

# Challenges for Future Water Management in the Southwest

Stan Leake

U.S. Geological Survey

Tucson, Arizona

saleake@usgs.gov

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# Outline

- Regional population and water-use trends, 1950-2000
- Challenges for future ground-water development with expanding population
  - Lost volume in storage
  - Threats to riparian areas
  - Land subsidence
- Concluding thoughts

# Population and Water-Use Trends

Available online:

<http://pubs.usgs.gov/sir/2004/5148/>

Ground-Water Resources Program

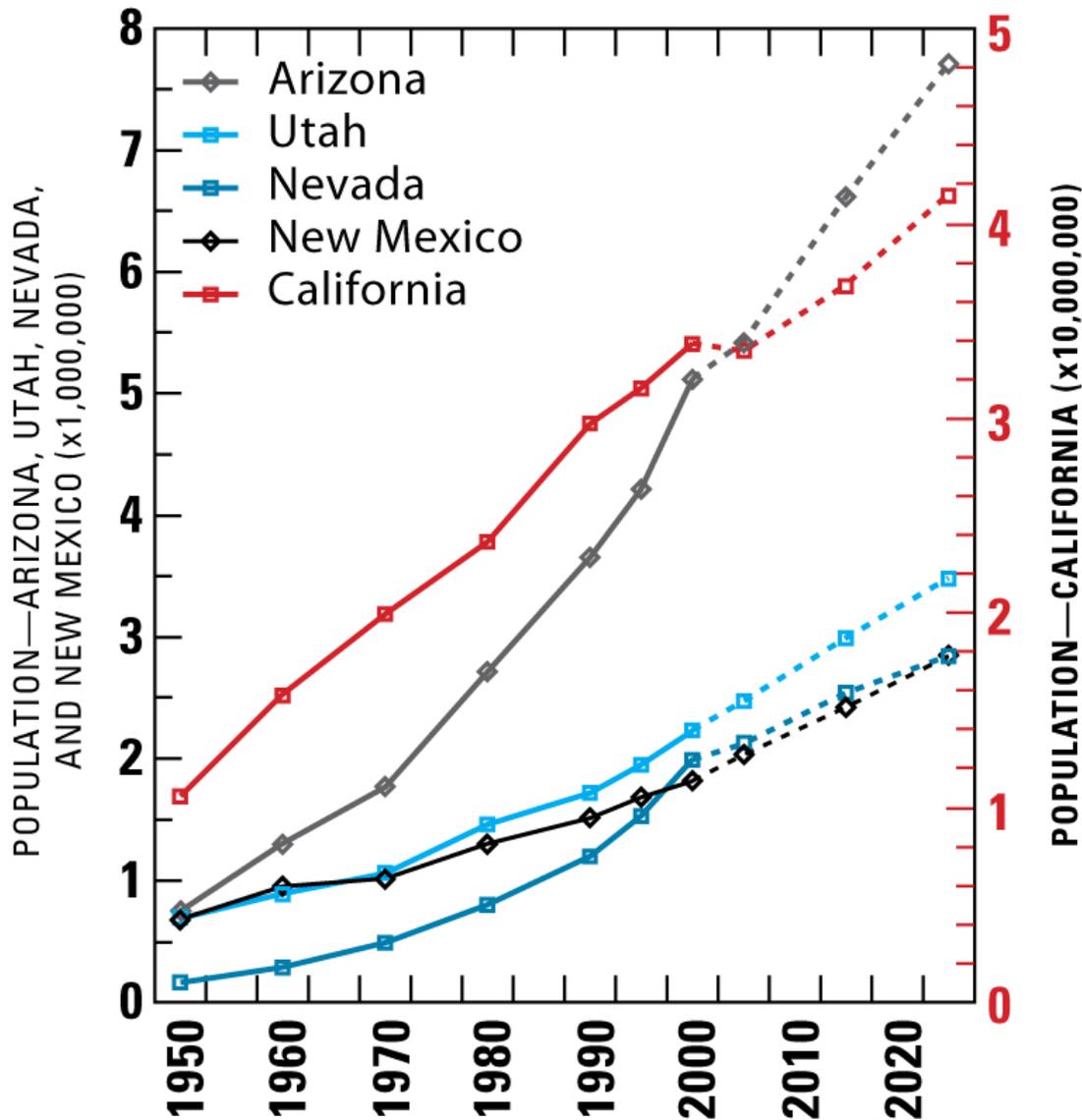
## Water-Use Trends in the Desert Southwest—1950–2000



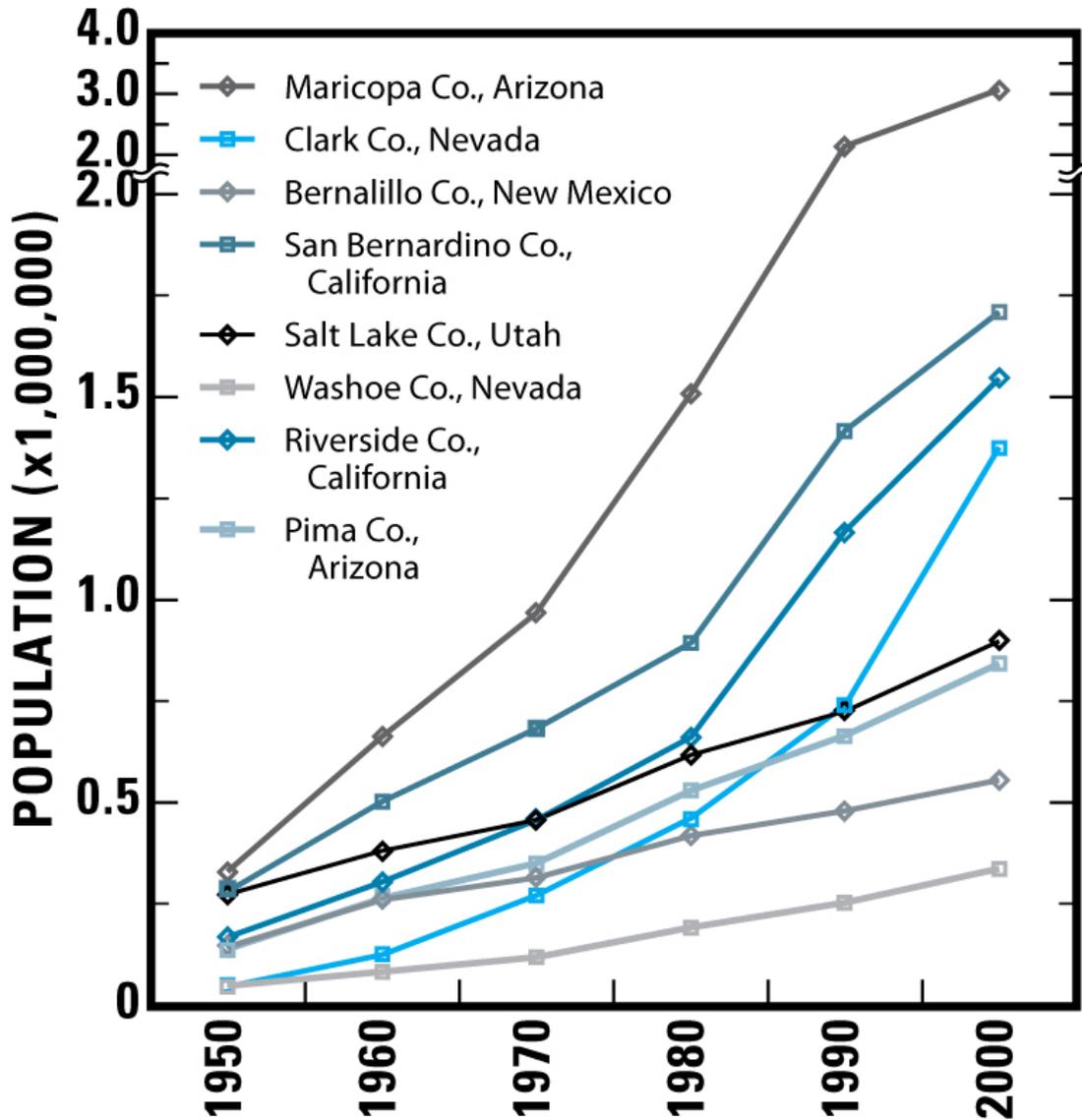
Scientific Investigations Report 2004–5148

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

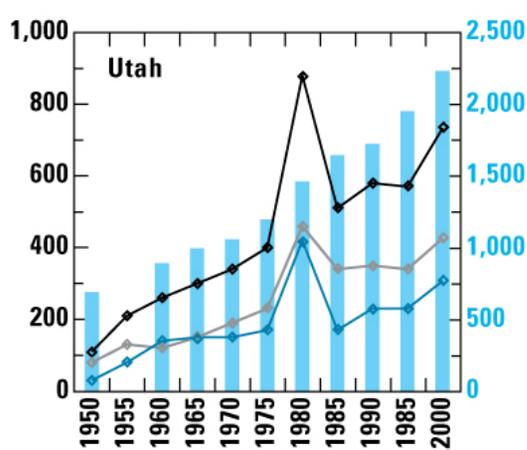
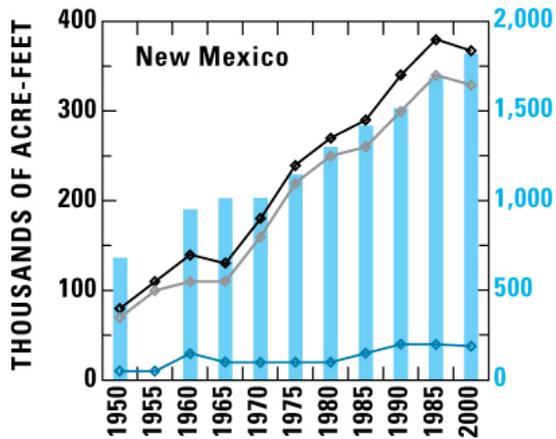
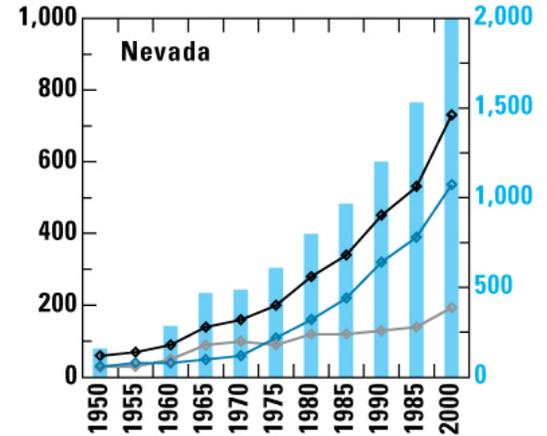
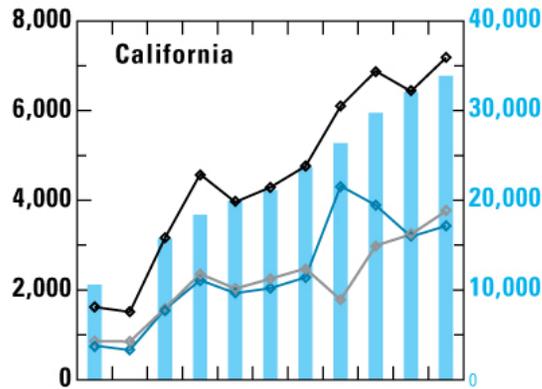
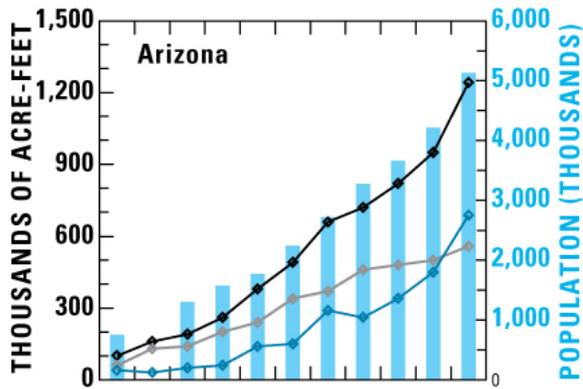
# Population and Water-Use Trends



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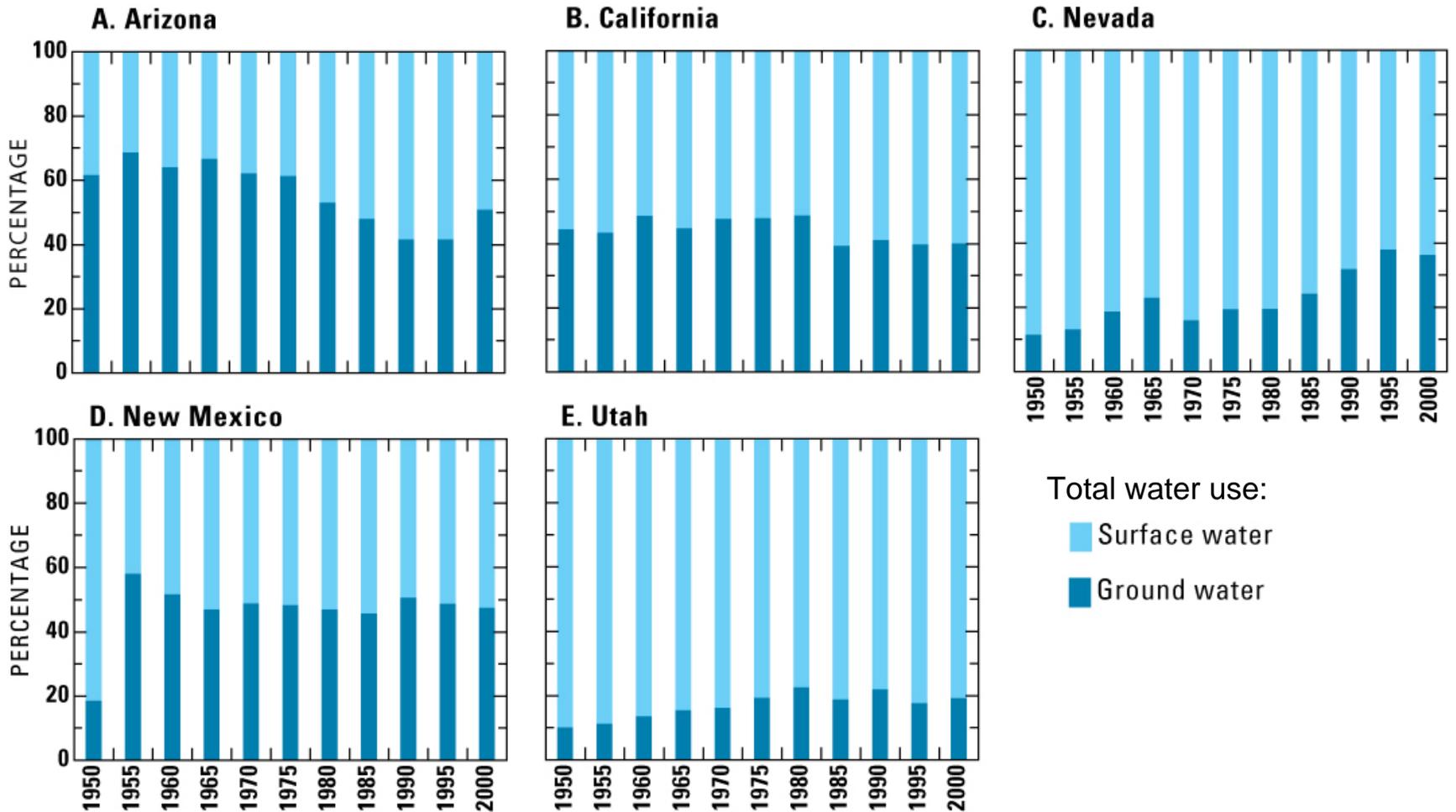


**Domestic use:**

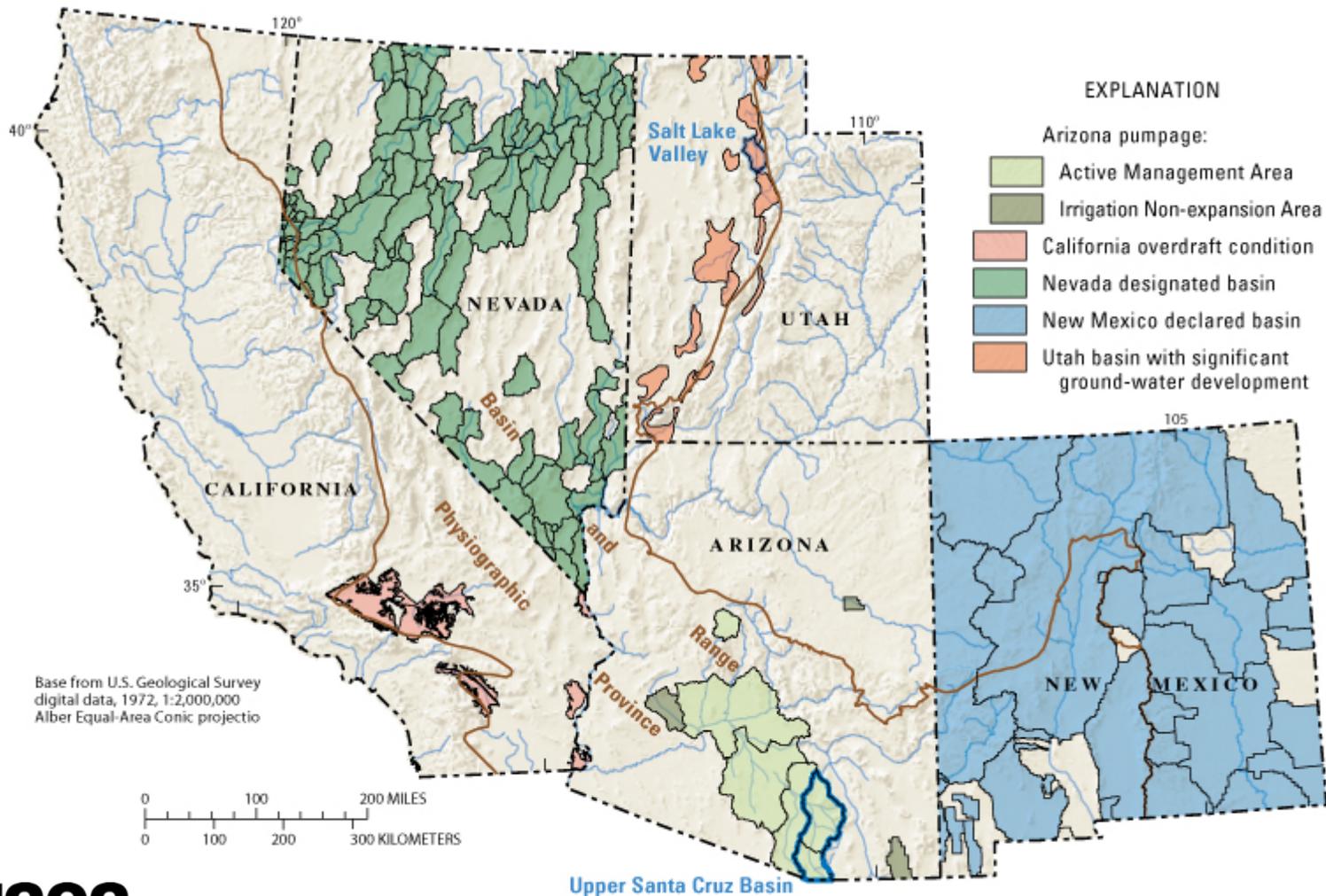
- Ground water
- Surface water
- Total
- Population

NOTE: No population data available for 1955

# Population and Water-Use Trends

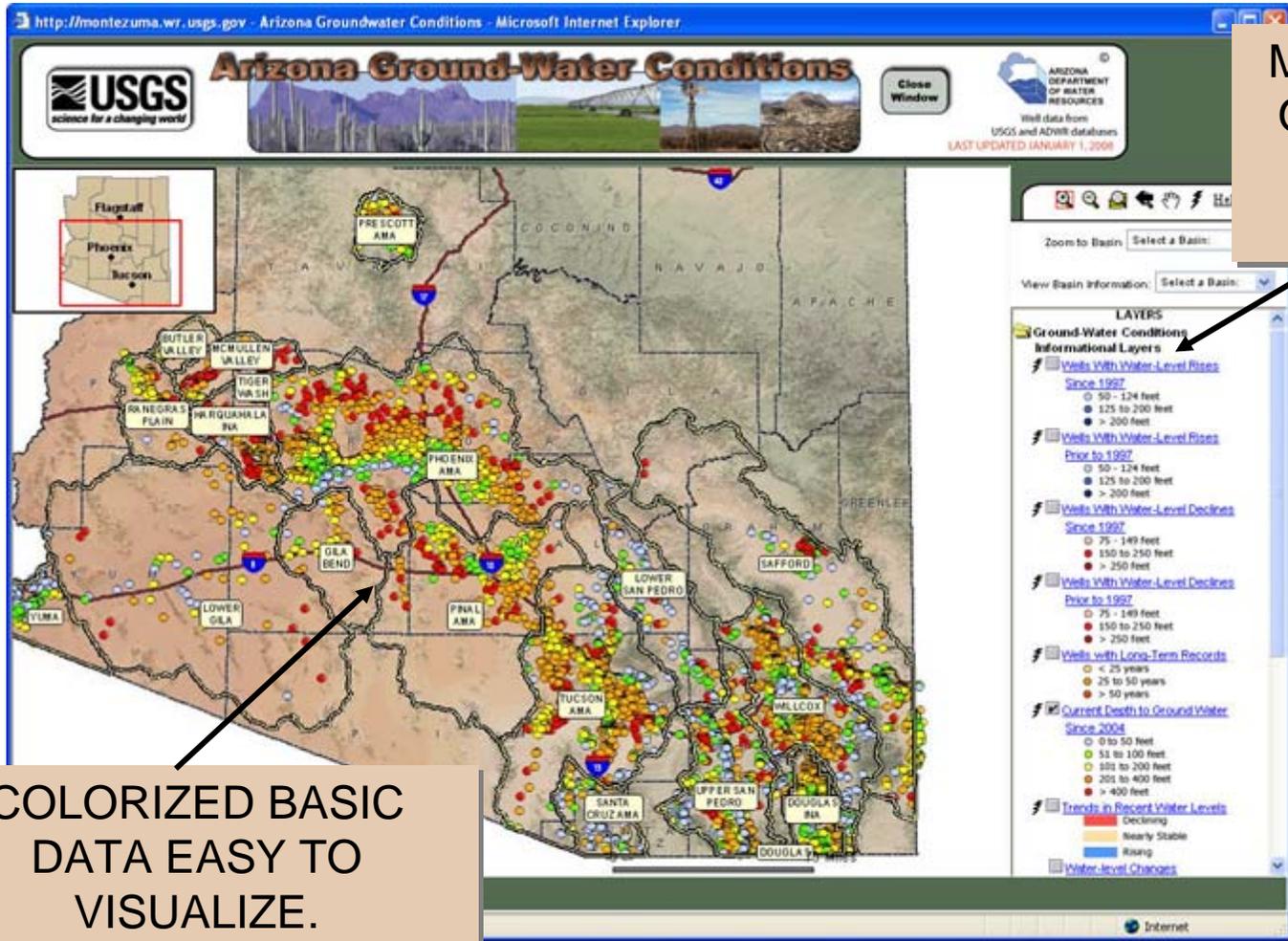


# Ground-Water Management in the Desert Southwest



# Ground-Water Use– Storage Change

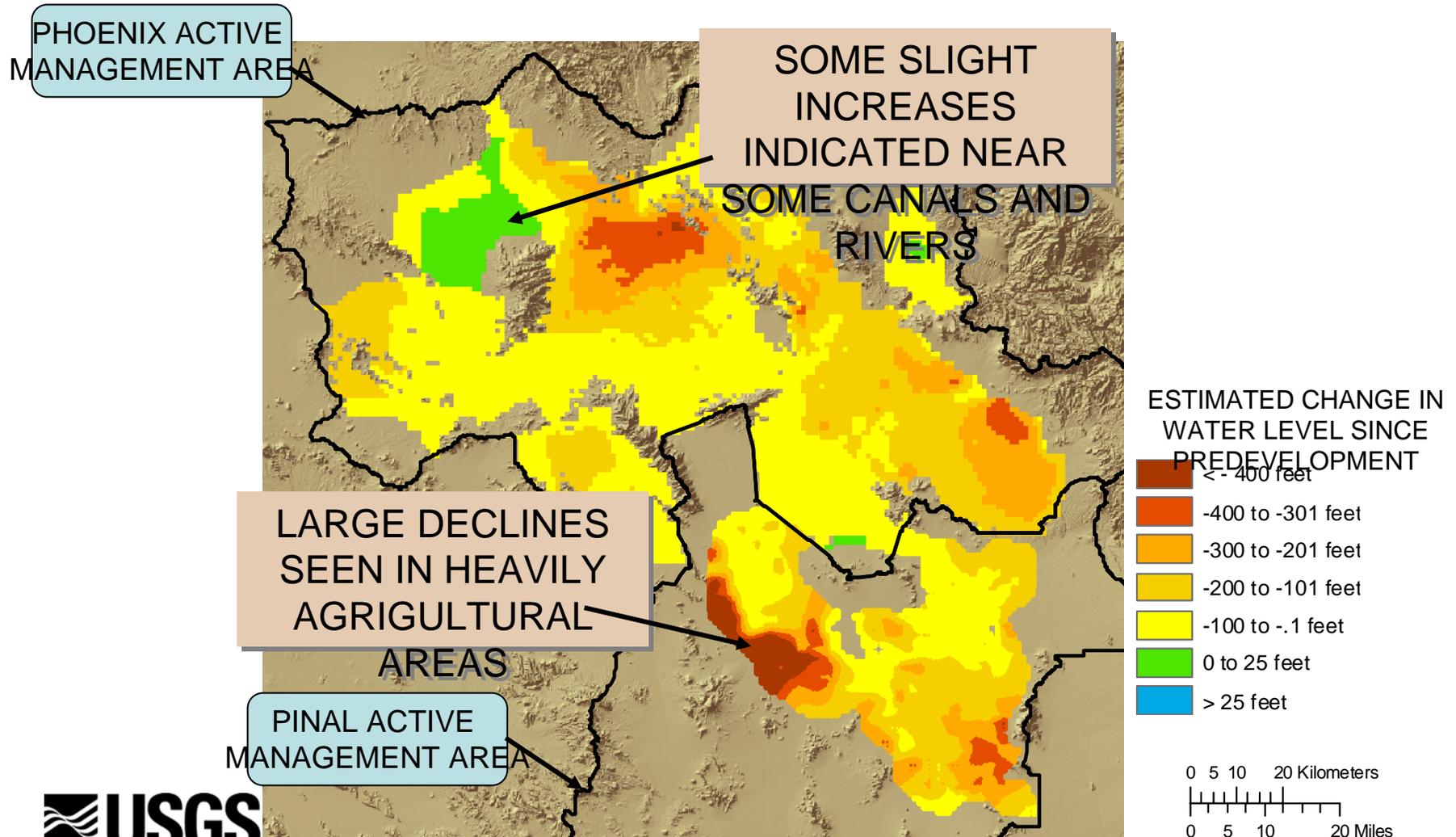
New Online Interactive Map for Presenting Ground-Water Conditions  
<http://montezuma.wr.usgs.gov/website/azgwconditions>



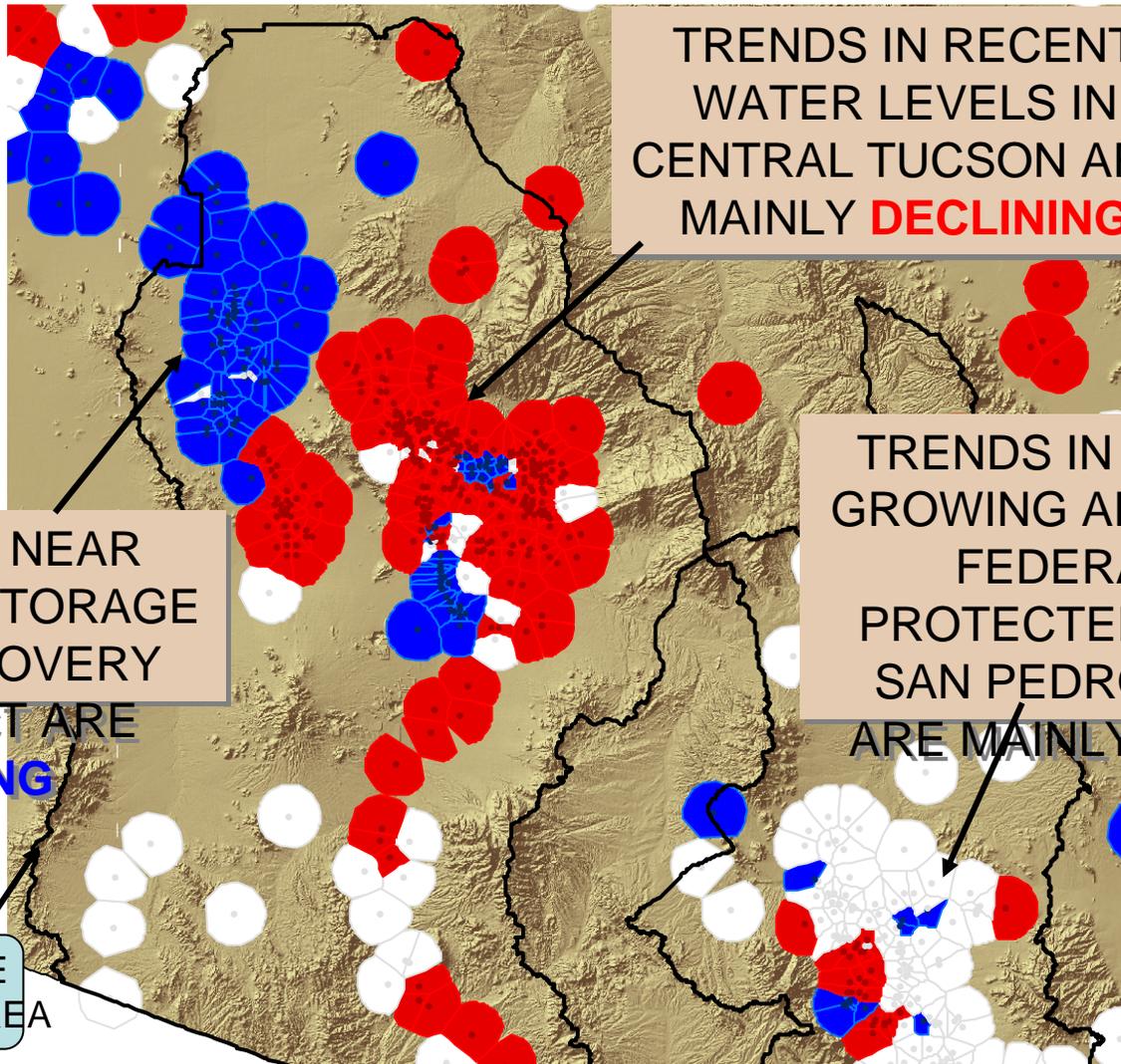
MULTIPLE LAYERS OF INFORMATION ON GROUND-WATER CONDITIONS

COLORIZED BASIC DATA EASY TO VISUALIZE. ADDITIONAL

# Ground-Water Use– Storage Change



# Ground-Water Use– Storage Change



TRENDS IN RECENT WATER LEVELS IN CENTRAL TUCSON ARE MAINLY **DECLINING**

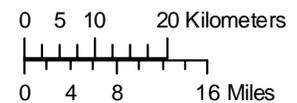
TRENDS NEAR AQUIFER STORAGE AND RECOVERY PROJECT ARE

**RISING**

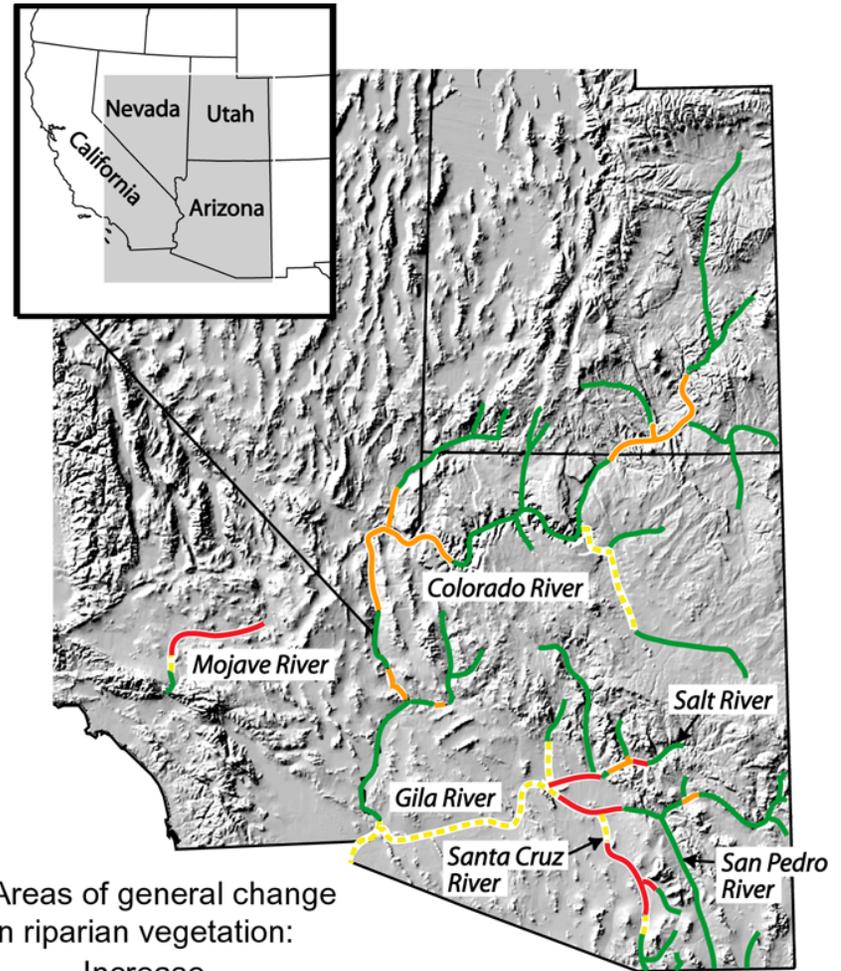
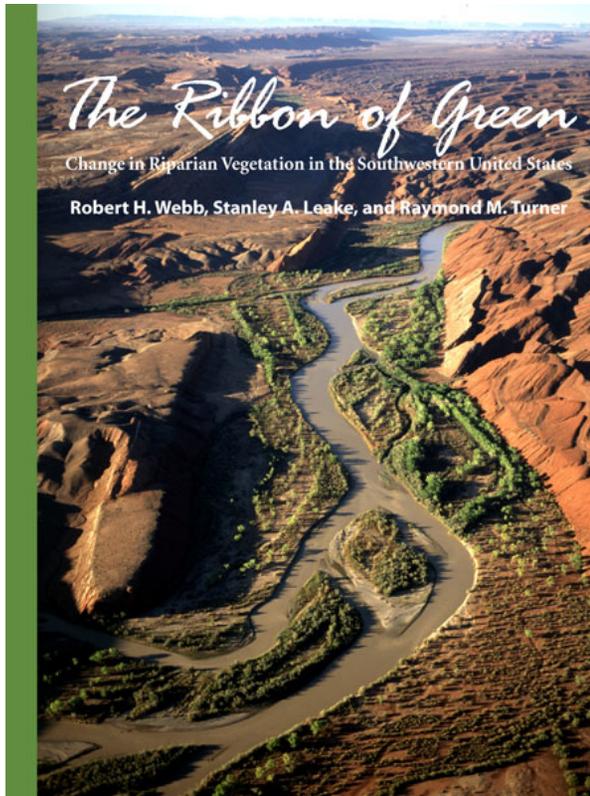
TRENDS IN RAPIDLY GROWING AREA NEAR FEDERALLY PROTECTED UPPER SAN PEDRO RIVER

ARE MAINLY **STABLE**

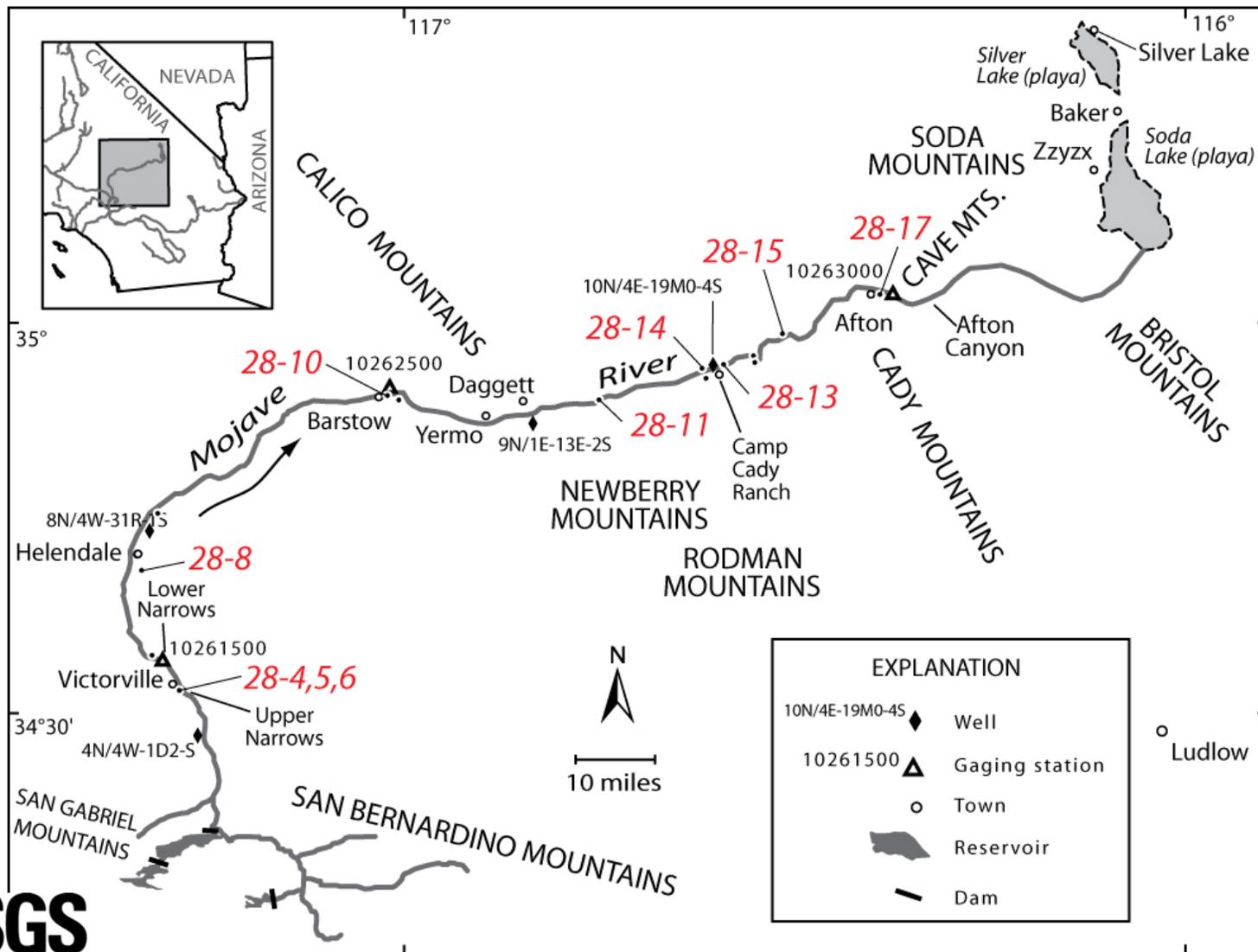
TUCSON ACTIVE MANAGEMENT AREA



# Ground-Water Use and Connected Riparian Systems



# Ground-Water Use and Connected Riparian Systems



Mojave River at Barstow, 1919



Mojave River at Barstow, 2000



Santa Cruz River at Martinez Hill, 1912



Santa Cruz River at Martinez Hill, 1981



# Santa Cruz River at Martinez Hill, 2002



Escalante River at Harris Wash, 1953



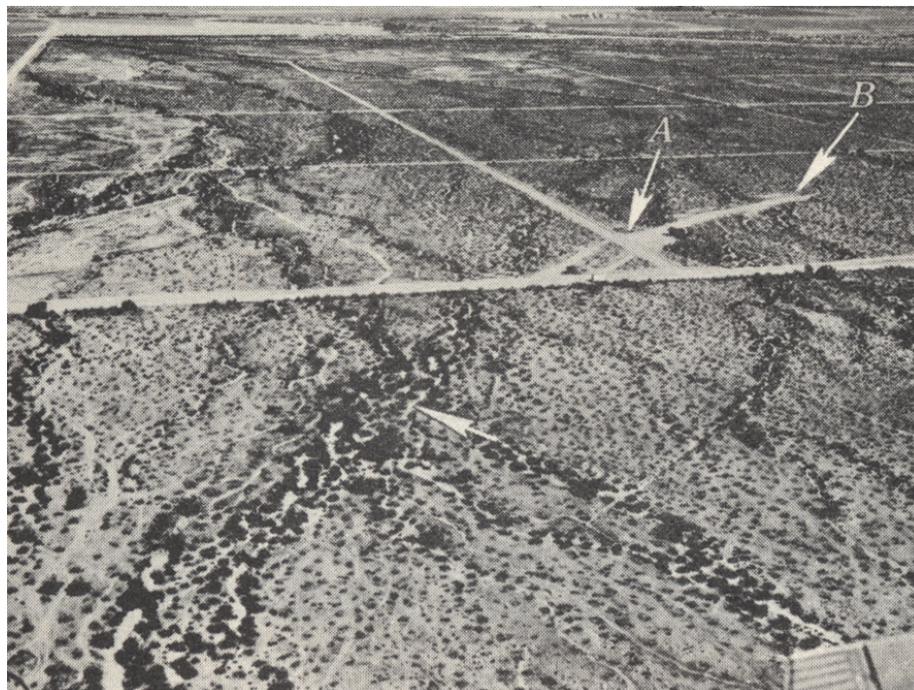
# Escalante River at Harris Wash, 2004





## CHANDLER HEIGHTS

Close to the northernmost flank of Santan Mountain, approximately 30 miles southeast of Phoenix and 12 miles southeast of Chandler, local residents report that earth fissures have occurred on several occasions. The fissures are oriented roughly parallel to the nearest exposed segment of the mountain mass (pl. 1). The trace of a spectacular opening that formed in 1961 is marked on photographs (figs. 4A and B), which were taken from the air on February 10, 1962, to show the fissure site and part of the surrounding area. The lower left part of figure 4A is viewed closer up in figure 4B to show more clearly some details of the fissure trace. The circled saguaro cactus, about 30 feet tall, is also partly circled in the lower left corner of figure 4A. Irrigated land is visible to the north (fig. 4A) of the fissure site but the principal irrigated acreage and area of ground-water withdrawal lies to the northwest. The white scar bracketed by arrows A and B marks the interval in which the fissure terminated. The area was reworked by earth-moving equipment to fill the fissure. The magnitude of the fissure opening is graphically revealed in figure 5, as photographed on September 16, 1961, from a ground site near arrow A (fig. 4A). These photographs suggest that again the earth material has simply pulled apart. No differential horizontal movement can be seen along the fissure and no differential vertical movement is apparent. Where islands or blocks of material have been left standing in the larger openings some crumbling and slumping have occurred.



# Concluding Thoughts

- Water needs for increasing population in the desert Southwest likely will be at the expense of agriculture
- With regards to desert ecosystems threatened by ground-water withdrawals, adaptive management may be difficult, especially if pumping centers are distant
- With increased ground-water use in some areas, new areas of subsidence and earth fissures may occur and older but now stable areas may experience reactivation of movement