

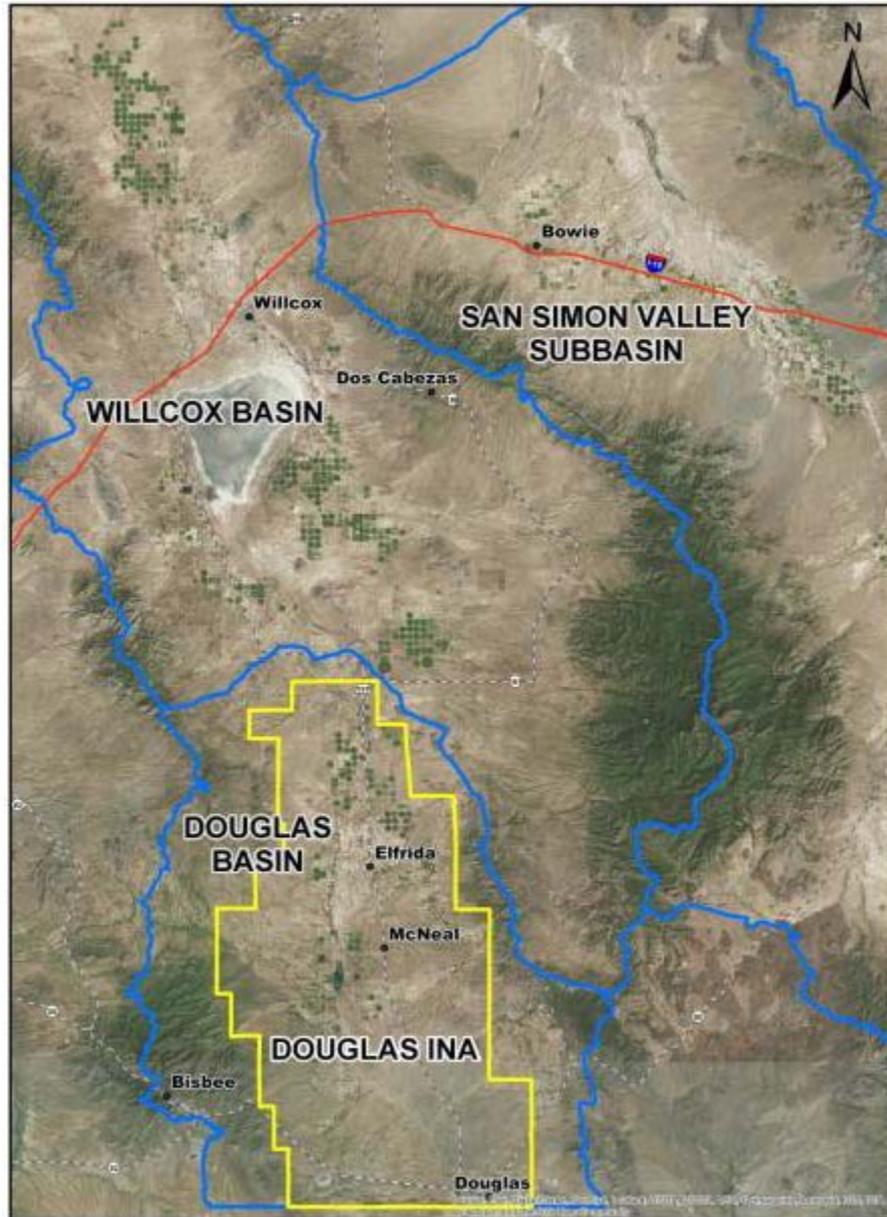
Groundwater Conditions in Southeast Arizona

*Pearce Sunsites Community Meeting
September 23, 2014*



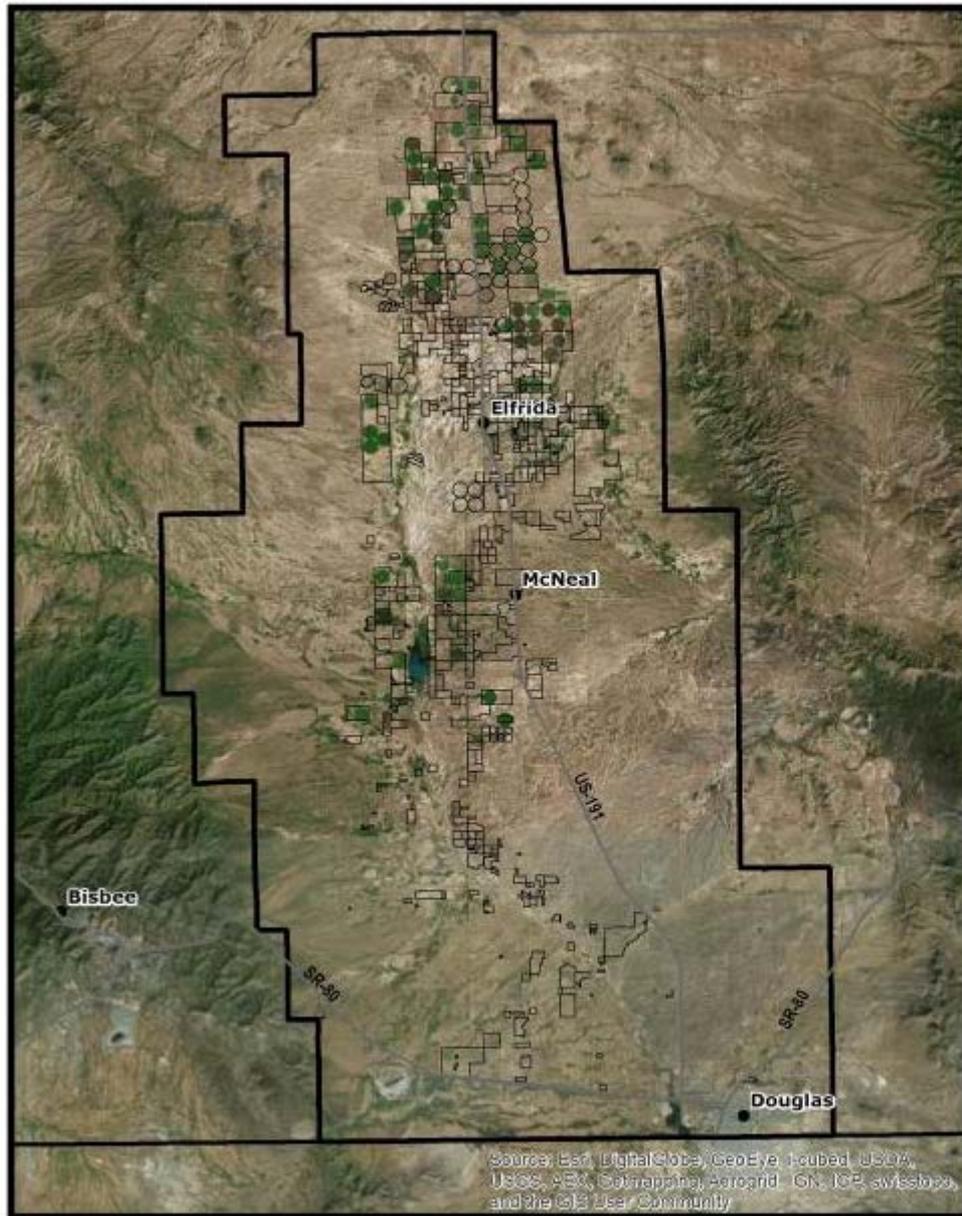
*Michael J. Lacey, Director
Arizona Department of Water Resources*

Map of Irrigation Acres in Southern Arizona



Source: ADWR

Map of Douglas Irrigation Non-Expansion Area Irrigation Authority Lands



Map of Douglas Irrigation Non-Expansion Area Irrigation Authority Lands



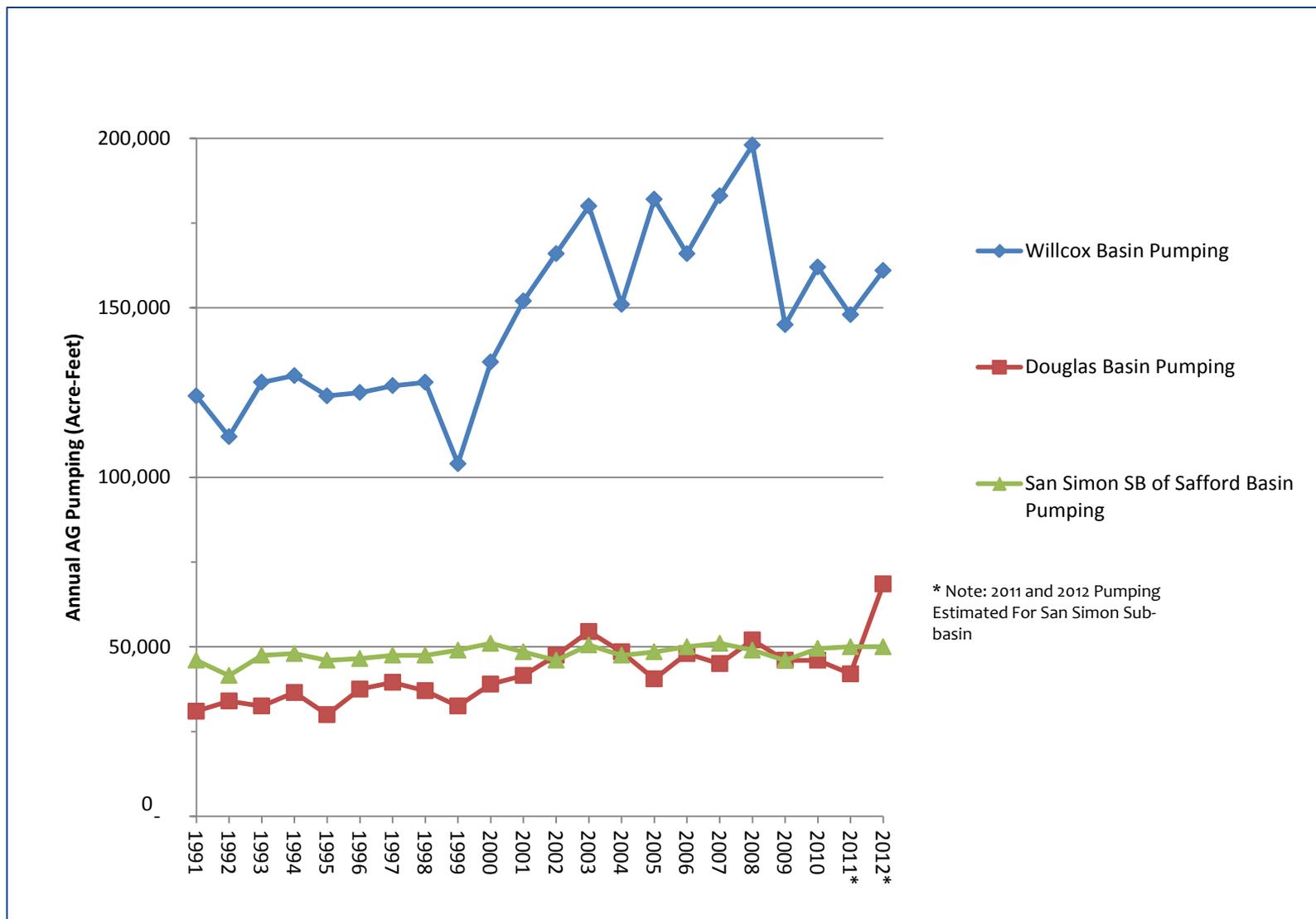
Legend

-  Douglas INA
-  Major Roads
-  Cities



PROTECTING ARIZONA'S
WATER SUPPLIES
FOR ITS NEXT CENTURY

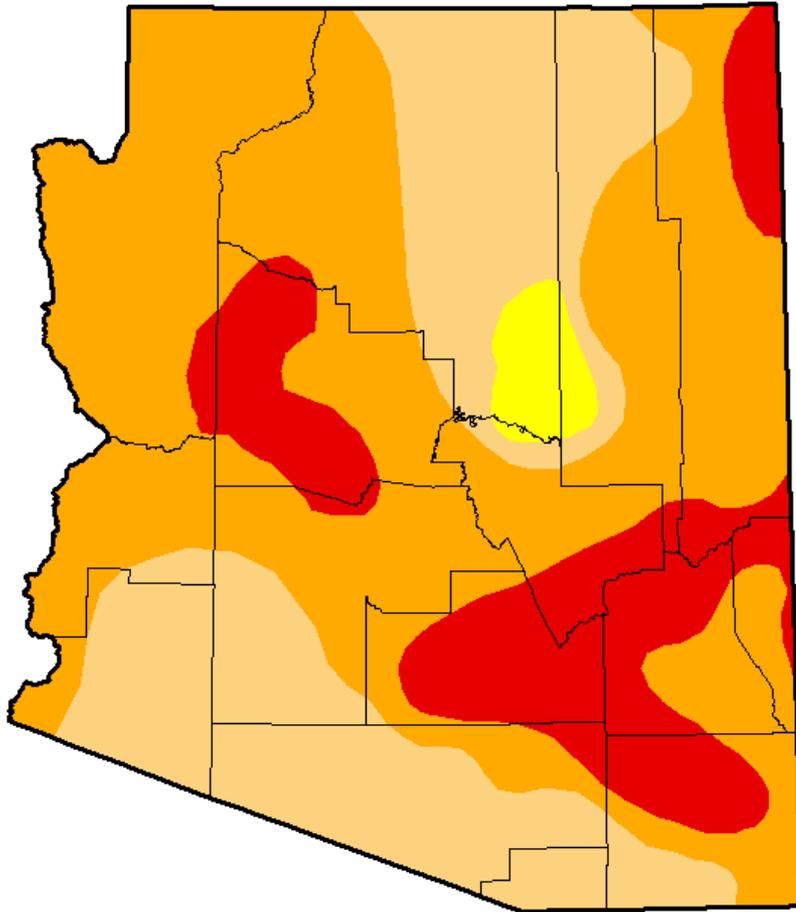
USGS Estimated Agricultural Pumping in the Willcox and Douglas Basins and the San Simon Sub-basin 1991 to 2012



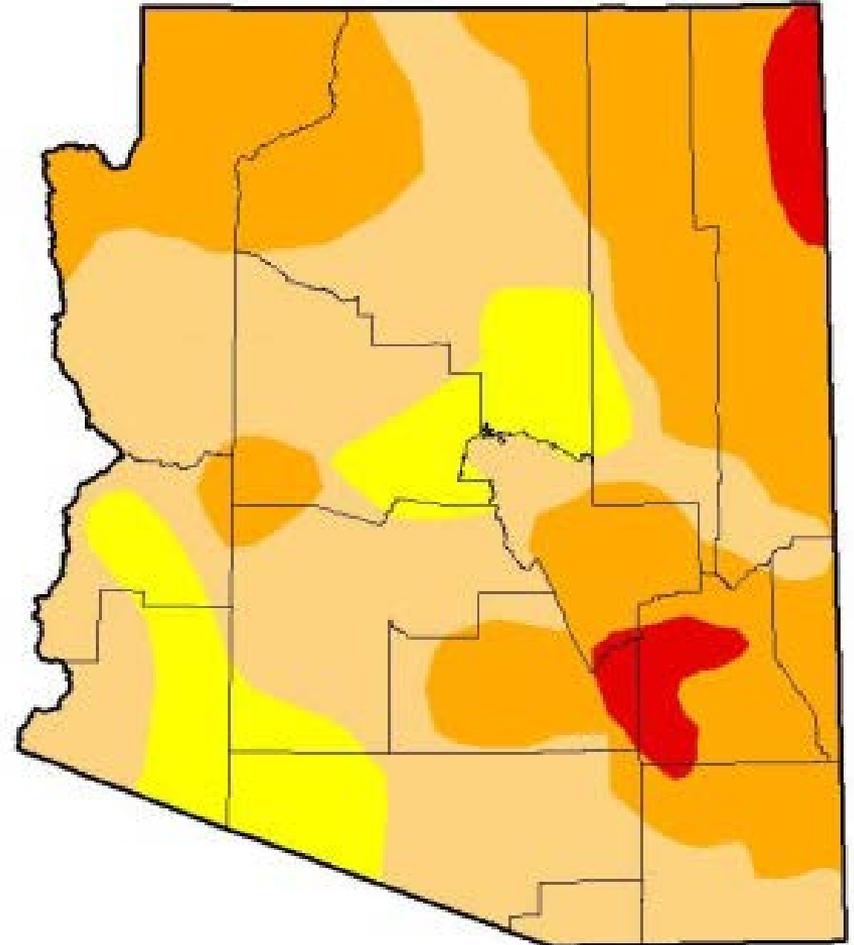
Source: US Geological Survey

Short Term Drought Status Map

July 29, 2014



September 16, 2014



Intensity.

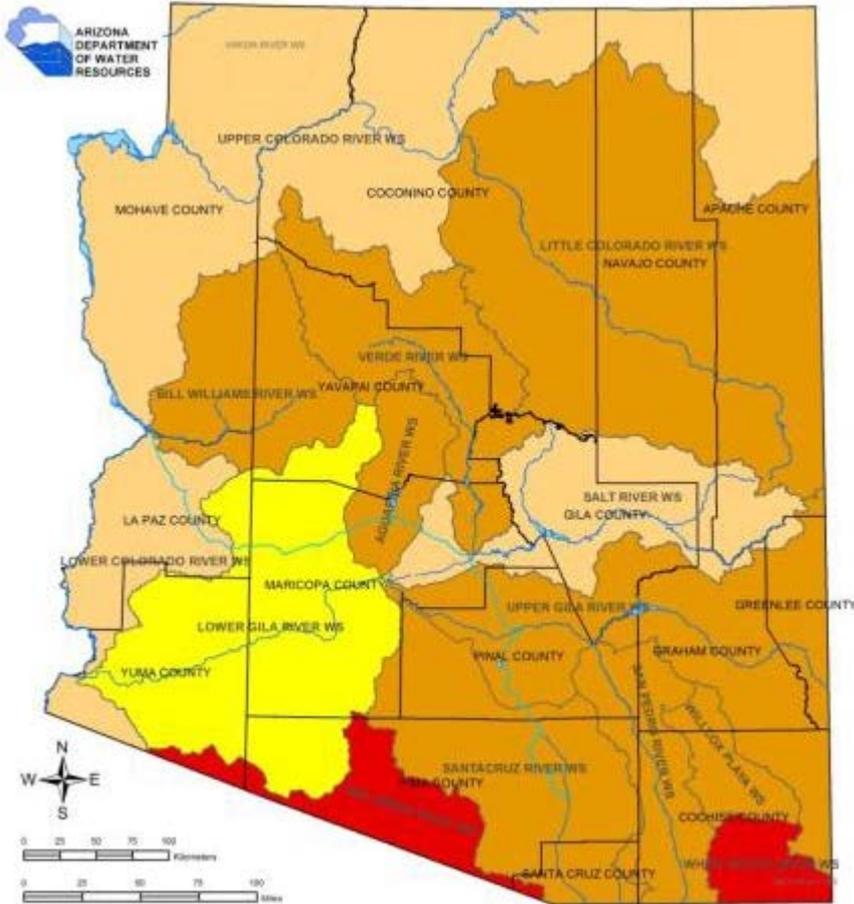
- | | |
|---|--|
|  D0 Abnormally Dry |  D3 Extreme Drought |
|  D1 Moderate Drought |  D4 Exceptional Drought |
|  D2 Severe Drought | |



Long Term Drought Status Map

July 2013

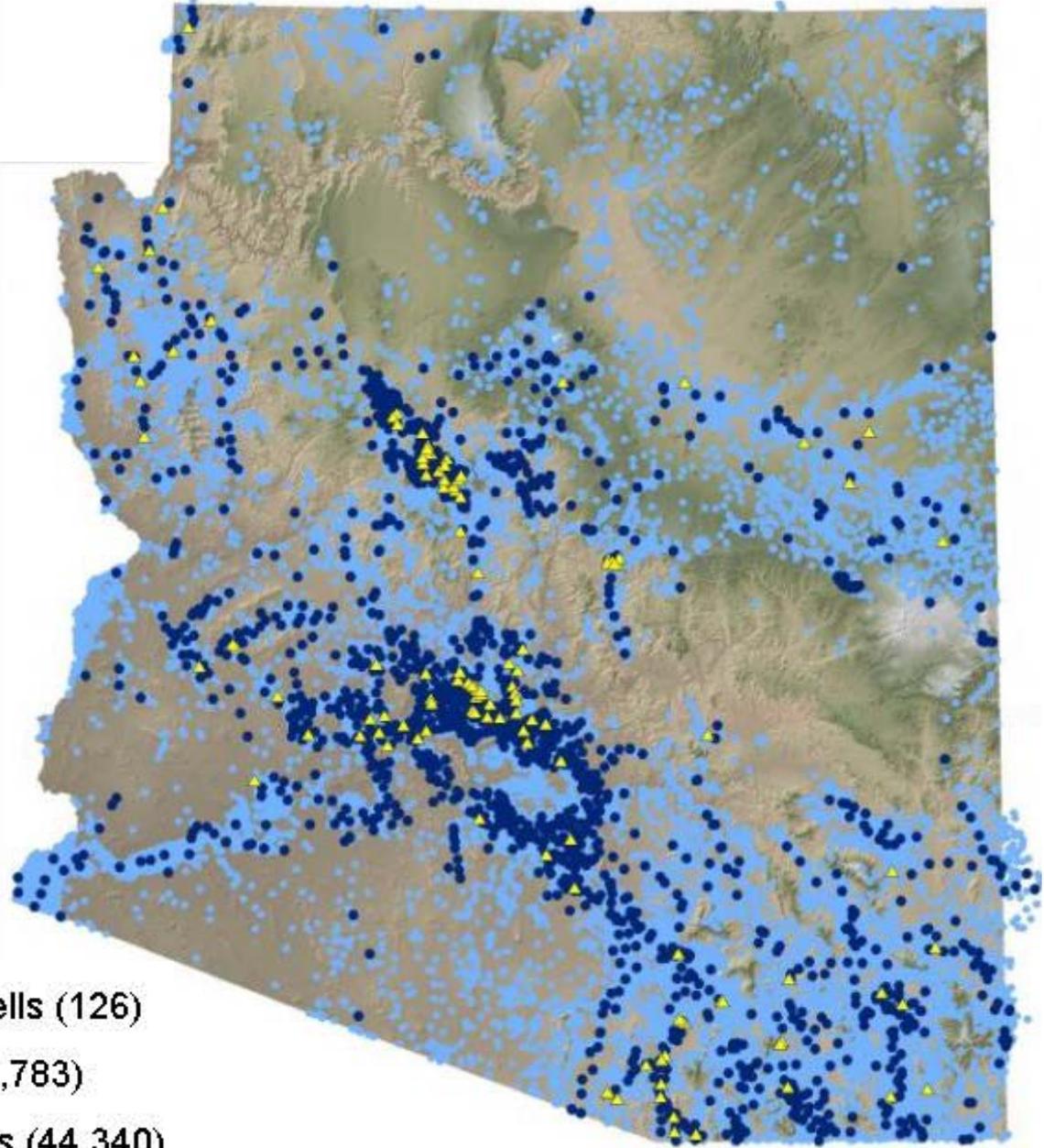
July 2014



Intensity:



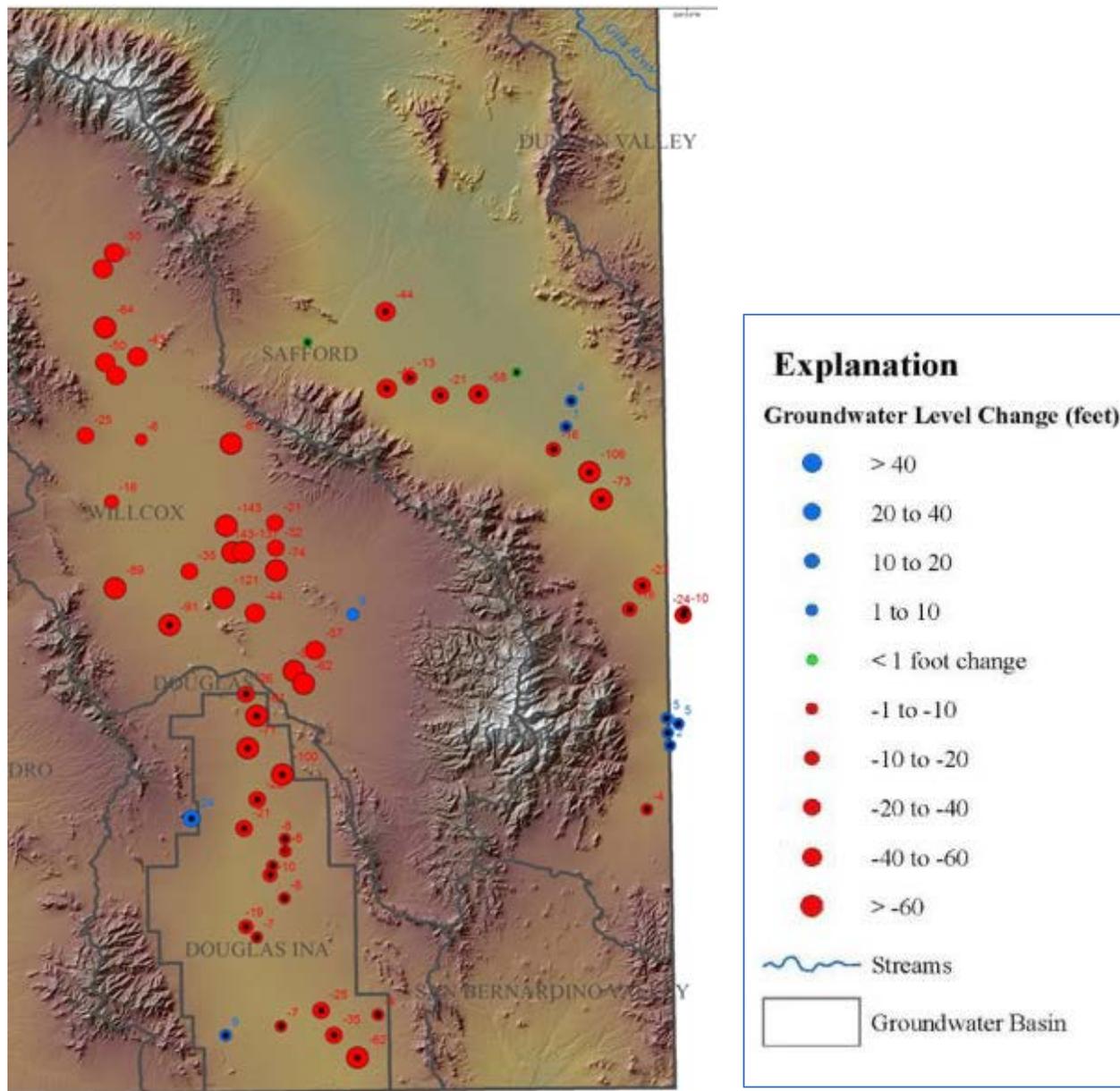
Groundwater Wells Used to Monitor Annual Changes in Groundwater Levels



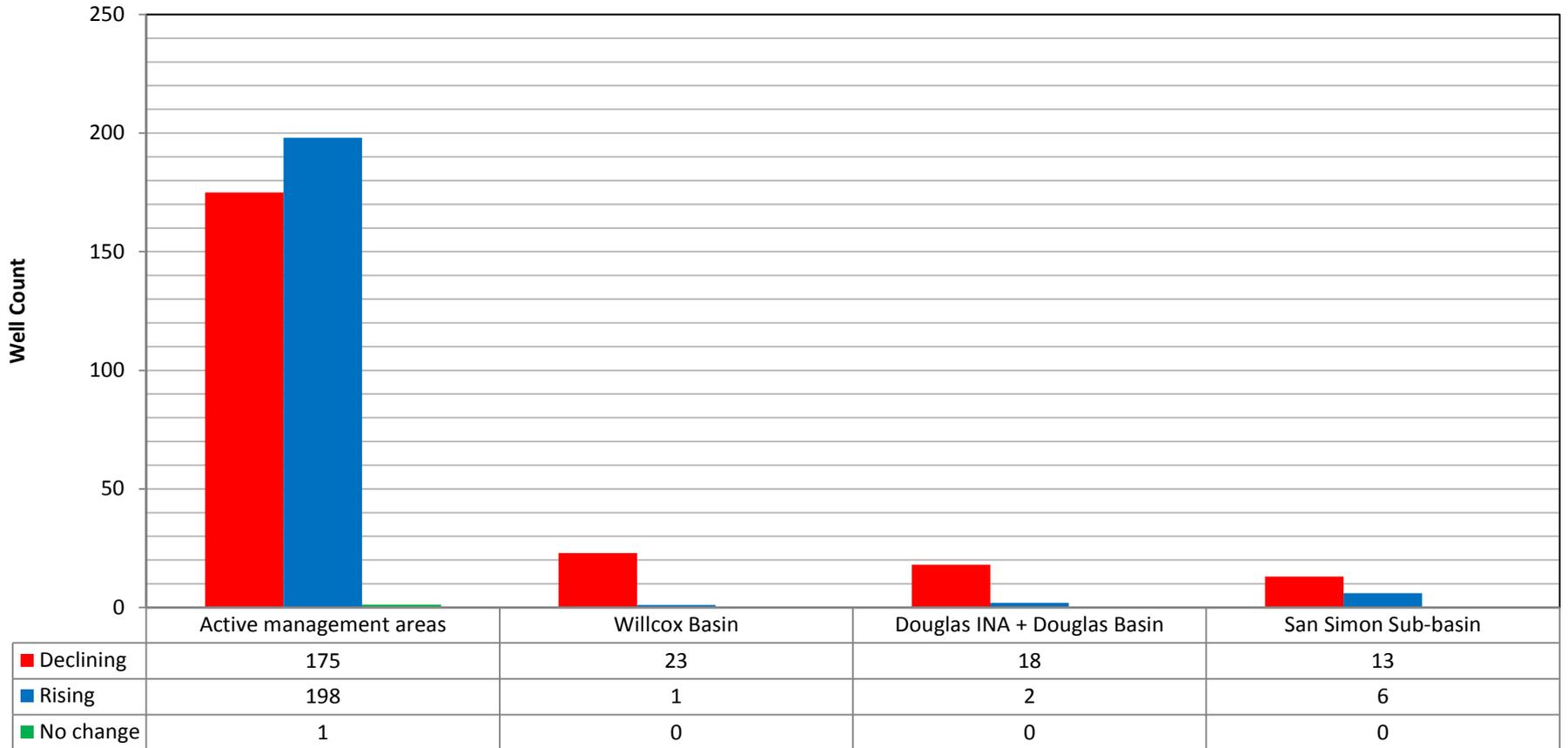
- ▲ Automated Wells (126)
- Index Wells (1,783)
- All GWSI Wells (44,340)

Source: ADWR Land Subsidence Monitoring Report No. 2

Groundwater Level Changes in Willcox, Douglas, Douglas INA Basins and the San Simon Sub-basin (1993 to 2013)

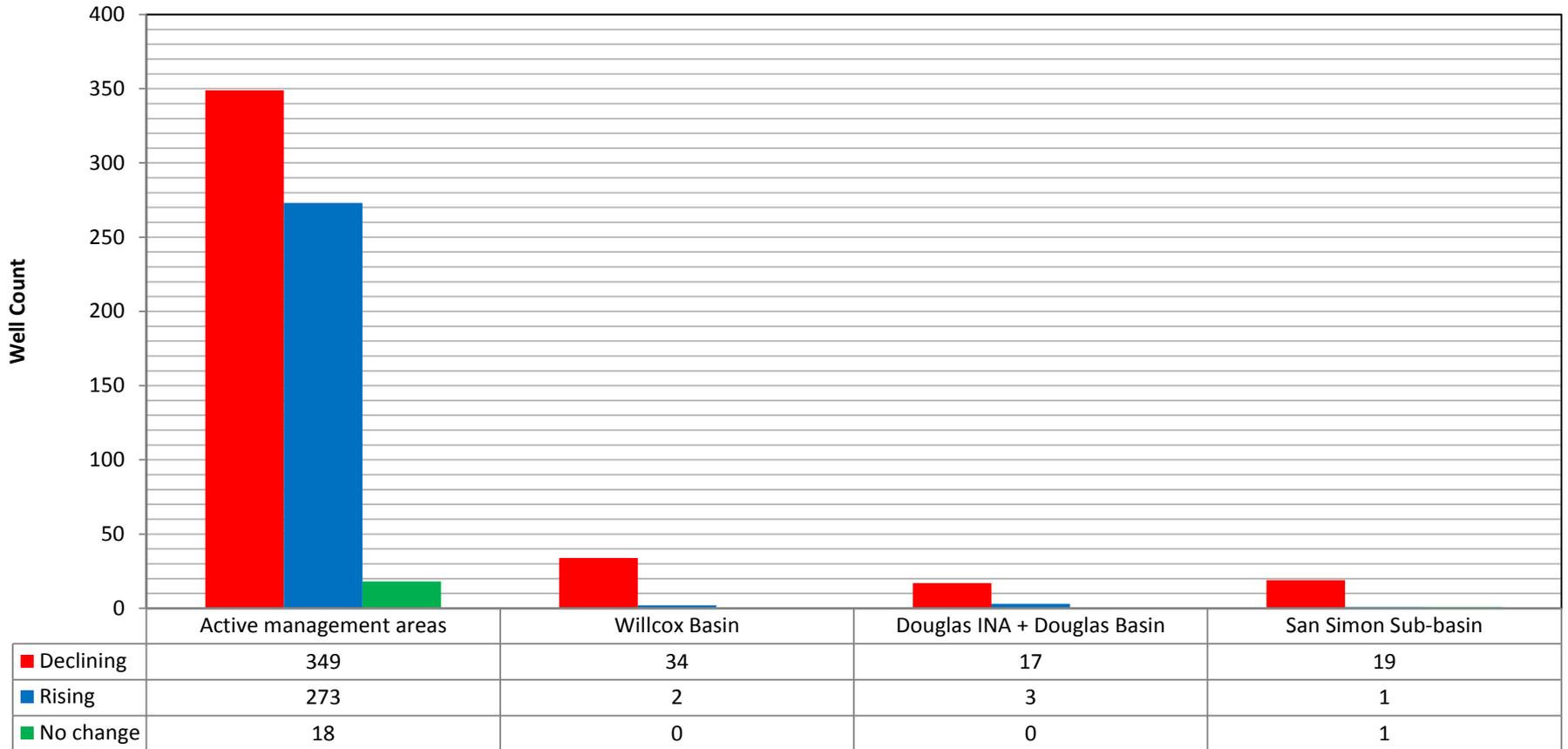


1993 to 2013 Water Level Change Counts



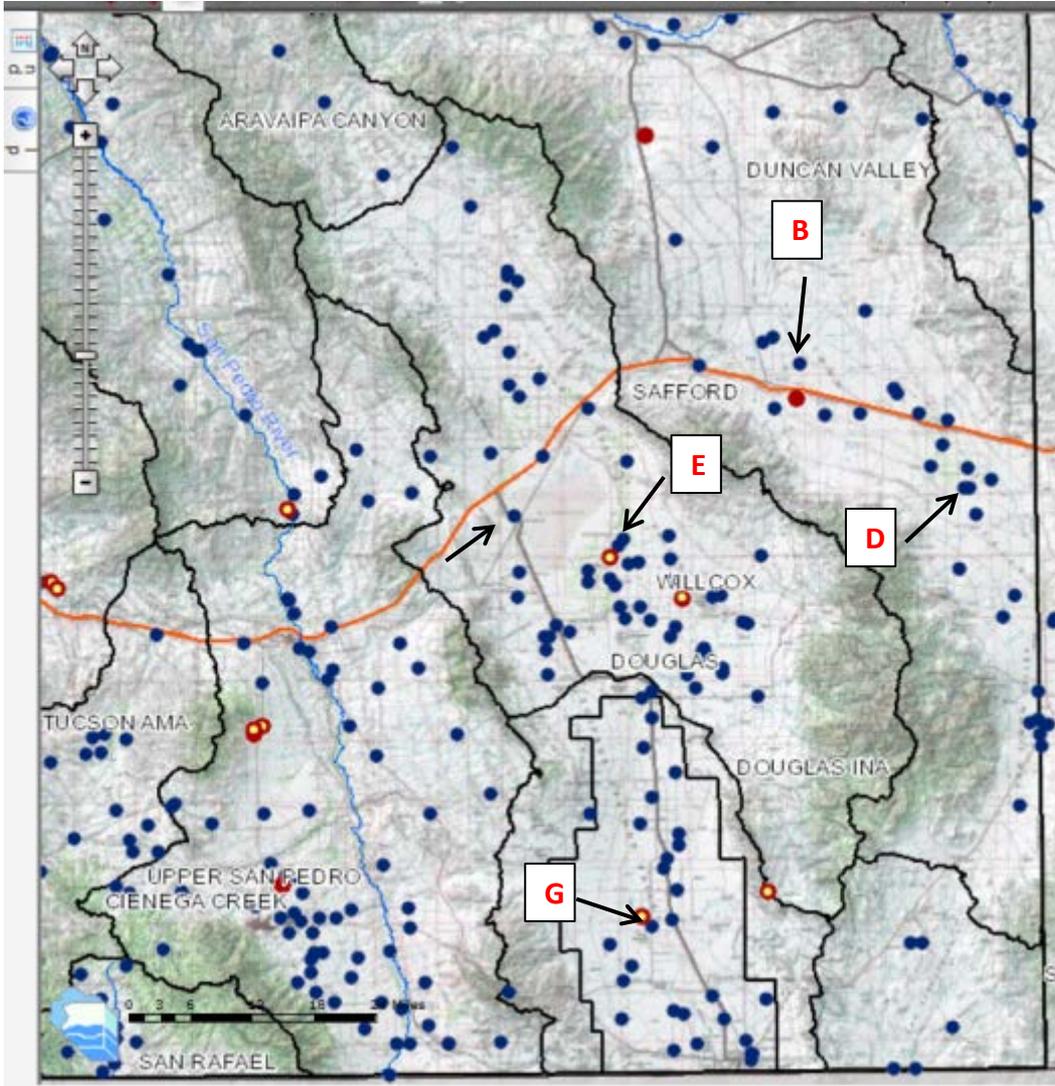
Source: ADWR State Wide Groundwater Level Changes In Arizona Water Years 1993 to 2003 to 2013 and 2012 to 2013

2012 to 2013 Water Level Change Counts



Source: ADWR State Wide Groundwater Level Changes In Arizona Water Years 1993 to 2003 to 2013 and 2012 to 2013

Locations of Wells Showing Hydrograph Examples



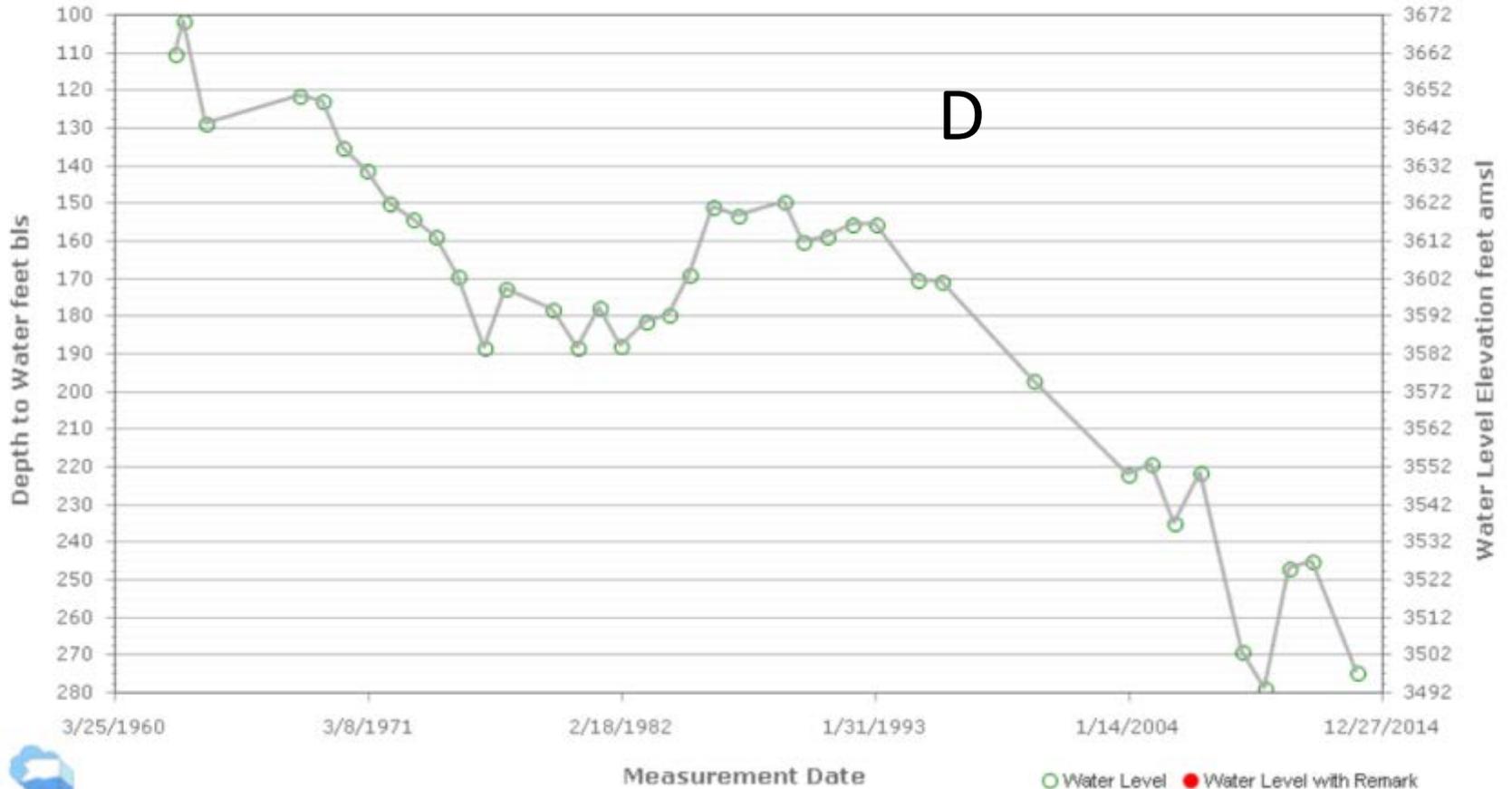
LEGEND

-  Location Of Well With Hydrograph
-  ADWR Index Well
-  ADWR Automated Monitoring Well
-  ADWR Automated Monitoring Well With Radio Telemetry

Hydrograph for Well near San Simon

Arizona GroundWater Monitoring Site Hydrograph

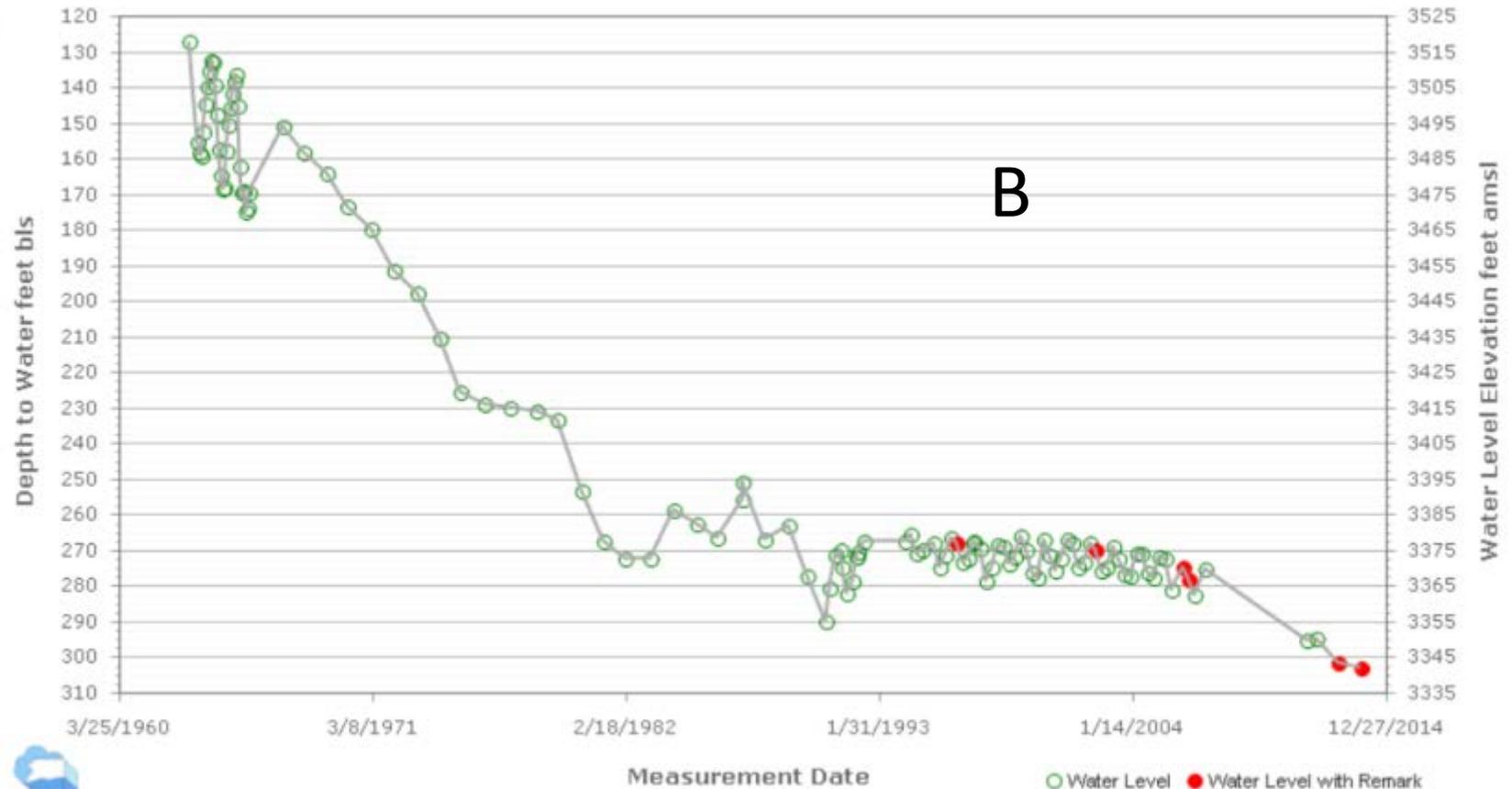
Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elev. (ft)
D-14-31 35BCC	321016109094501		32° 10' 12.8"	109° 9' 27.5"	3772	IRRIGATION	800	16	12/24/1958	11/6/2013	274.6	3497.4



Hydrograph for Well near Bowie

Arizona GroundWater Monitoring Site Hydrograph

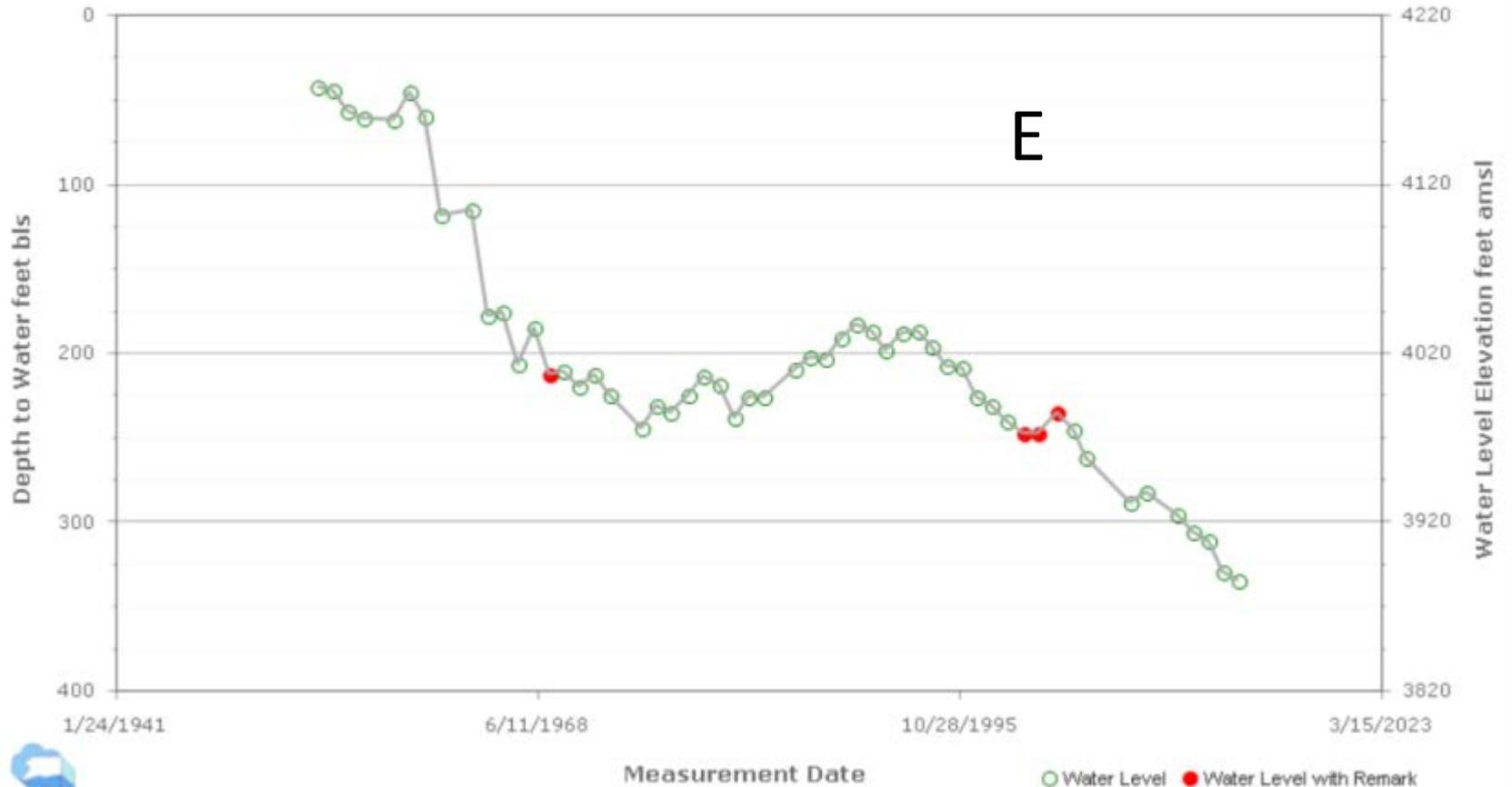
Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elev. (ft)
D-12-28 25DCC	322116109262201		32° 21' 16.8"	109° 26' 24.3"	3645	UNUSED	1700	18	9/1/1955	11/29/2011	294.2	3350.8



Hydrograph for Well in the Willcox Basin

Arizona GroundWater Monitoring Site Hydrograph

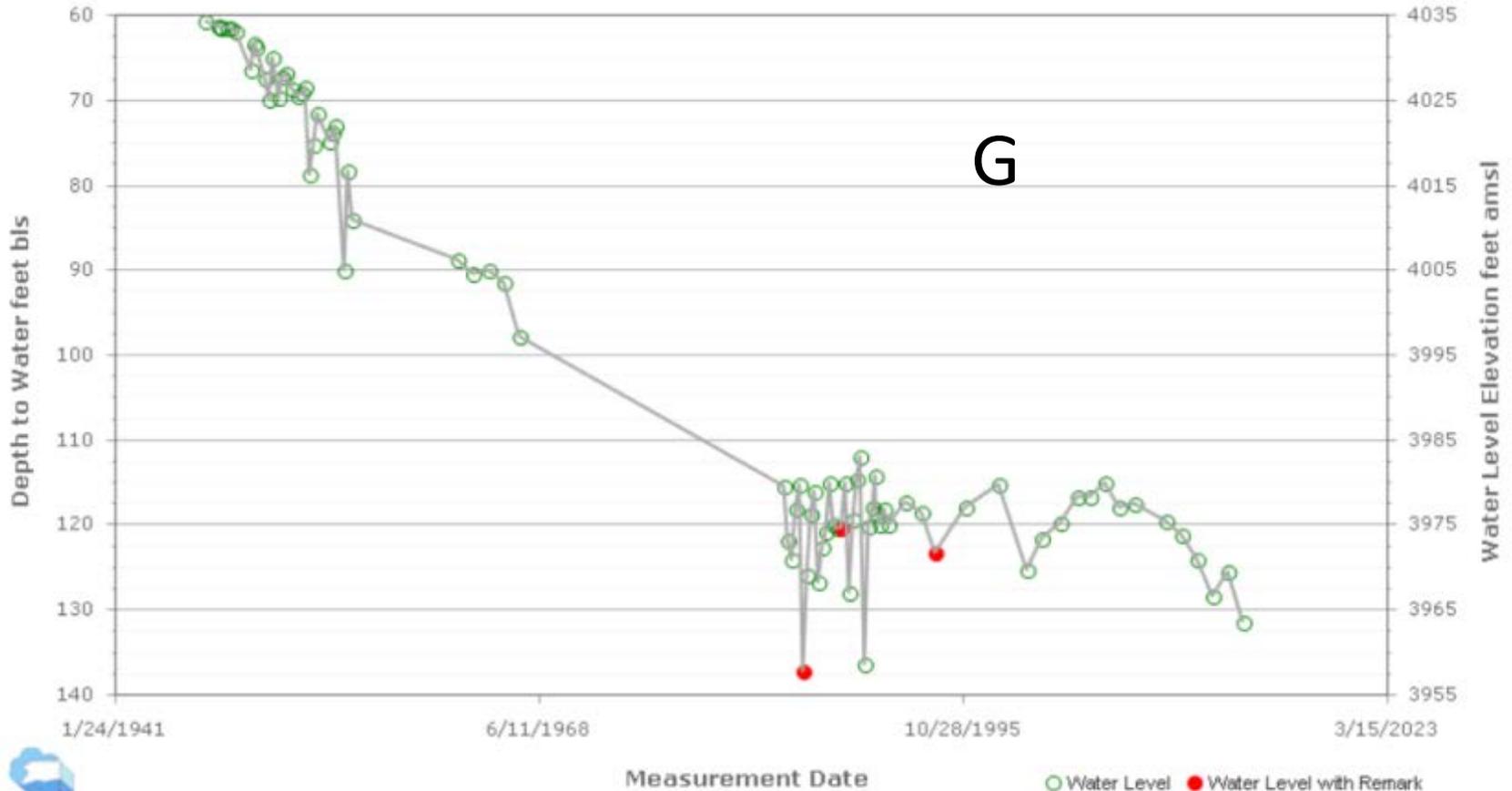
Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elev. (ft)
D-15-25 25AAD	320614109442401	604416	32° 6' 17.6"	109° 44' 20.4"	4220	IRRIGATION	515	18	8/1/1953	11/6/2013	334.7	3885.3



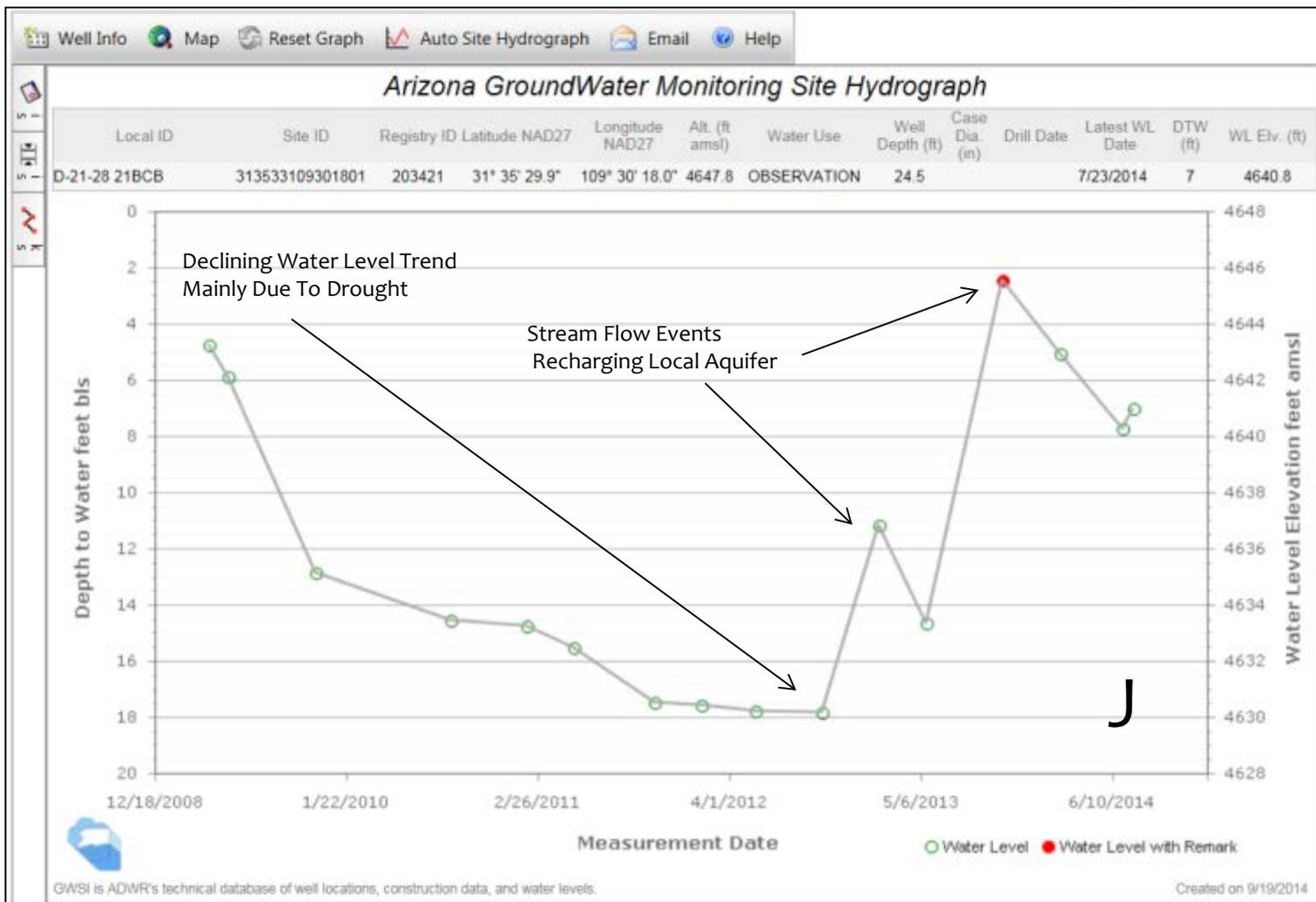
Hydrograph for Well in Douglas INA

Arizona GroundWater Monitoring Site Hydrograph

Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elev. (ft)
D-22-26 04DAD	313242109415501		31° 32' 41.4"	109° 41' 52.8"	4095	DOMESTIC	275	12	5/1/1946	11/6/2013	131.3	3963.7

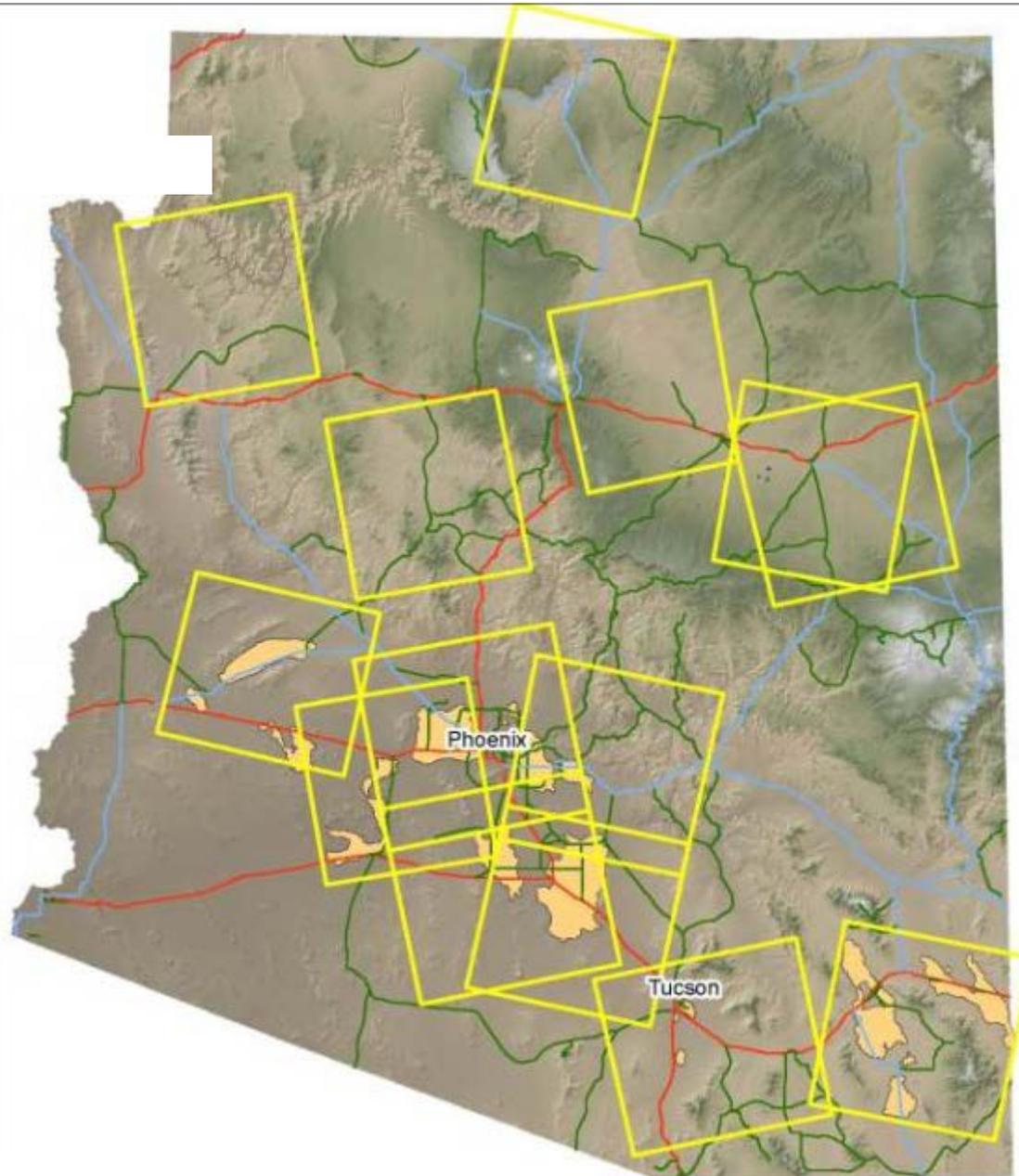


Hydrograph for Leslie Canyon Well (Located on the Southern Border of the Douglas INA)

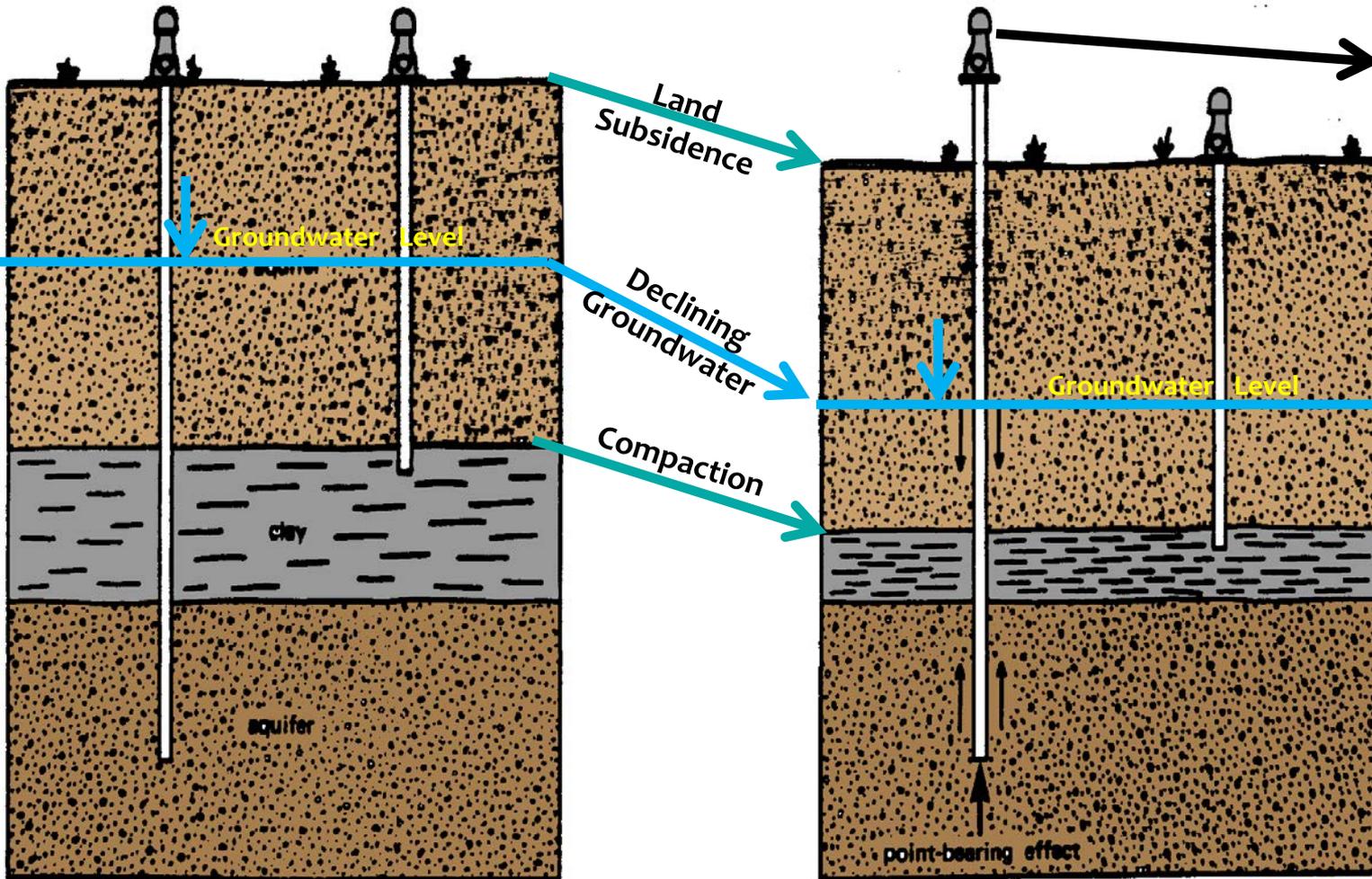


Leslie Canyon well is a state drought index well that is remotely located in a bedrock area and essentially unaffected by regional groundwater pumping but sensitive to impacts of drought and recharge from stream flow in Leslie Canyon

Satellite Frames Used to Collect InSAR Data



Land Subsidence and Groundwater Withdrawal

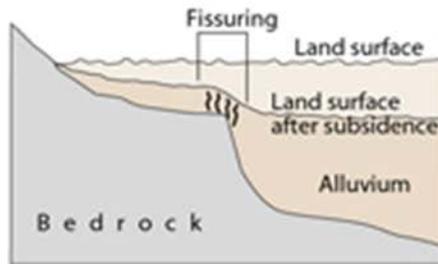


Displaced Well Example:
Located a mile northeast
of the Intersection of
Dragoon and Cochise
Stronghold Roads,
Cochise County, AZ

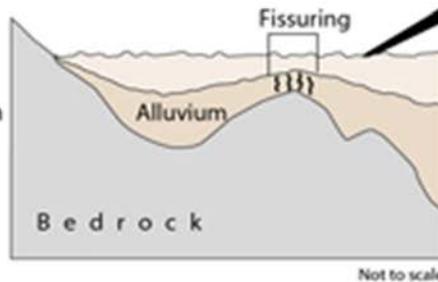
Earth Fissure Development

Earth Fissure Formation by Differential compaction

As the land surface subsides, alluvium stretches and eventually fails, generally in a region of abrupt change in alluvium thickness.



Fissures are concentrated in areas where the thickness of the alluvium changes, such as near the margin of basins or where bedrock is near the surface.



Lateral stresses induce tension cracking.



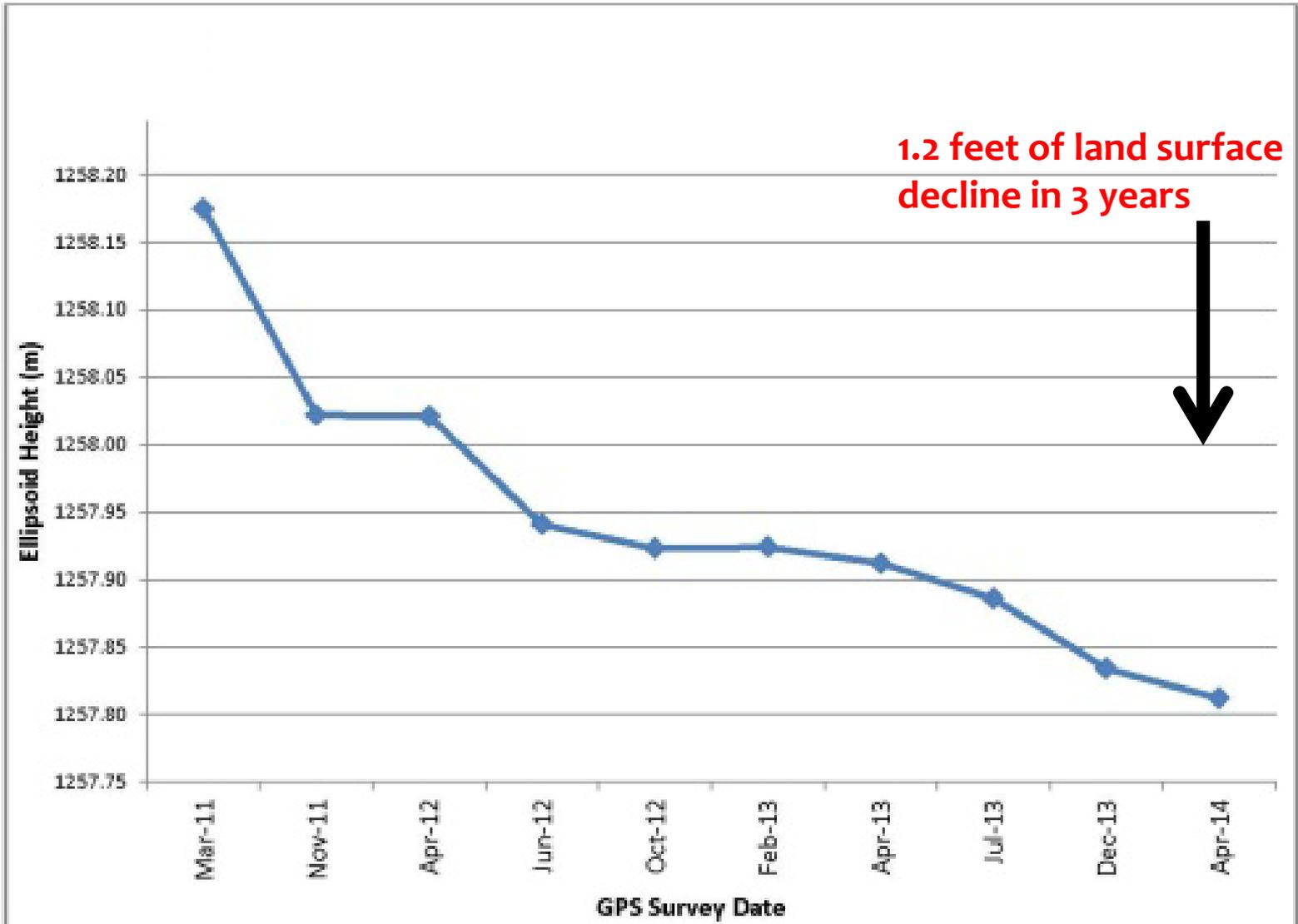
Surface water infiltrates, dissolving the natural cement bonding the soil, connecting hairline cracks, and further eroding and enlarging the fissure.



Fissure progressively enlarges, capturing surface runoff, sediment, and debris. Eventually vegetation establishes itself, creating a line of vegetation along the trace of the fissure.

Modified from Galloway et al., 1999

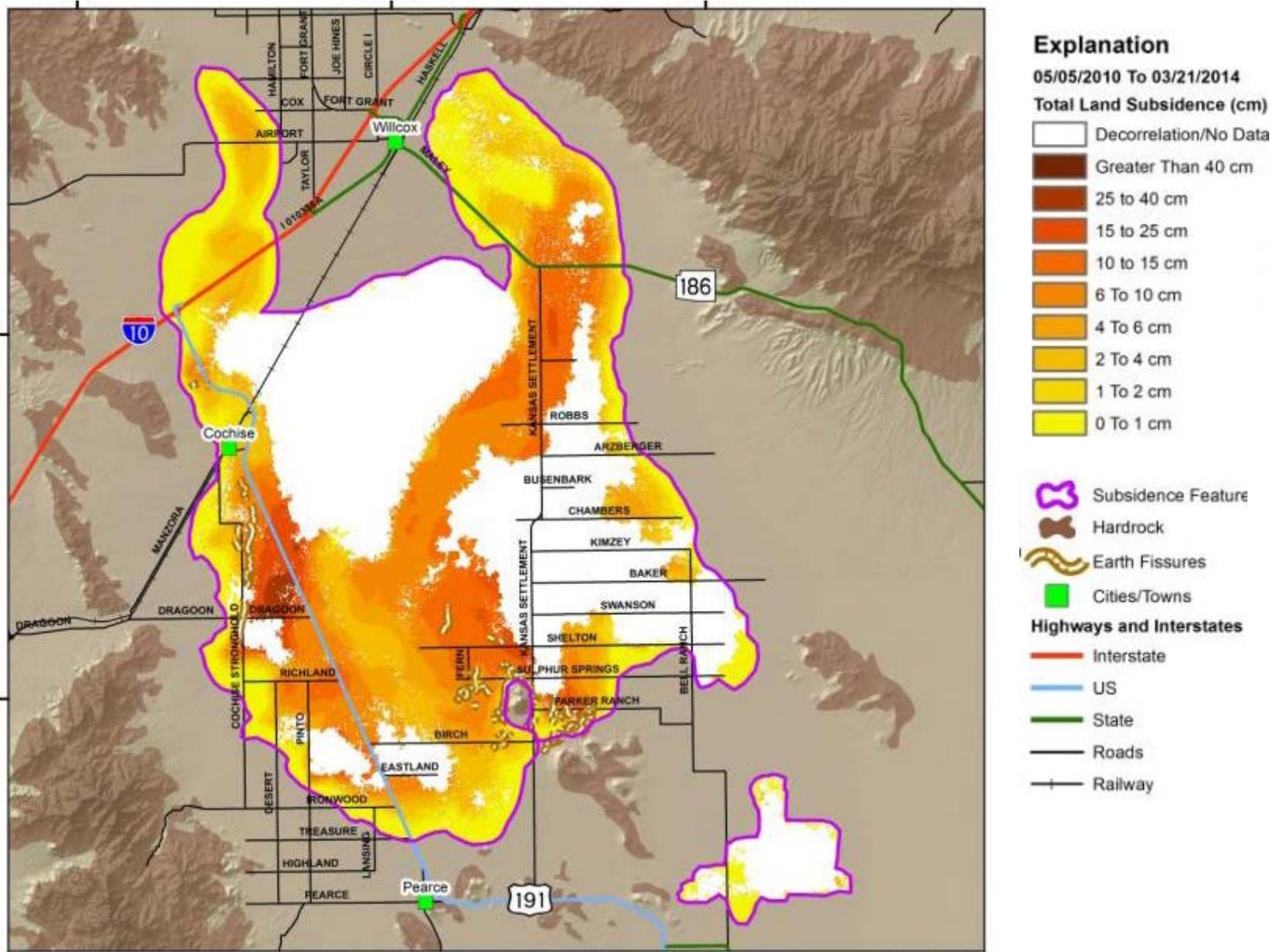
Cochise County GPS Survey for Land Subsidence Monitoring and InSAR Support (March 2011 through April 2014)



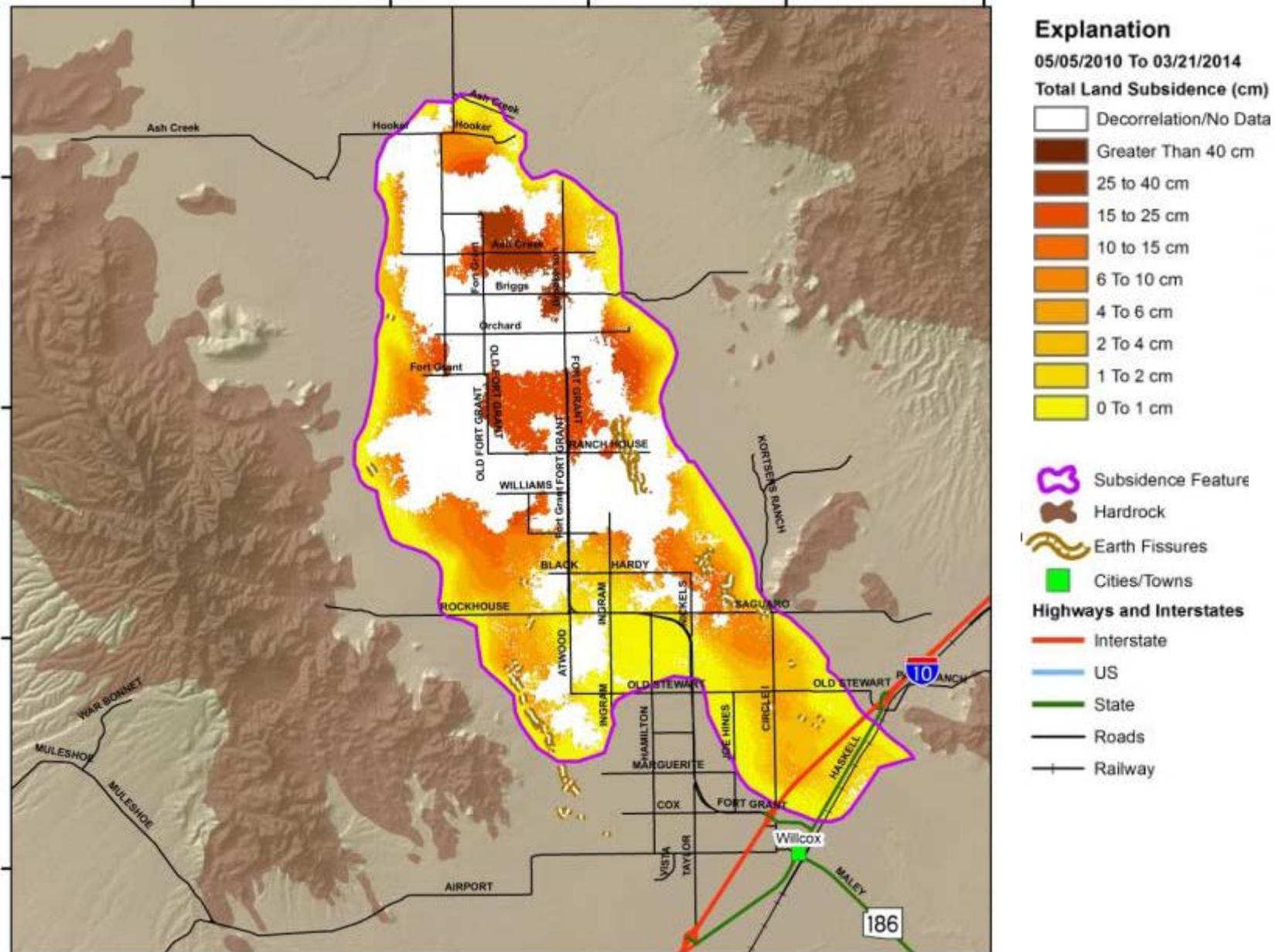
Graph 2 – GPS Survey data for land subsidence along Dragoon Rd in the Kansas Settlement Land Subsidence Feature

Land Subsidence in the Willcox and Kansas Settlement Areas

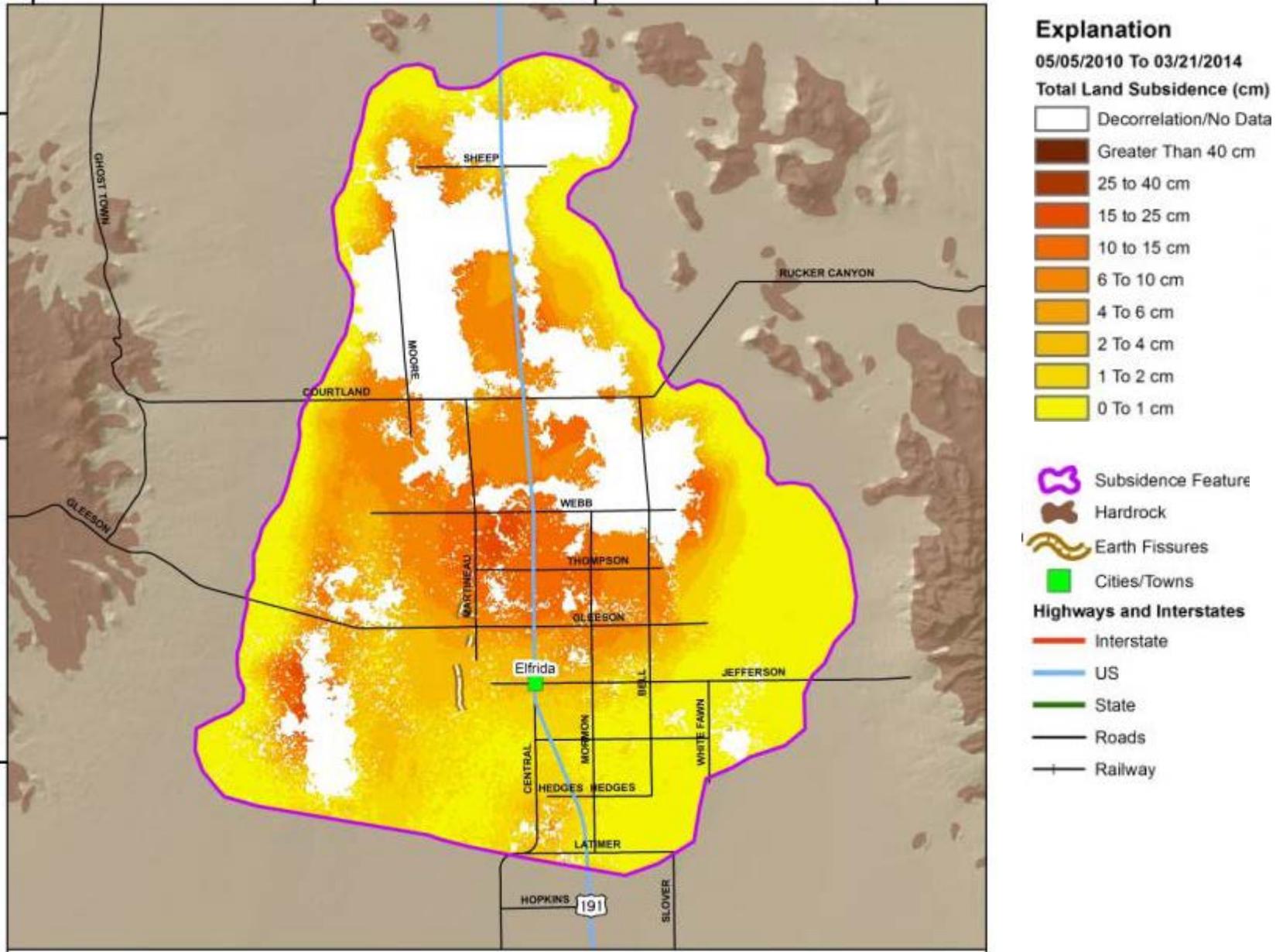
May 2010 through March 2014



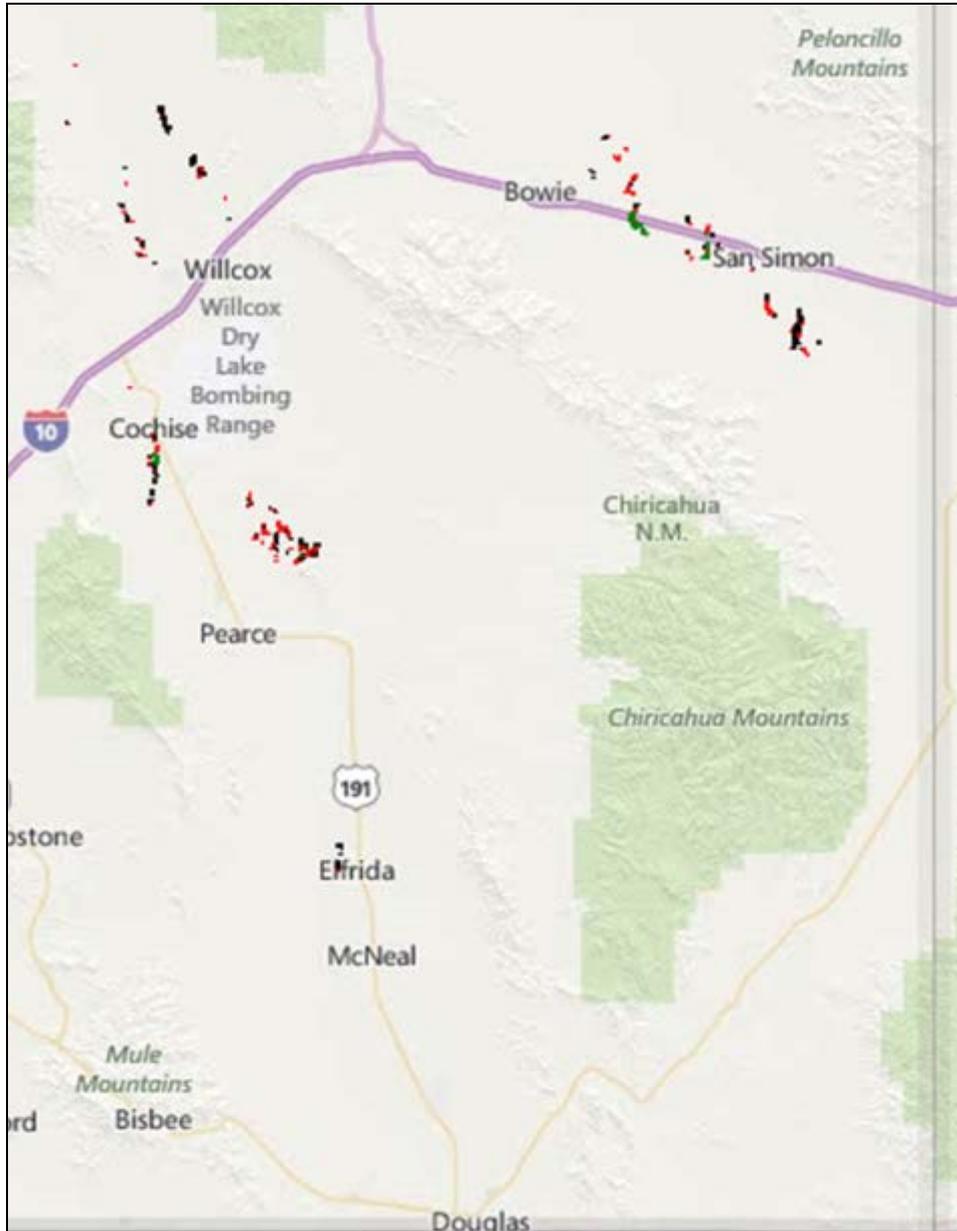
Land Subsidence in the Fort Grant Road and Willcox Areas (May 2010 through March 2014)



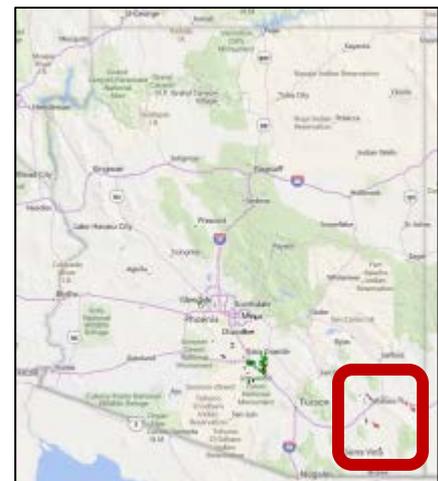
Land Subsidence in the Elfrida Area (Douglas INA) (May 2010 through March 2014)



Cochise County Earth Fissures



Fissure Type	
<input checked="" type="checkbox"/>	 Continuous Earth Fissure
<input checked="" type="checkbox"/>	 Discontinuous
<input checked="" type="checkbox"/>	 Reported/Unconfirmed



Source: Arizona Geological Survey

Questions?

