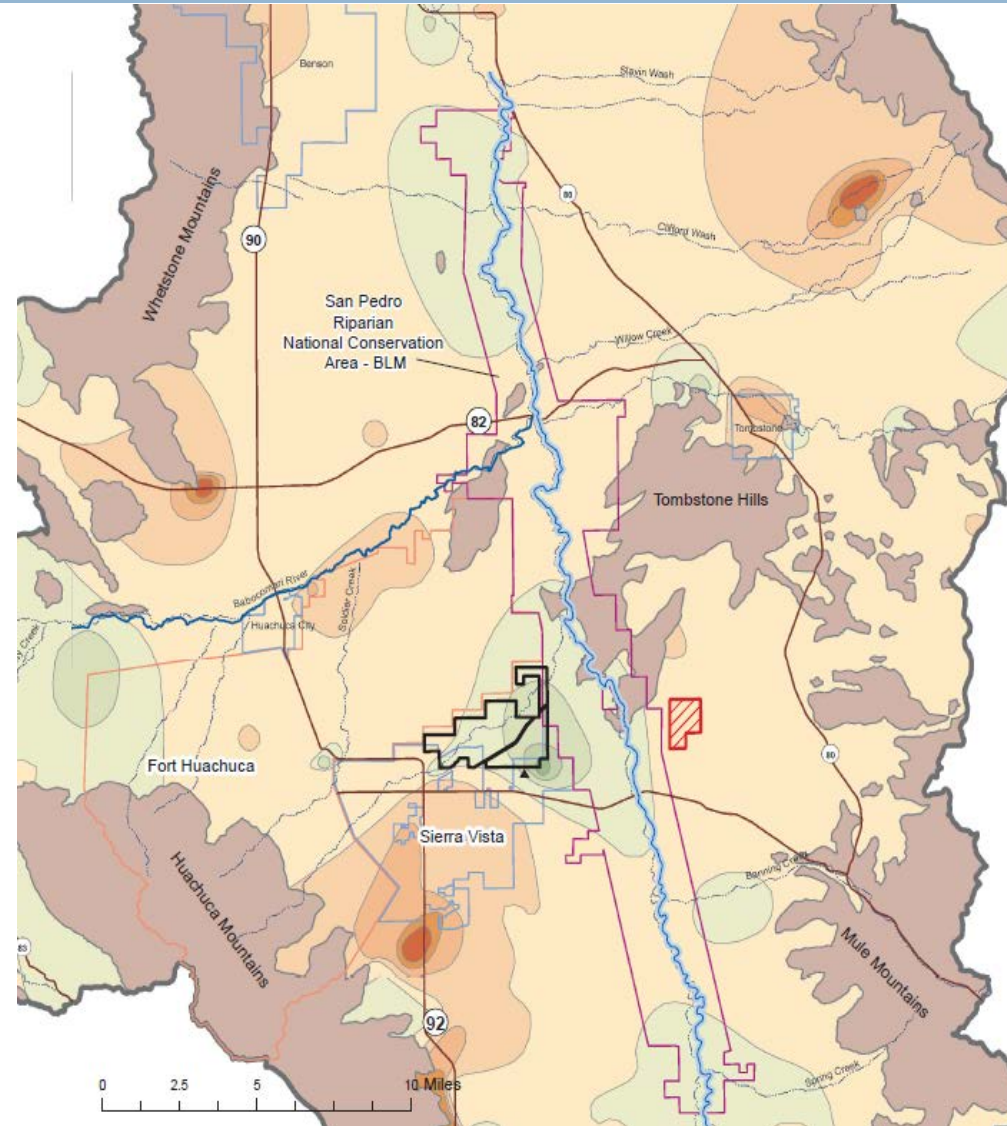
Retired Pumping

IMPACT OF HIGH-VOLUME PUMPING ON THE WATER LEVEL IN A WELL NEAR THE SAN PEDRO RIVER

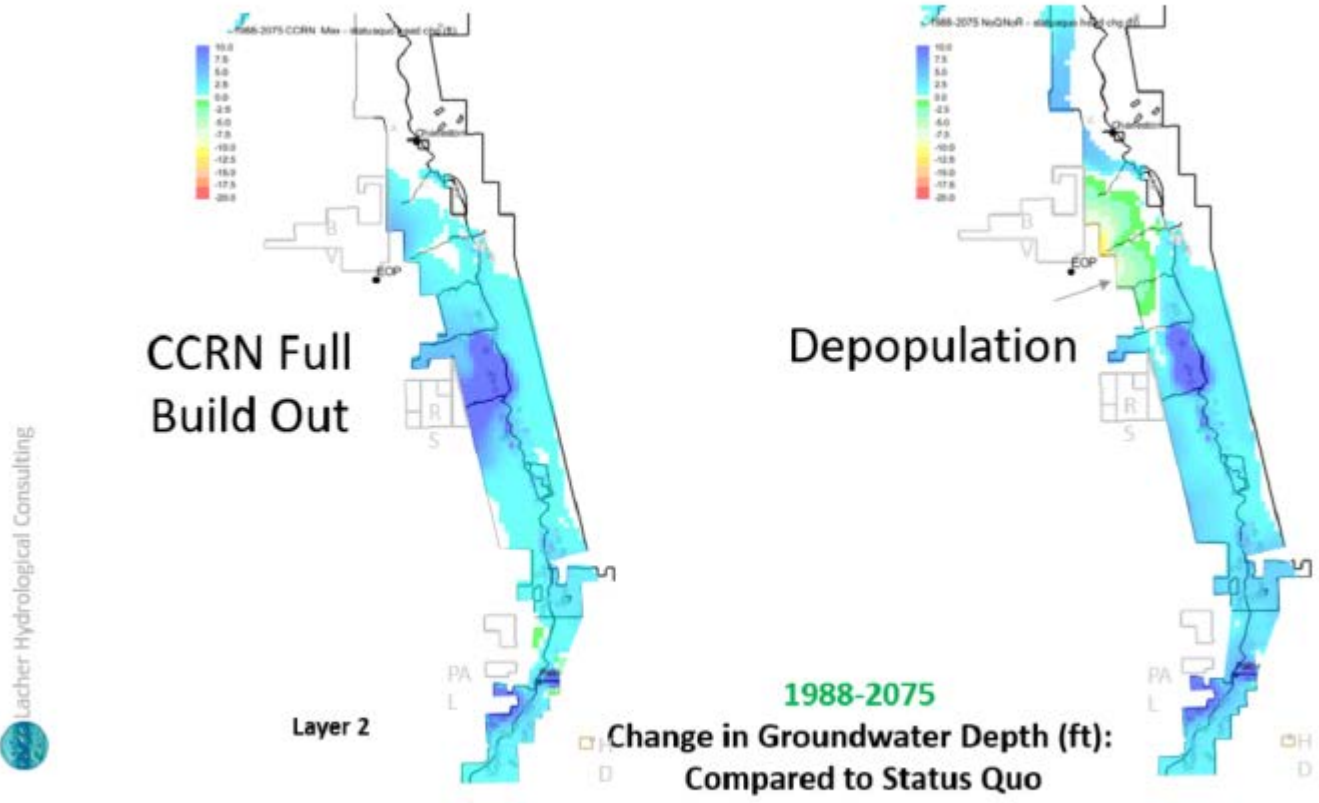


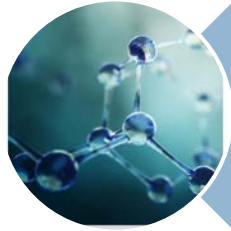
Aquifer Recharge- City of Sierra Vista

32

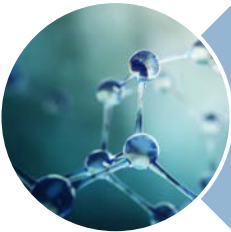


The Bottom Line...

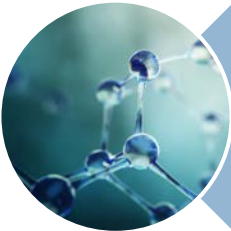




Data



Planning Policy and
Implementation



Water Management
Resource Strategies



Laws and Regulations

Legal Considerations

- Unique habitat and biodiversity attributes of the SPRNCA has resulted in significant legislation and litigation.
- Legal aspects have impacted partnerships direction and work.
- *Federal reserved water rights for SPRNCA and Gila Water Rights Adjudication address federal gross need for water. Fort Huachuca and BLM have both completed claims/extensive trials and awaiting court decisions.*
- *Section 7 of Endangered Species Act has implications for net effect of water usage on San Pedro River and endangered and threatened species. 5 lawsuits against Fort over past 25 years. Lawsuit currently pending. Current Fort Biological Opinion has water credit surplus for Fort.*

THANK YOU!

