

DWR Update: Groundwater Conditions and Subsidence

Colusa County

September 10, 2015



Roy Hull, Engineering Geologist
CA Department of Water Resources

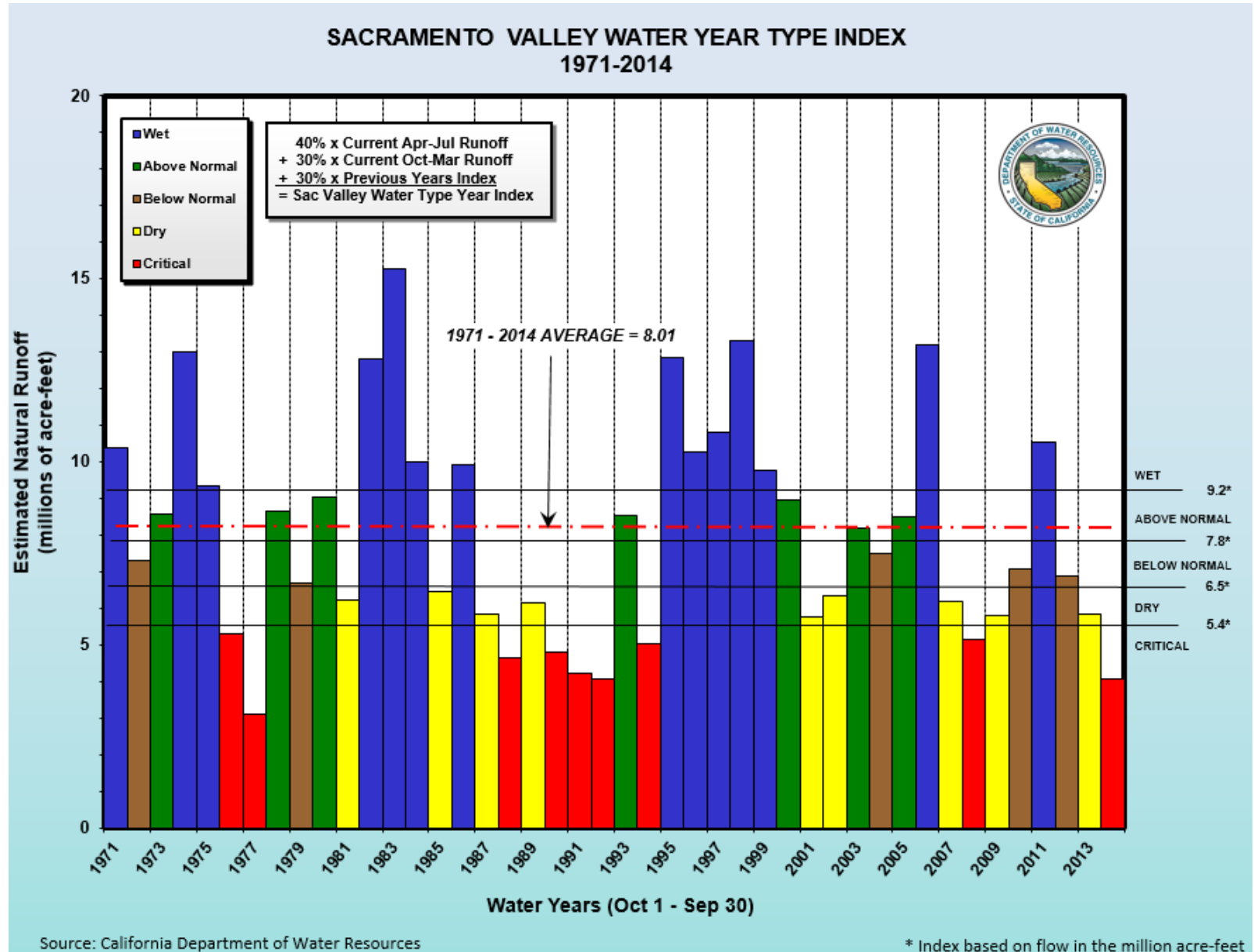
*Groundwater and Geologic Investigations Section
Northern Region Office, Red Bluff*



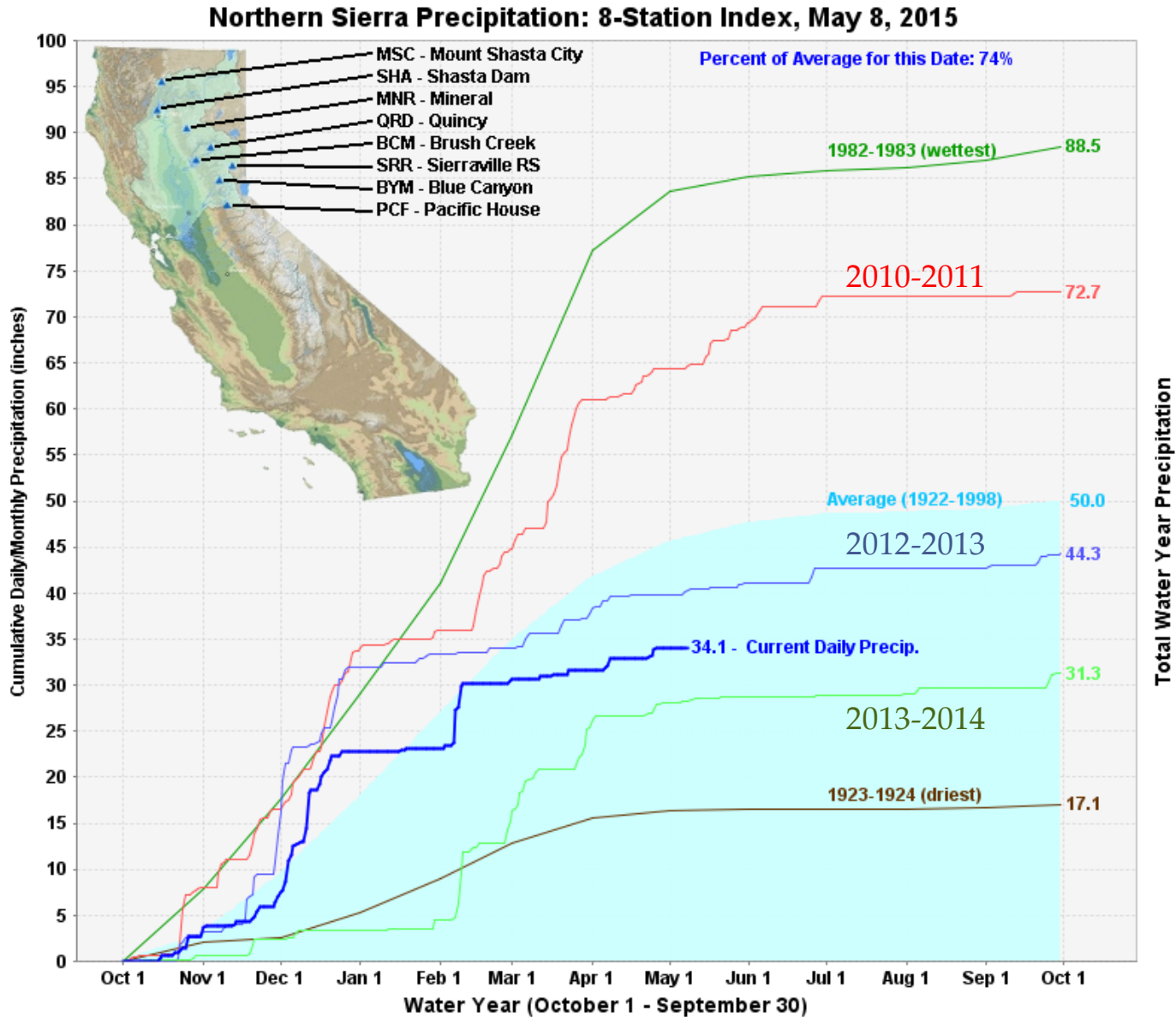
Agenda

- Water Year
- Summer 2015 GW level report
 - Colusa County with select hydrographs
 - North Sacramento Valley
- Crash course in ground subsidence

Water Year Index 1971-2014

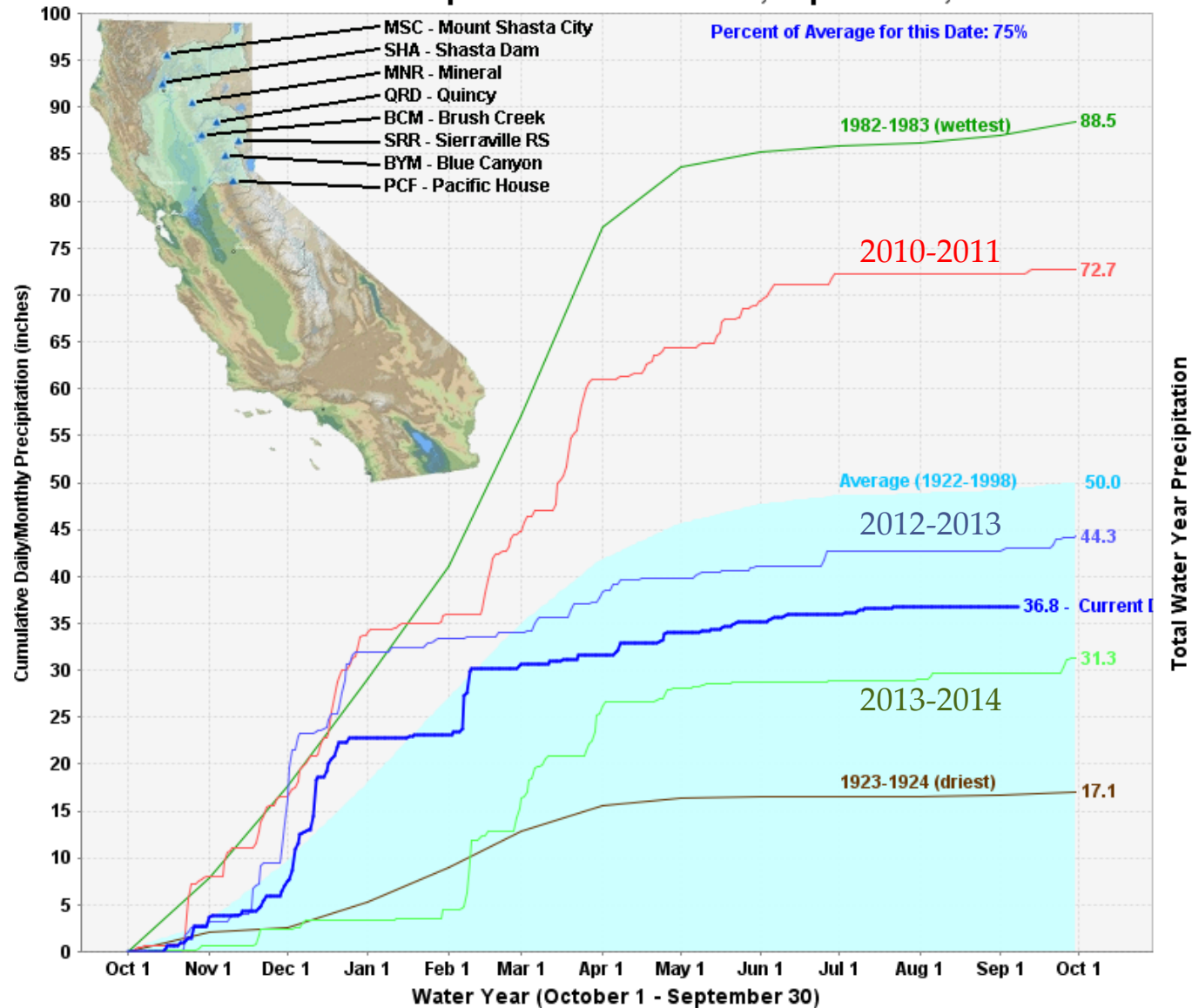


Sacramento Valley Precipitation



Sacramento Valley Precipitation

Northern Sierra Precipitation: 8-Station Index, September 8, 2015



Groundwater Change in Elevation Maps

Hydrographs

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Summer 2015

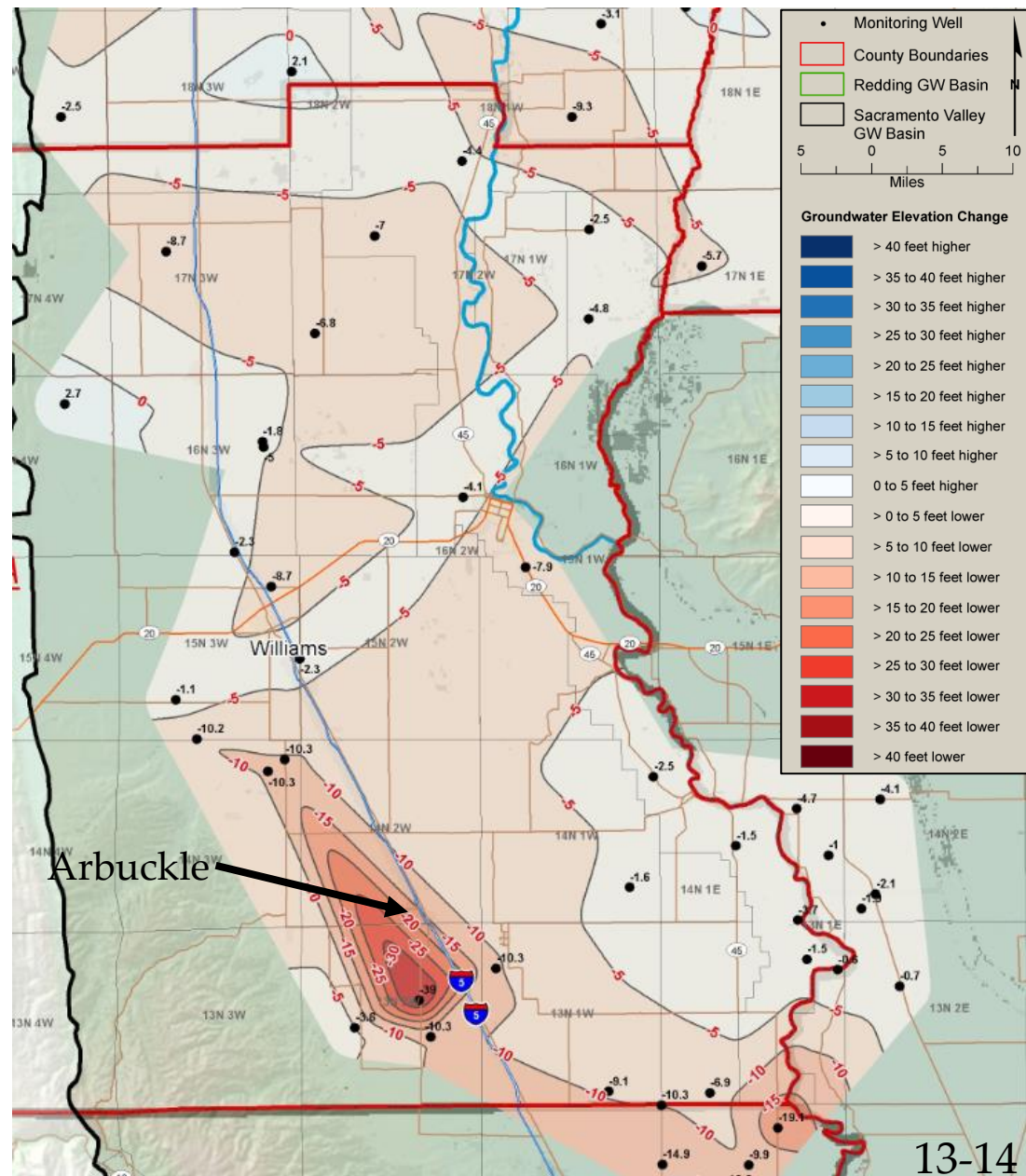
Groundwater Elevation Change Map Colusa County

Summer 2013 to 2014
Summer 2014 to 2015

Average:
100 to 450 feet
below ground surface

Colusa County - Sacramento Valley GW Basin

Maximum Increase GWL(ft)	4.1
Maximum Decrease GWE (ft)	-21.0
Average Change GWE (ft)	-3.0
Average Well Depth (ft)	278
Number of Wells Monitored	39



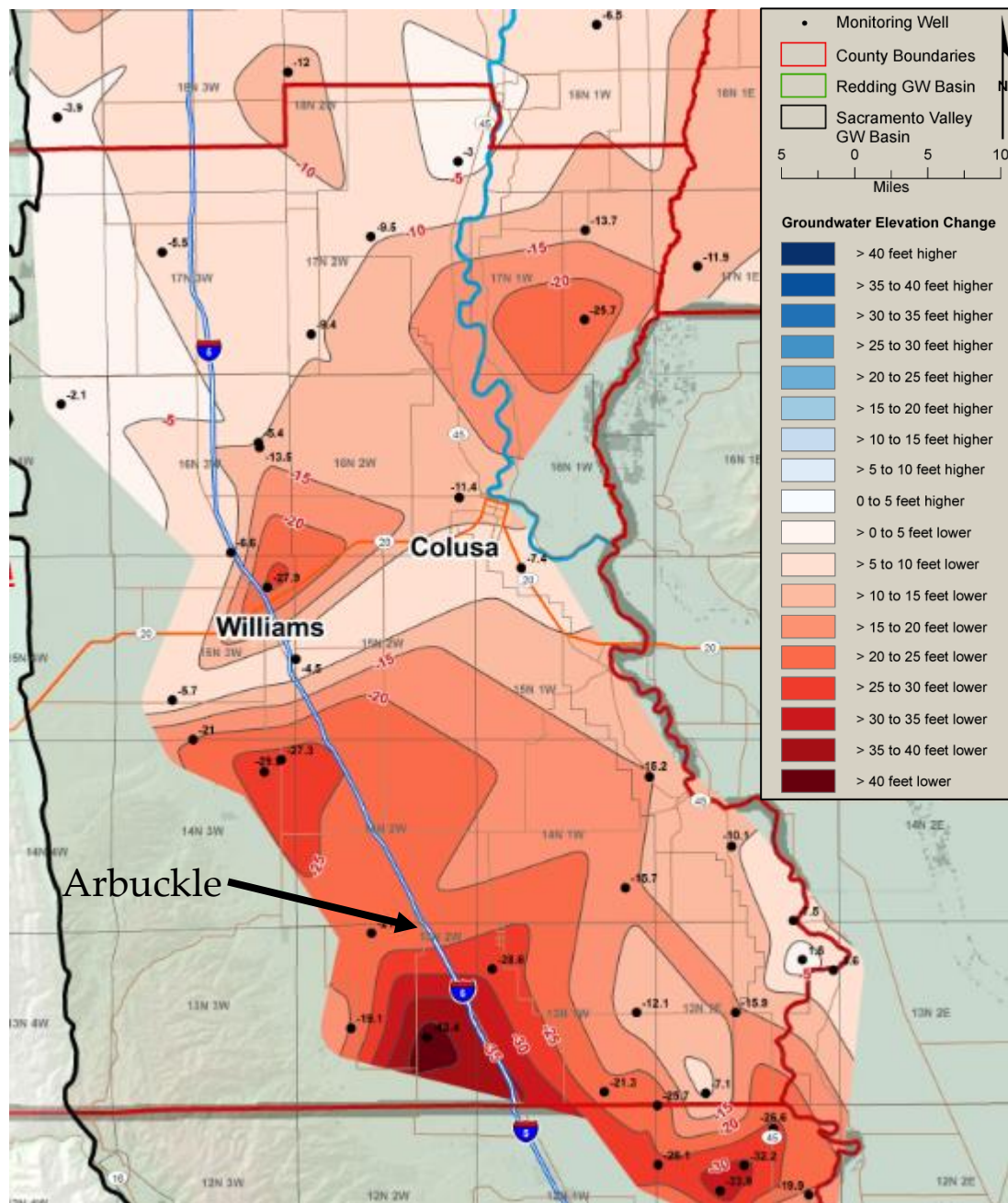
Groundwater Elevation Change Map Colusa County

Summer 2011 to 2015

Average:
100 to 450 feet
below ground surface

Colusa County - Sacramento Valley GW Basin

Maximum Increase GWL(ft)	1.6
Maximum Decrease GWE (ft)	-43.4
Average Change GWE (ft)	-14.4
Average Well Depth (ft)	283
Number of Wells Monitored	31



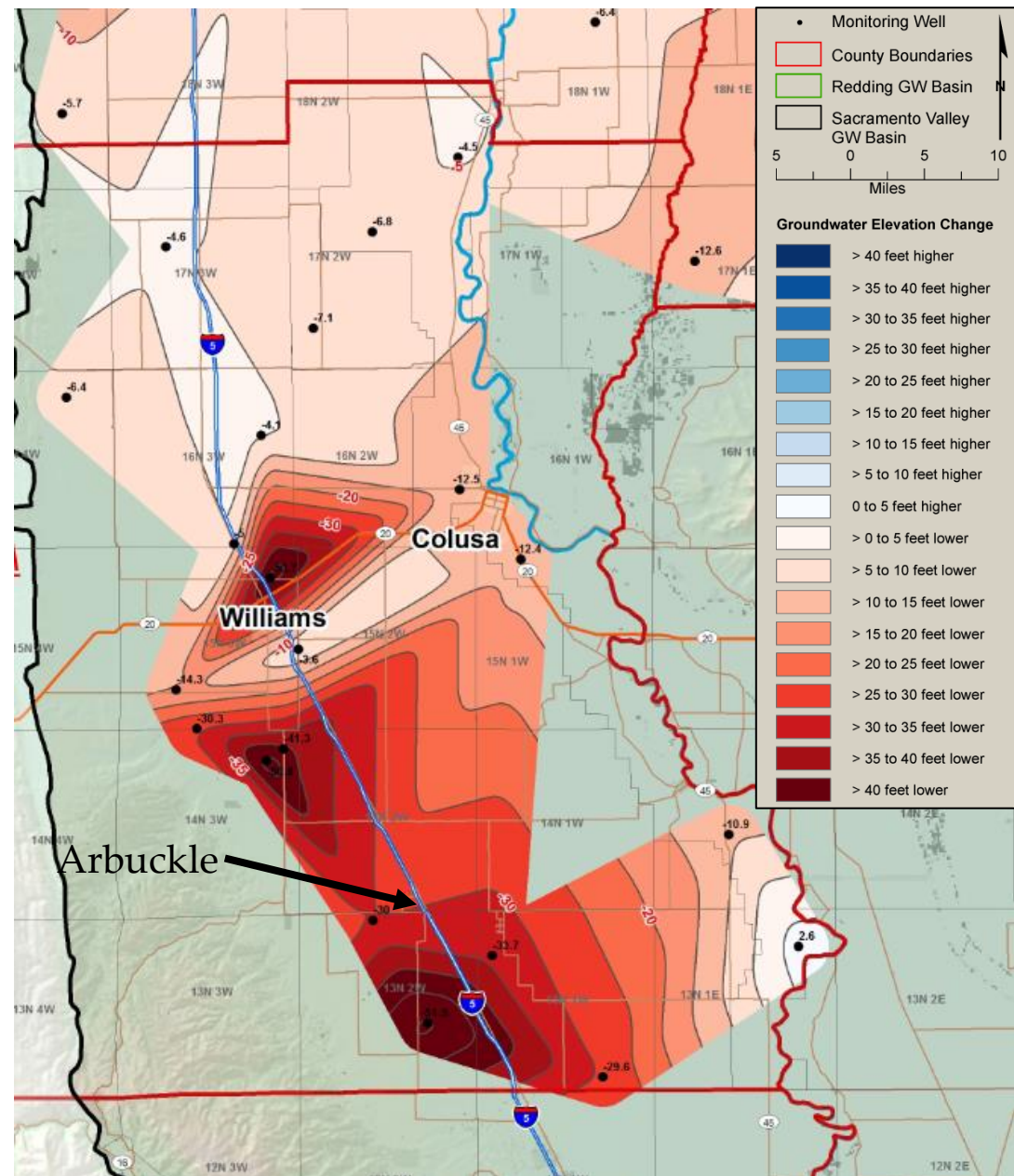
Groundwater Elevation Change Map Colusa County

Summer 2004 to 2015

Average:
100 to 450 feet
below ground surface

Colusa County - Sacramento Valley GW Basin

Maximum Increase GWL(ft)	2.6
Maximum Decrease GWE (ft)	-51.9
Average Change GWE (ft)	-19.4
Average Well Depth (ft)	253
Number of Wells Monitored	21



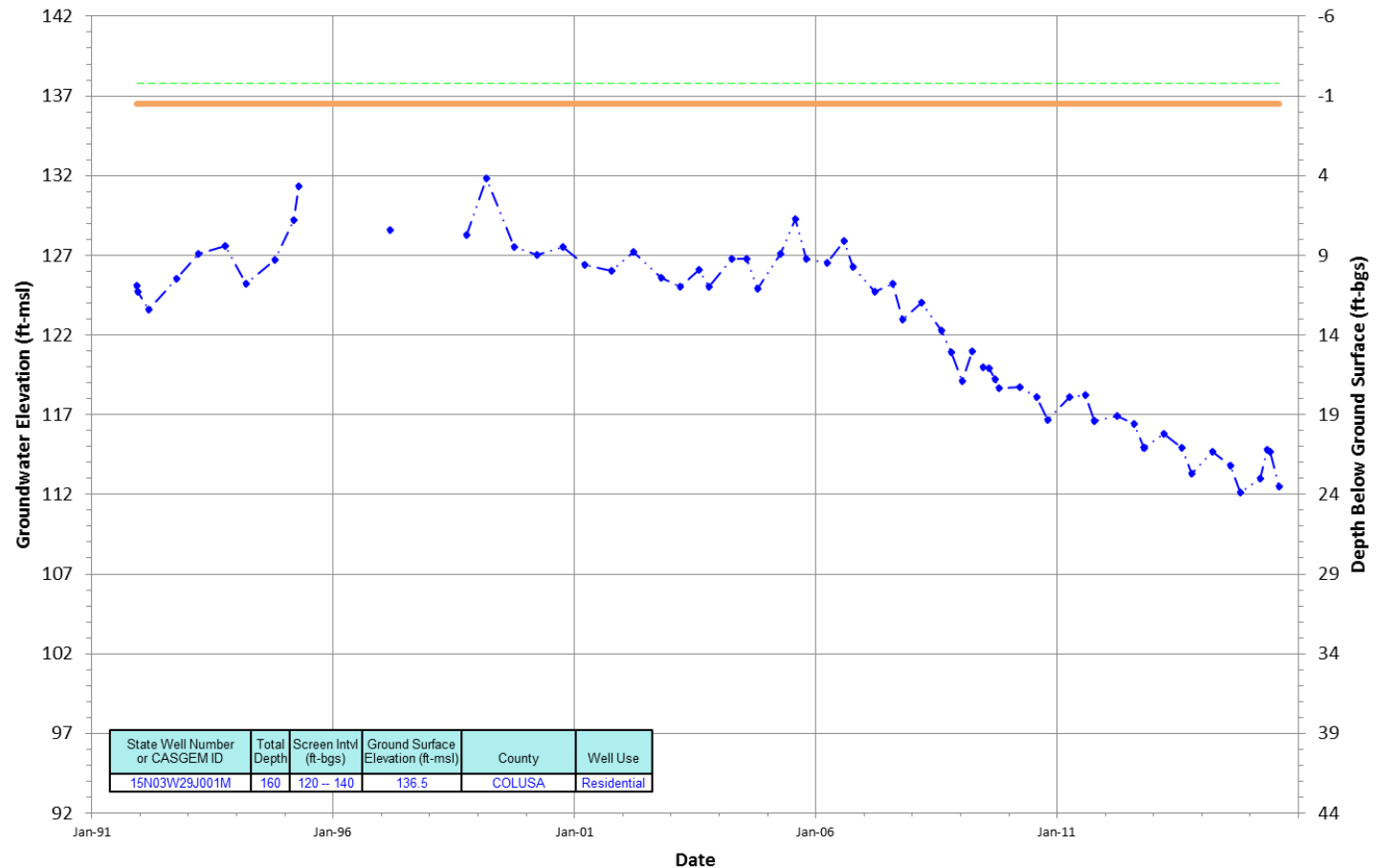
15N03W29J001M

15N03W29J001M

Period Of Record: 12/10/1991 to 08/03/2015

Hydrograph Criteria

State Well Number contains '15N03W'

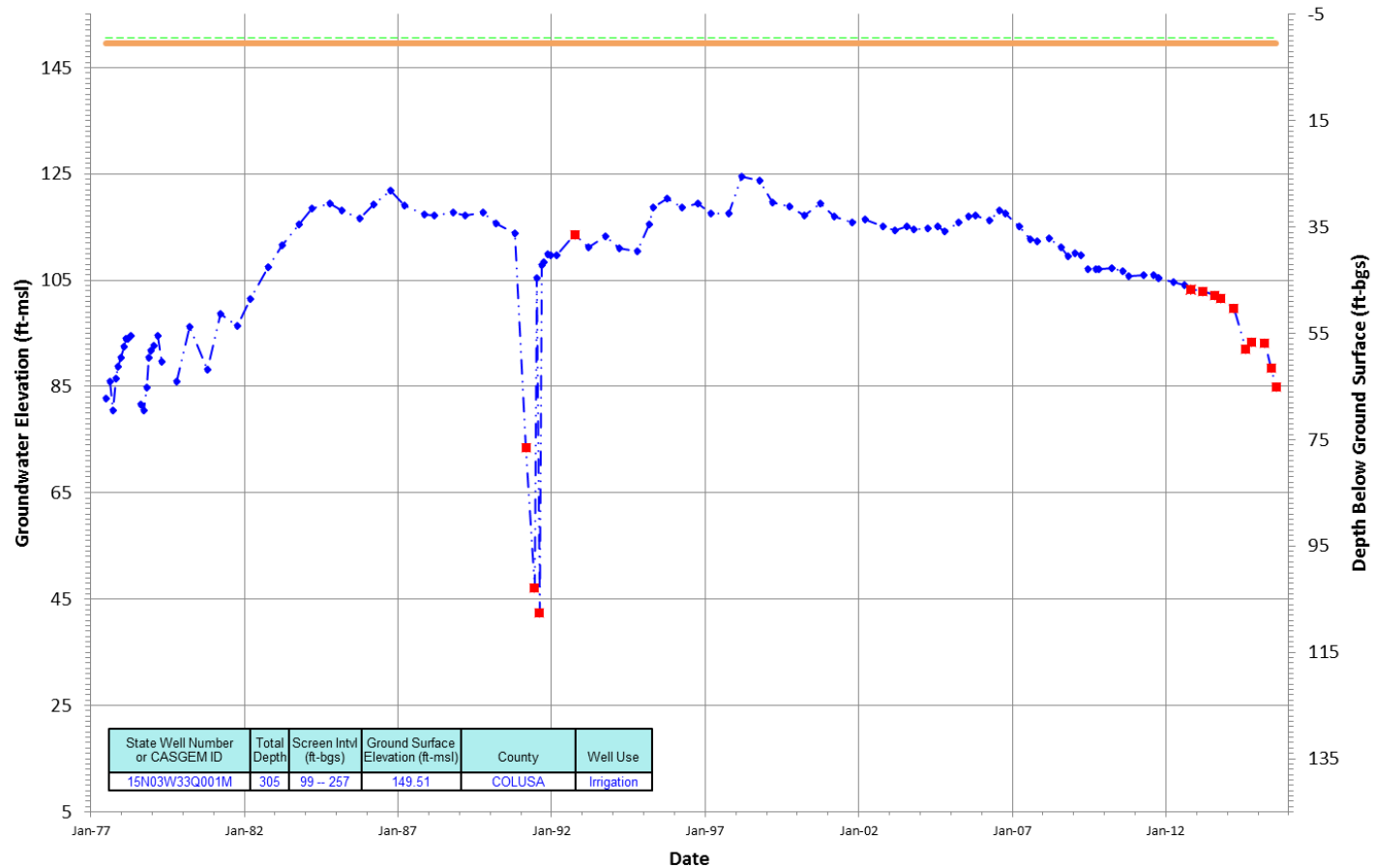


Ground Surface Elev RP Elev Periodic Measurements Questionable Measurements

15N03W33Q001M

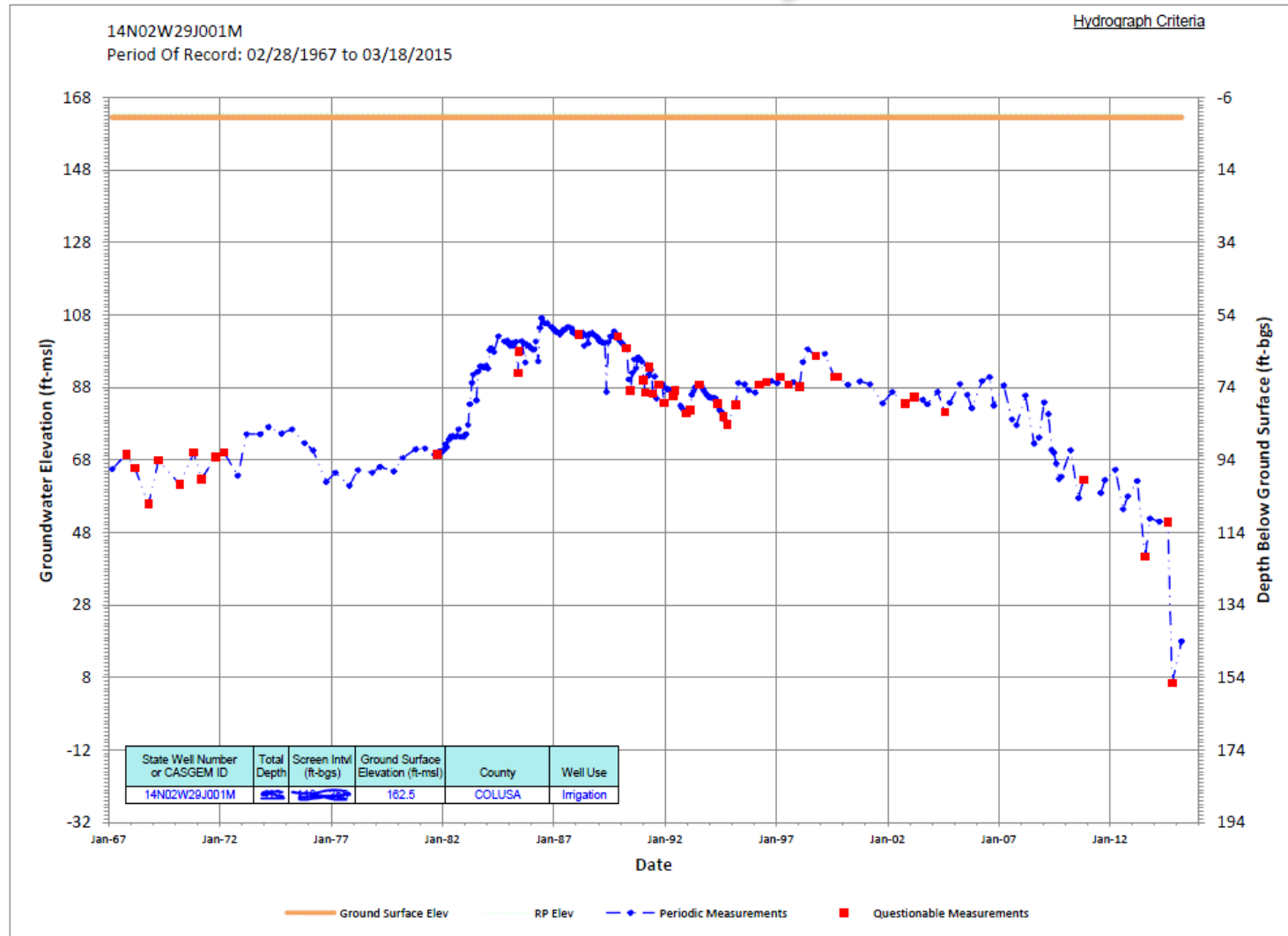
15N03W33Q001M
Period Of Record: 06/28/1977 to 08/03/2015

Hydrograph Criteria
State Well Number contains '15N03W'



Ground Surface Elev RP Elev Periodic Measurements Questionable Measurements

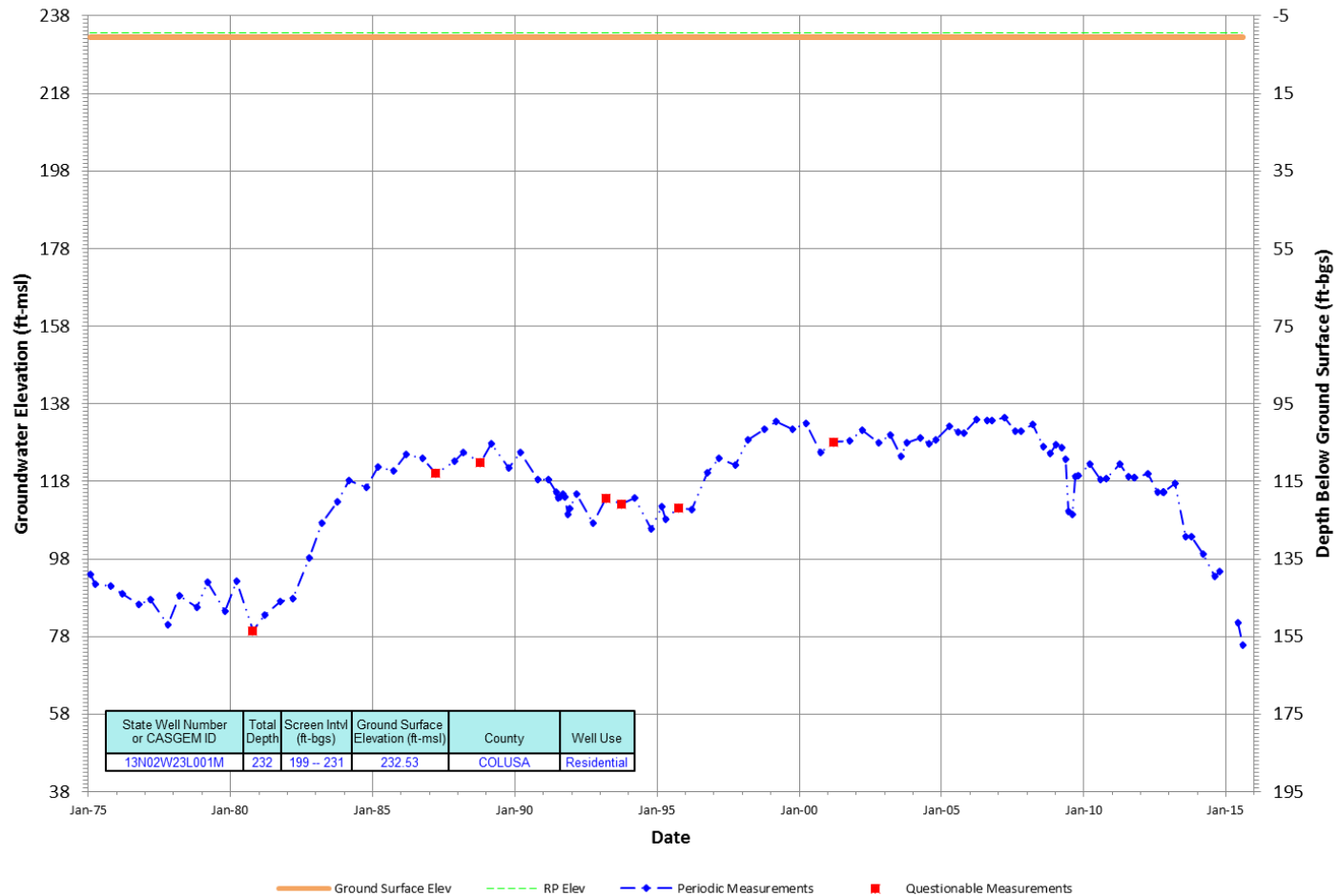
14N02W29J001M



13N02W23L001M

13N02W23L001M
Period Of Record: 01/28/1975 to 08/03/2015

Hydrograph Criteria
State Well Number contains "13N02W"



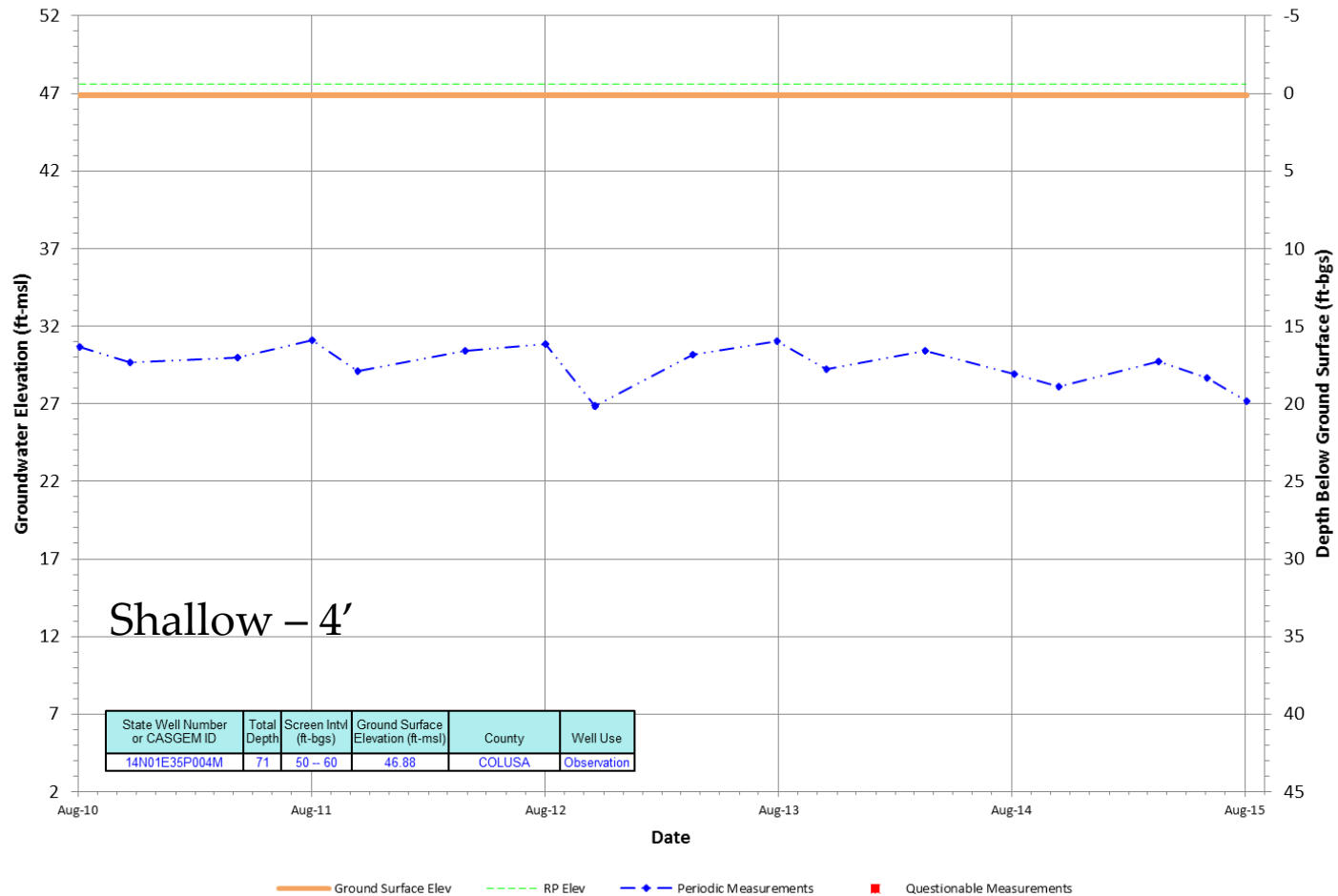
14N01E35P004

14N01E35P004M

Period Of Record: 08/03/2010 to 08/03/2015

Hydrograph Criteria

State Well Number contains '14N01'

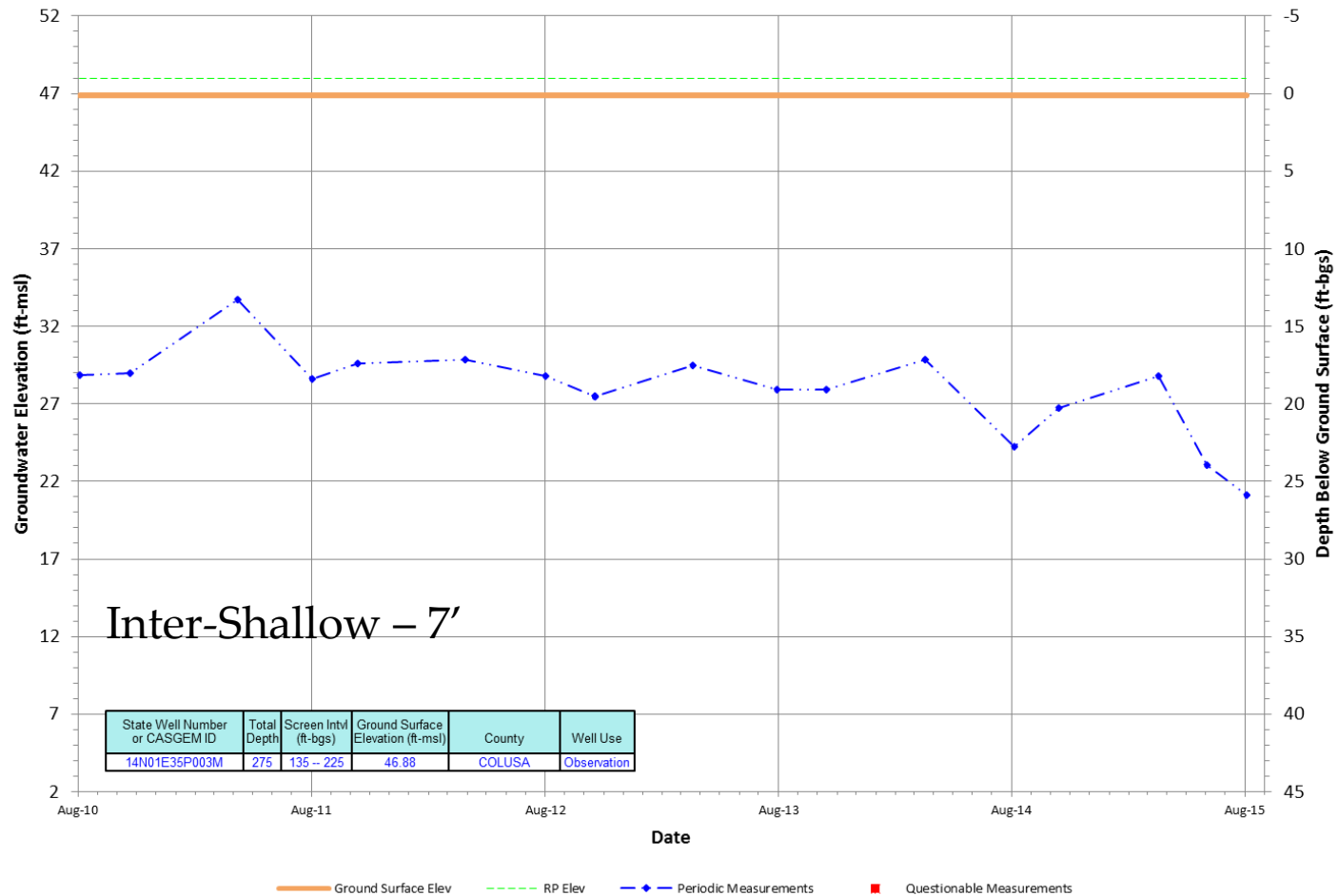


14N01E35P003

14N01E35P003M

Period Of Record: 08/03/2010 to 08/03/2015

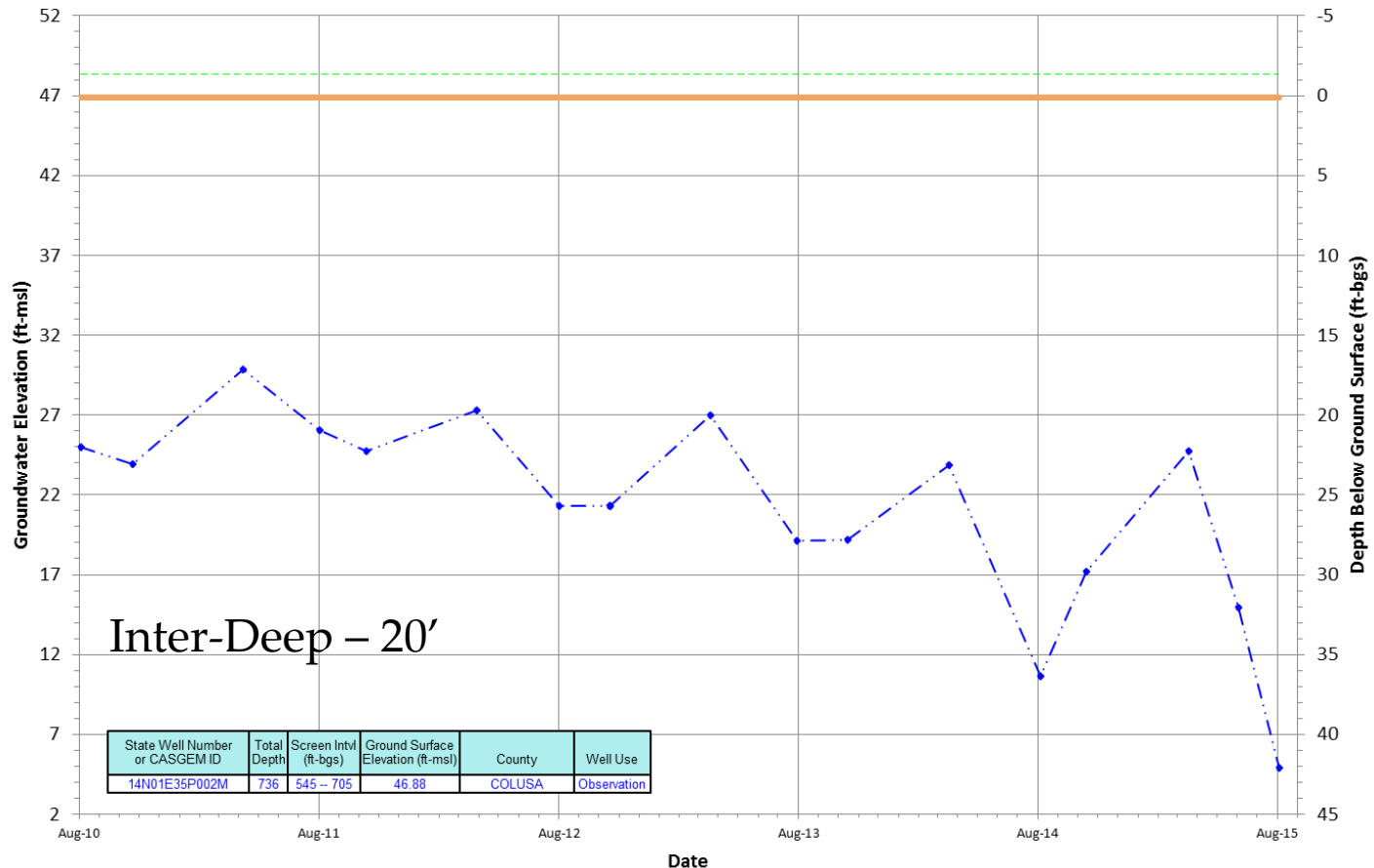
Hydrograph Criteria
State Well Number contains '14N01'



14N01E35P002

14N01E35P002M
Period Of Record: 08/03/2010 to 08/03/2015

Hydrograph Criteria
State Well Number contains '14N01'



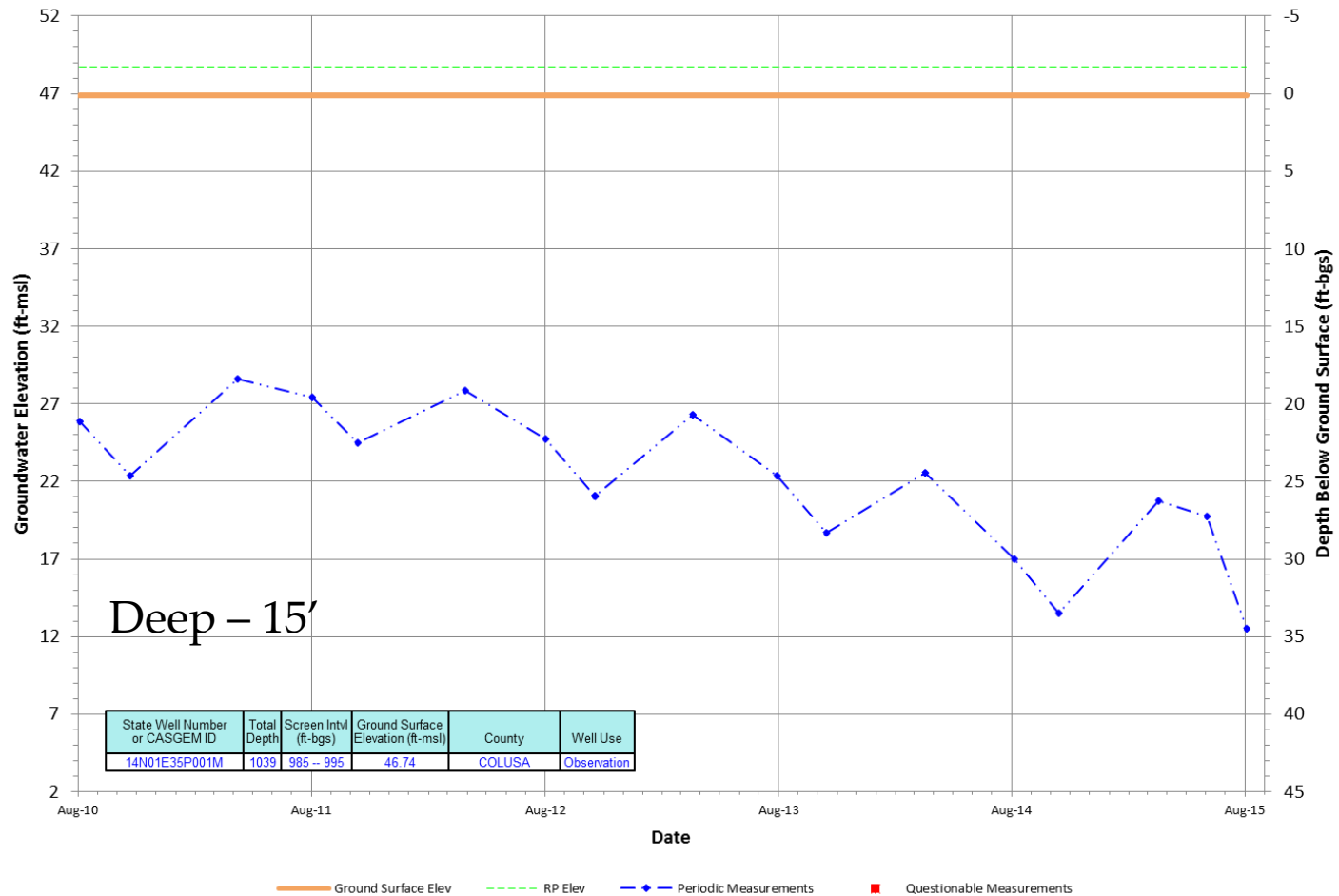
Ground Surface Elev RP Elev Periodic Measurements Questionable Measurements

14N01E35P001

14N01E35P001M

Period Of Record: 08/03/2010 to 08/03/2015

Hydrograph Criteria
State Well Number contains '14N01'



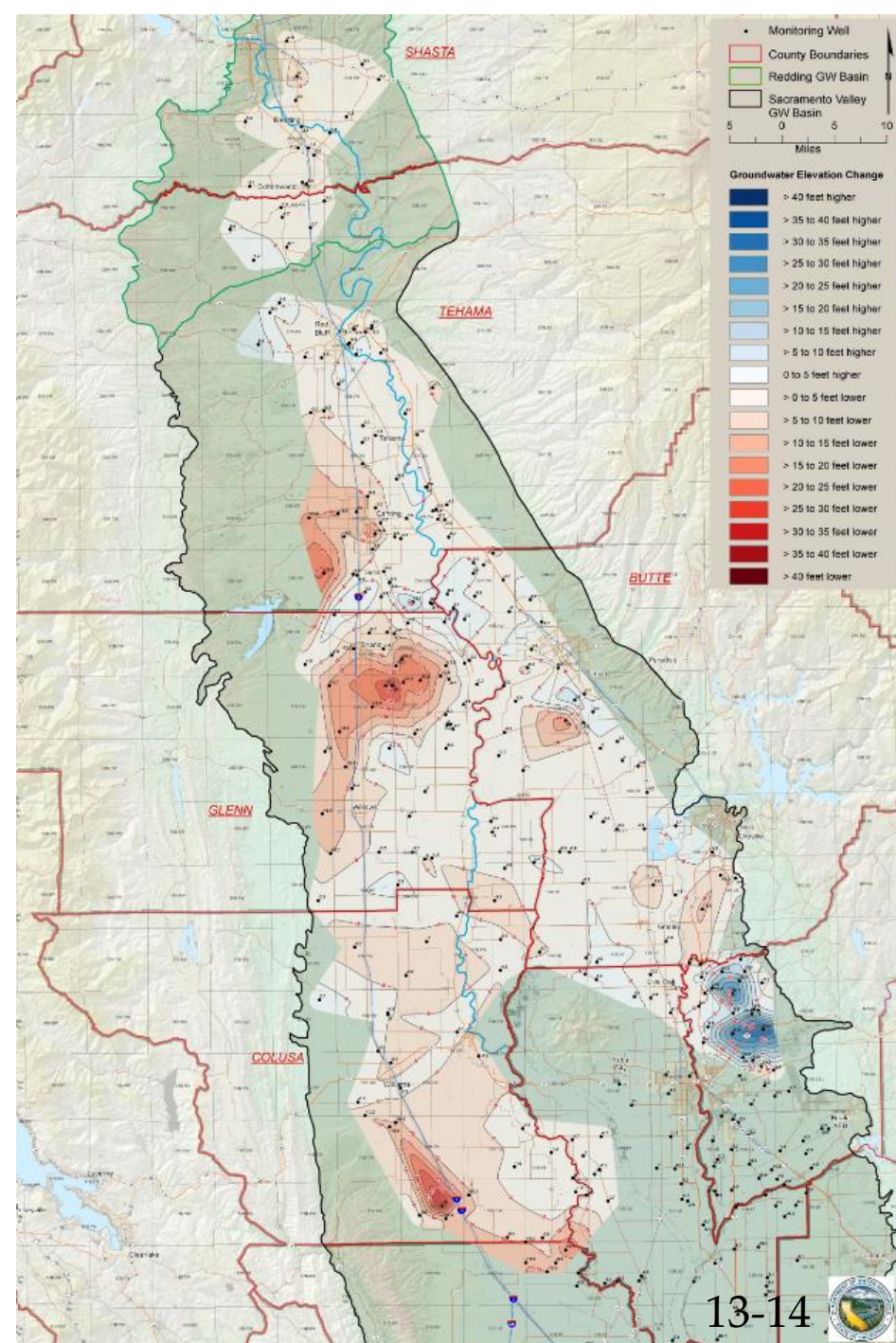
Groundwater Elevation Change Map Sacramento River Valley

Summer 2013 to 2014
Summer 2014 to 2015

Average:
100 to 450 feet
below ground surface

Summary Results for Summer 2013 to Summer 2014 Change in Groundwater Elevation

Maximum Increase GWE (ft)	14.6
Maximum Decrease GWE (ft)	-39.0
Average Change GWE (ft)	-4.1
Average Well Depth (ft)	255
Number of Wells Monitored	209



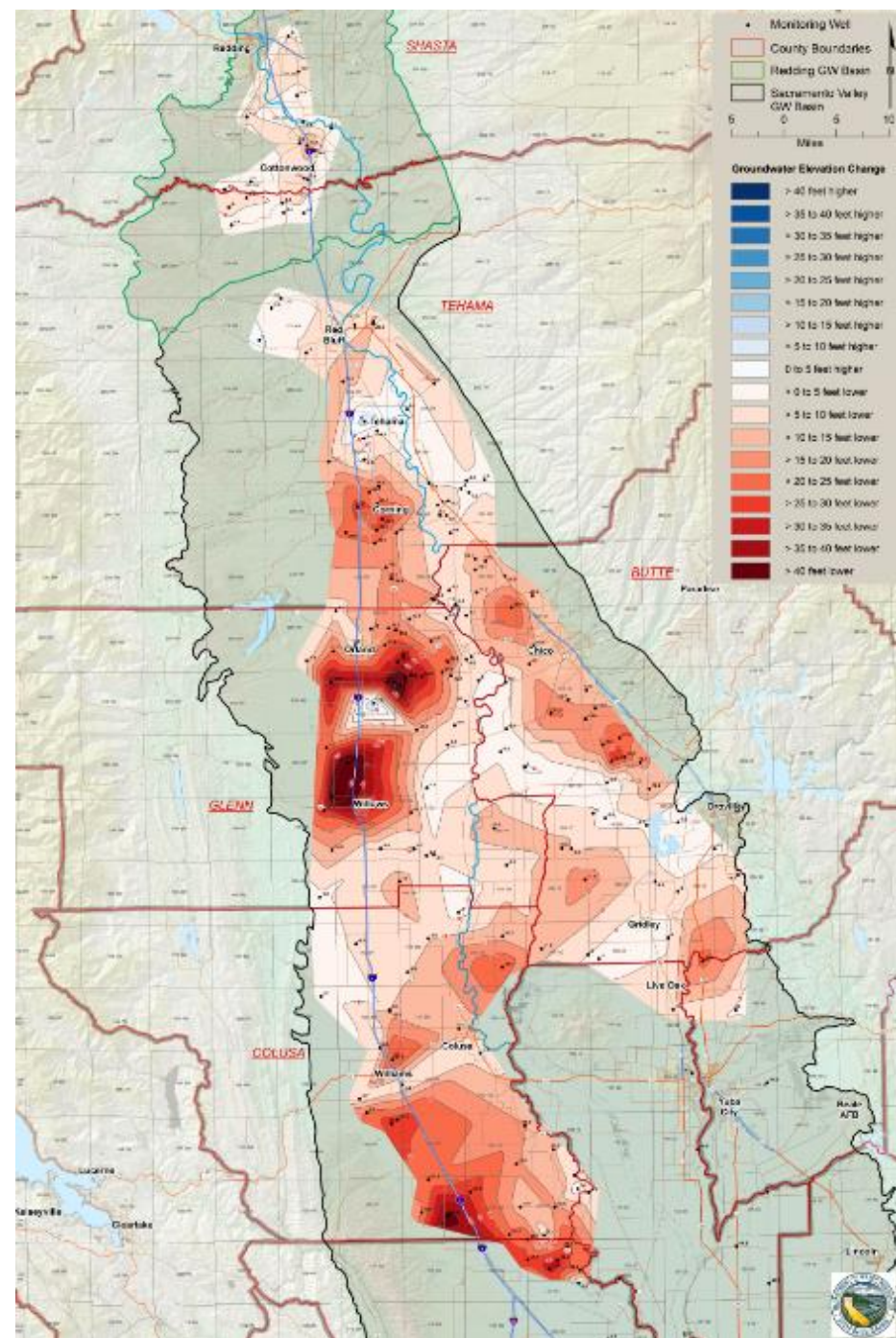
Groundwater Elevation Change Map Sacramento River Valley

Summer 2011 to 2015

Average:
100 to 450 feet
below ground surface

Summary Results for Summer 2011 to Summer 2015 Change in Groundwater Elevation

Maximum Increase GWE (ft)	11.8
Maximum Decrease GWE (ft)	-47.5
Average Change GWE (ft)	-12.5
Average Well Depth (ft)	253
Number of Wells Monitored	176



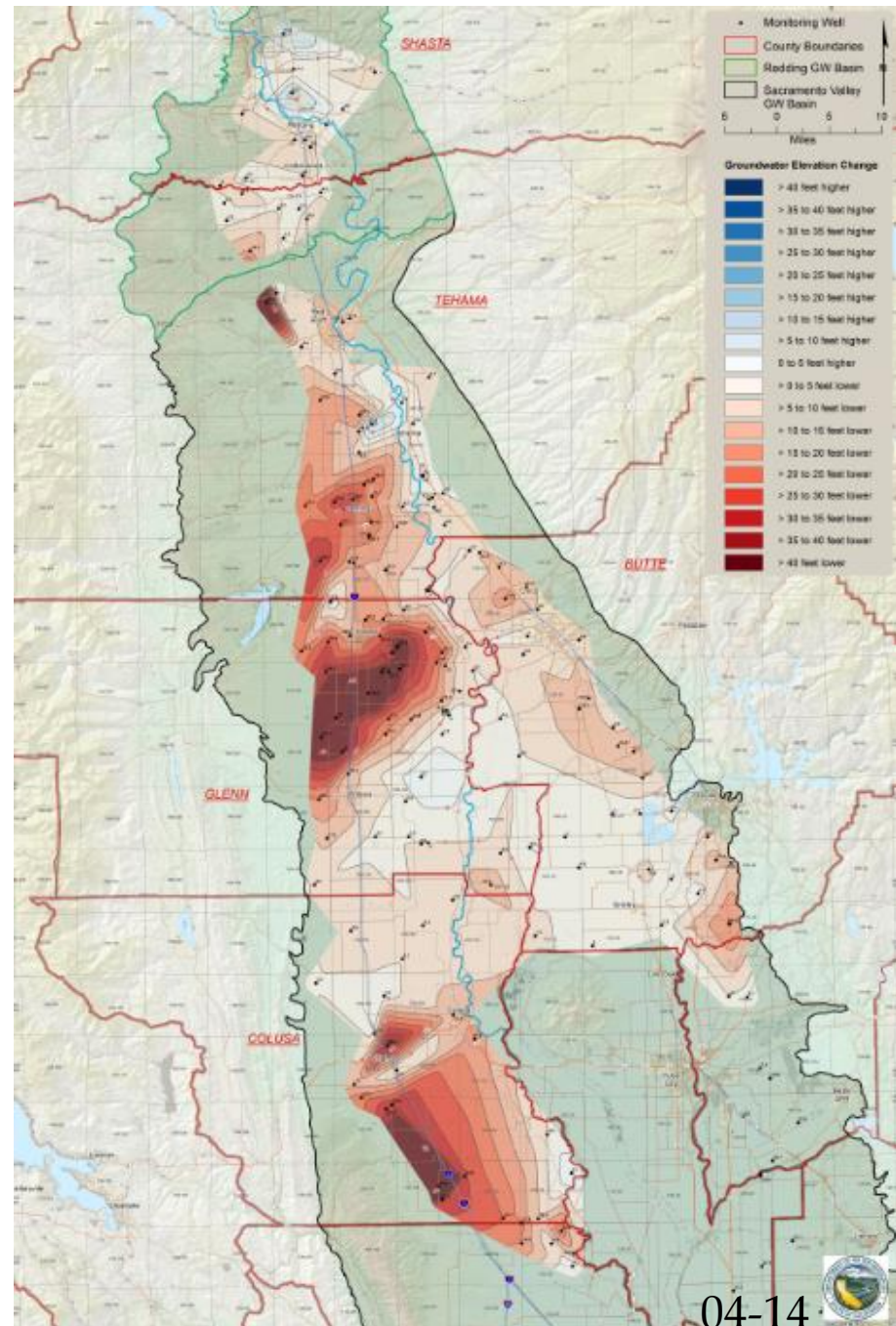
Groundwater Elevation Change Map Sacramento River Valley

Summer 2004 to 2014
Summer 2004 to 2015

Average:
100 to 450 feet
below ground surface

Summary Results for Summer 2004 to Summer 2014 Change in Groundwater Elevation

Maximum Increase GWE (ft)	13.8
Maximum Decrease GWE (ft)	-93.8
Average Change GWE (ft)	-13.8
Average Well Depth (ft)	242
Number of Wells Monitored	162



DWR Groundwater Information Center

Maps



<http://water.ca.gov/groundwater/gwinfo>

Groundwater Information Center

Maps and Reports

Groundwater data and related information can be reported in a variety of formats, including maps, figures, and written reports.

This page provides access to PDF documents which report groundwater conditions in a variety of formats. Documents are organized by report type (for example, "Groundwater Level Change Maps") and by region. Statewide reports, or reports that cover large regions of the state are found on this page, whereas local reports are available at Region Office Reports and Data below. Please note that data reports and other information is being added to this page regularly.

Statewide and Regional Maps

+ Groundwater Level Change Maps (click here to view)

Statewide and Regional Reports



Public Update for Drought Response - November 30, 2014
Groundwater Basins with Potential Water Shortages, Gaps in Groundwater Monitoring, Monitoring of Land Subsidence, and Agricultural Land Following

+ Selected Report Figures (click here to view)



Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California - 2014



Geology of the Northern Sacramento Valley, California, June 2014



Public Update for Drought Response - April 30, 2014
Groundwater Basins with Potential Water Shortages and Gaps in Groundwater Monitoring

+ Report Figures 1-27 (click here to view)

GROUNDWATER HOME

GROUNDWATER INFORMATION CENTER

- Groundwater Basics
- Maps and Reports
- Groundwater Management
 - Groundwater Well Information
 - DWR Well Inquiry Contacts
 - Local Permitting Agencies
- Monitoring and Data Collection
 - CASGEM
 - Water Data Library
- GIC Interactive Map Application
- Groundwater Contacts
- SUSTAINABLE GROUNDWATER MANAGEMENT
 - CASGEM
 - BULLETIN 113

Highlights

- Water Mgmt. Planning Tool
- Initial Basin Prioritization for SGM
- Public Update for Drought Response, November 2014
- Geology of the Northern Sacramento Valley



Small Break!

Questions?



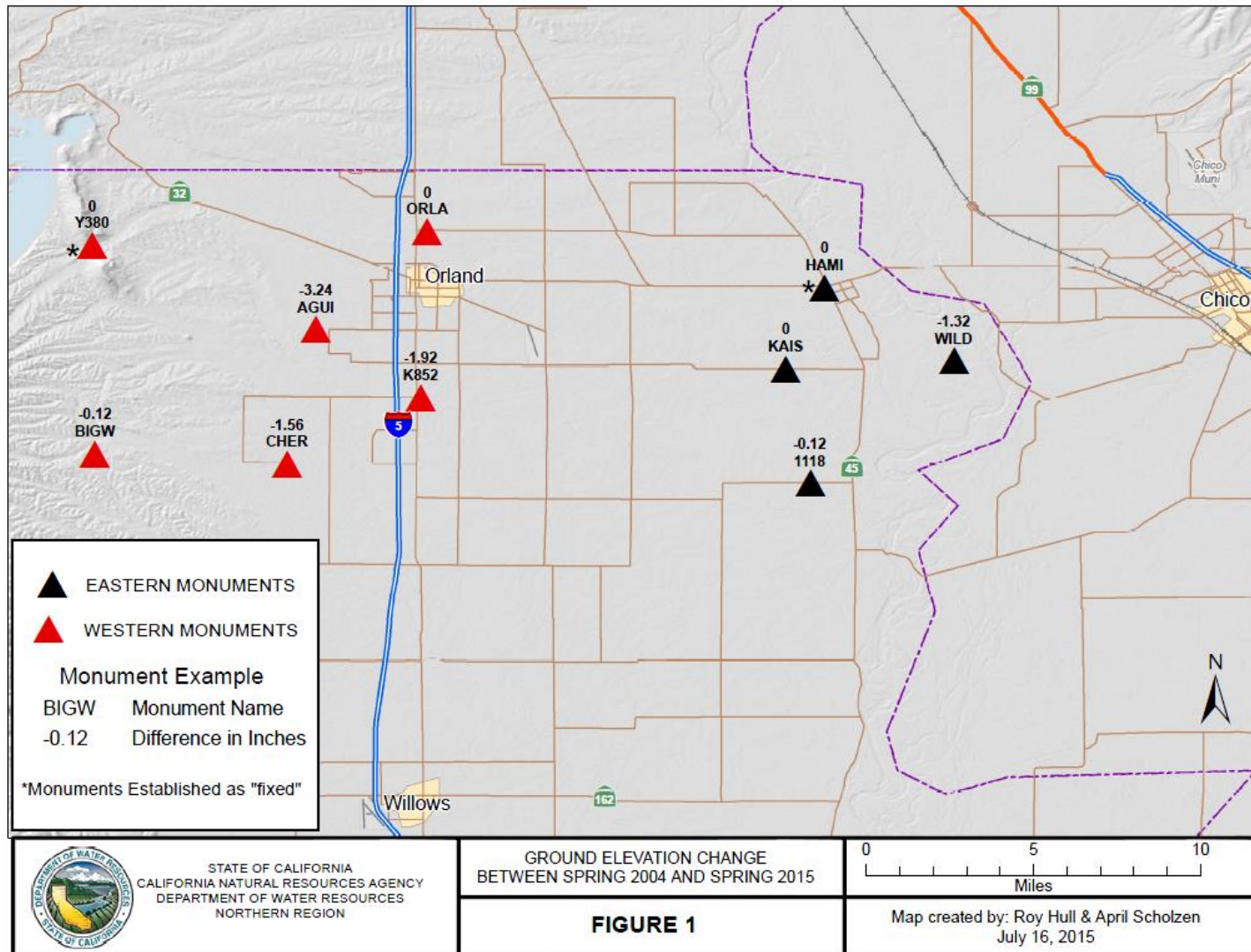
Photo Credit: Sue Graue

<http://water.ca.gov/groundwater/>

Crash course in subsidence, Upper Sacramento River Valley

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Subsidence in Glenn Co



Subsidence in Glenn Co

Table 1: West side of Glenn County, south of Orland

Monument	2004 GS Elevation (ft.) ²	2008 GS Elevation (ft.) ²	2015 GS Elevation (ft.) ²	Diff 2004- 2008 (in)	Per year 2004- 2008 (in)	Diff 2008- 2015 (in)	Per year 2008- 2015 (in)	Total Diff 2004- 2015 (in)	Per year 2004- 2015 (in)
ORLA	267.58	267.58	267.58	0	0.00	0	0.00	0	0.00
K852	230.71	230.74	230.55	0.36	0.09	-2.28	-0.33	-1.92	-0.18
AGUI	274.45	274.39	274.18	-0.72	-0.18	-2.52	-0.36	-3.24	-0.30
CHER	230.11	230.15	229.96	0.48	0.12	-2.28	-0.33	-1.80	-0.16
BIGW	457.72	457.77	457.71	0.6	0.15	-0.72	-0.10	-0.12	-0.01
Y380 ¹	462.79	462.79	462.79	0	0.00	0	0.00	0	0.00

Notes:

GS Ground Surface

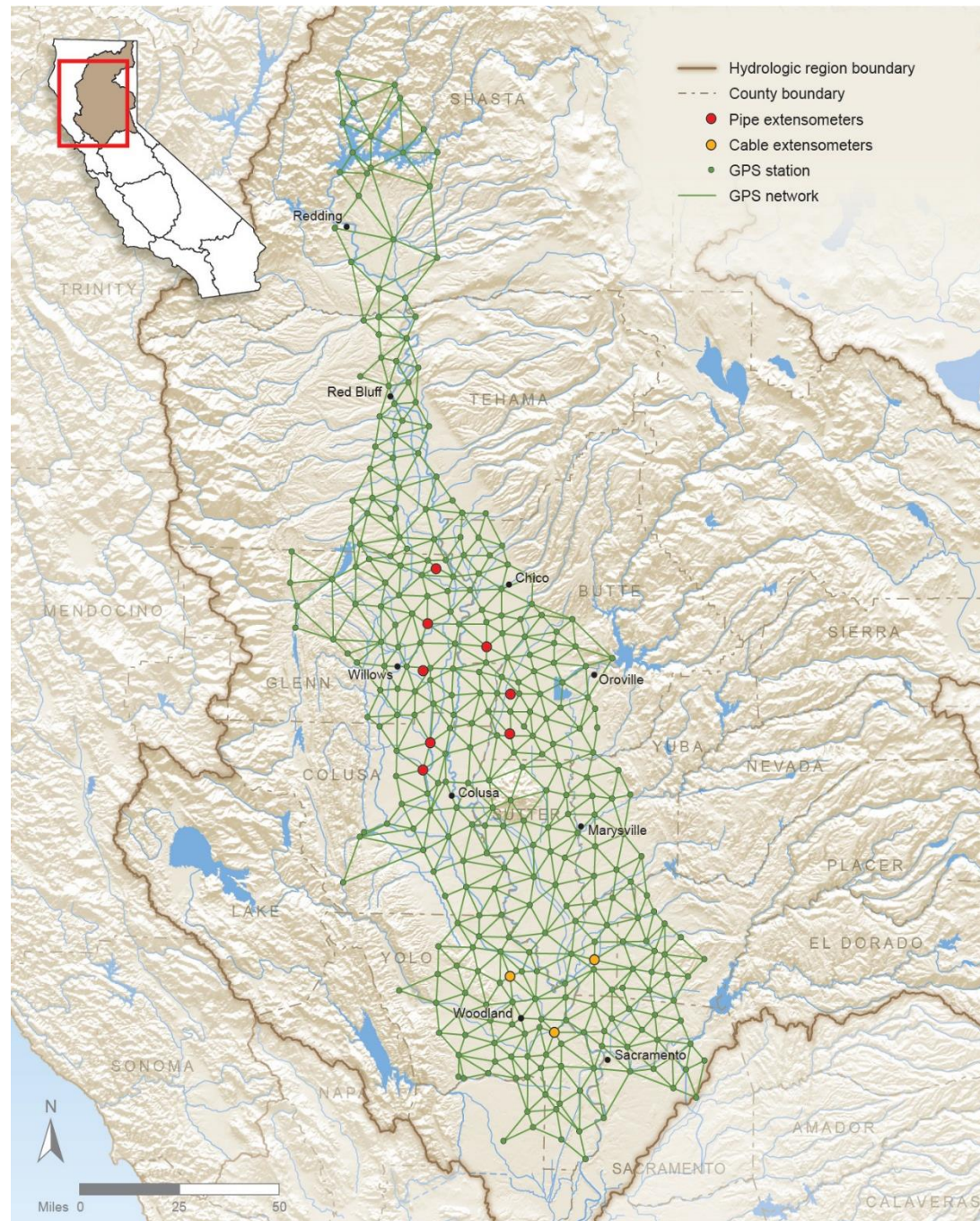
1 – Monument held fixed

2 – North American Vertical Datum of 1988 (NAVD88)

3 – Per year rates rounded to hundredths

GPS Grid

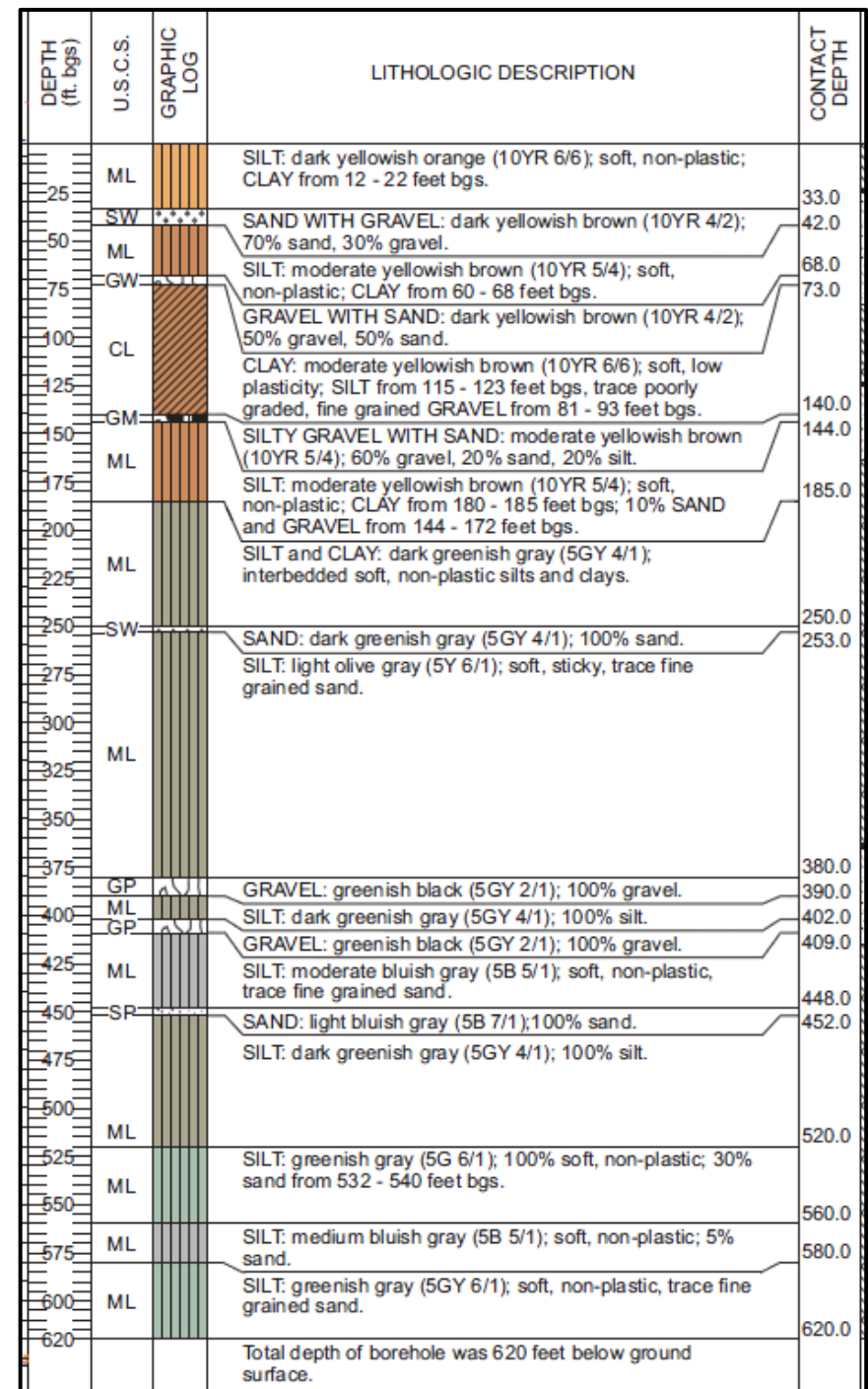
- Last Measurement – 2008
- Subset of Glenn Co – 2015
- Complete resurvey 2016 (?)



Source: Department of Water Resources

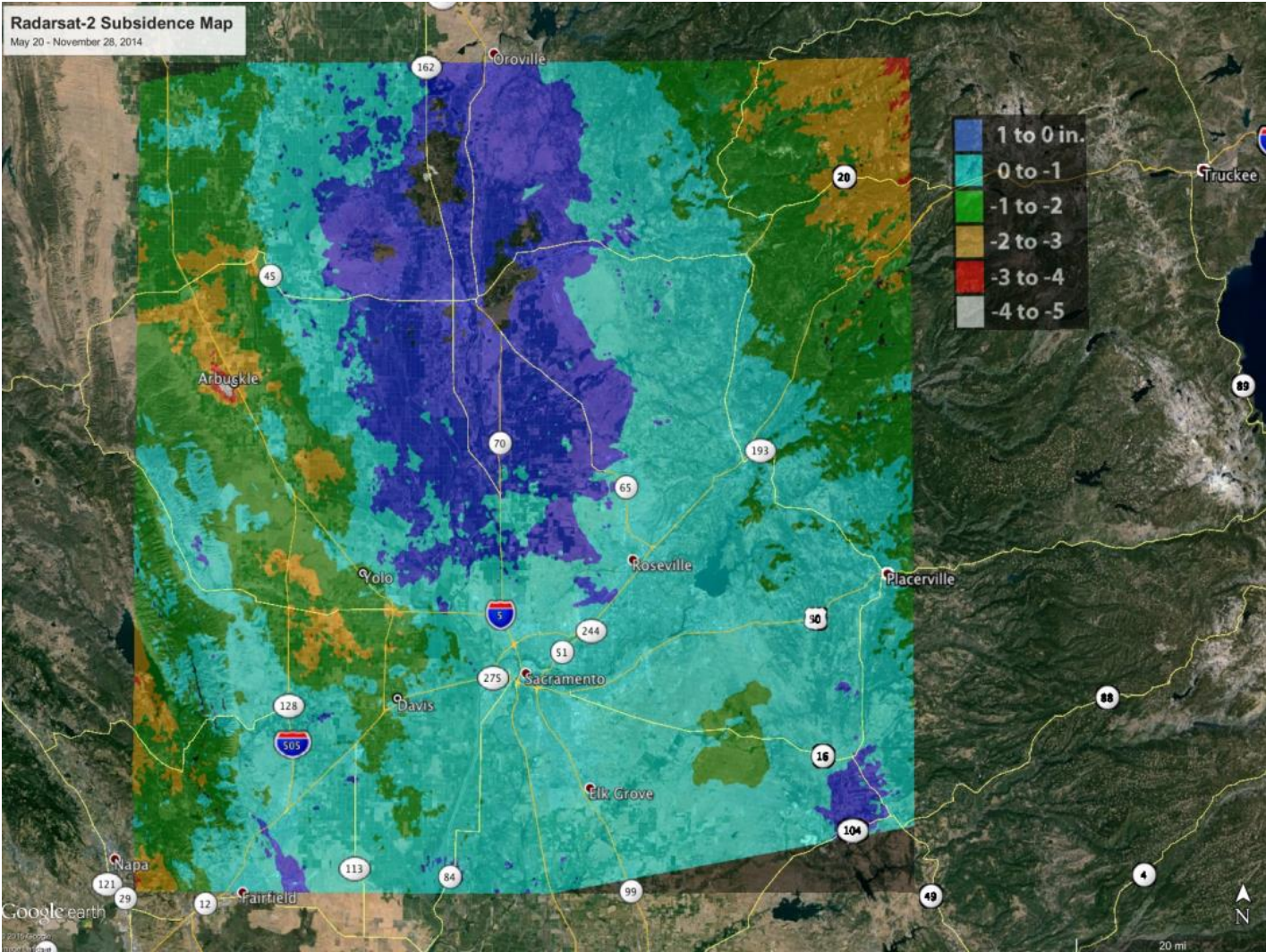
Lithology example: Powerhouse Rd

- Lithology - Fines
 - Clay
 - Silt
- Pumping
 - Causes drying and flattening of fines



NASA – InSAR

5/20 – 11/28 2014



What does NASA say?

- The small area of intense subsidence evident near Arbuckle in 2014 shows an uneven subsidence with time in Figure 3, totaling about 5" for the last half of 2014, but no subsidence in 2006 - 2010.

Figure 3

2006-2010

- ...but no subsidence in 2006 - 2010

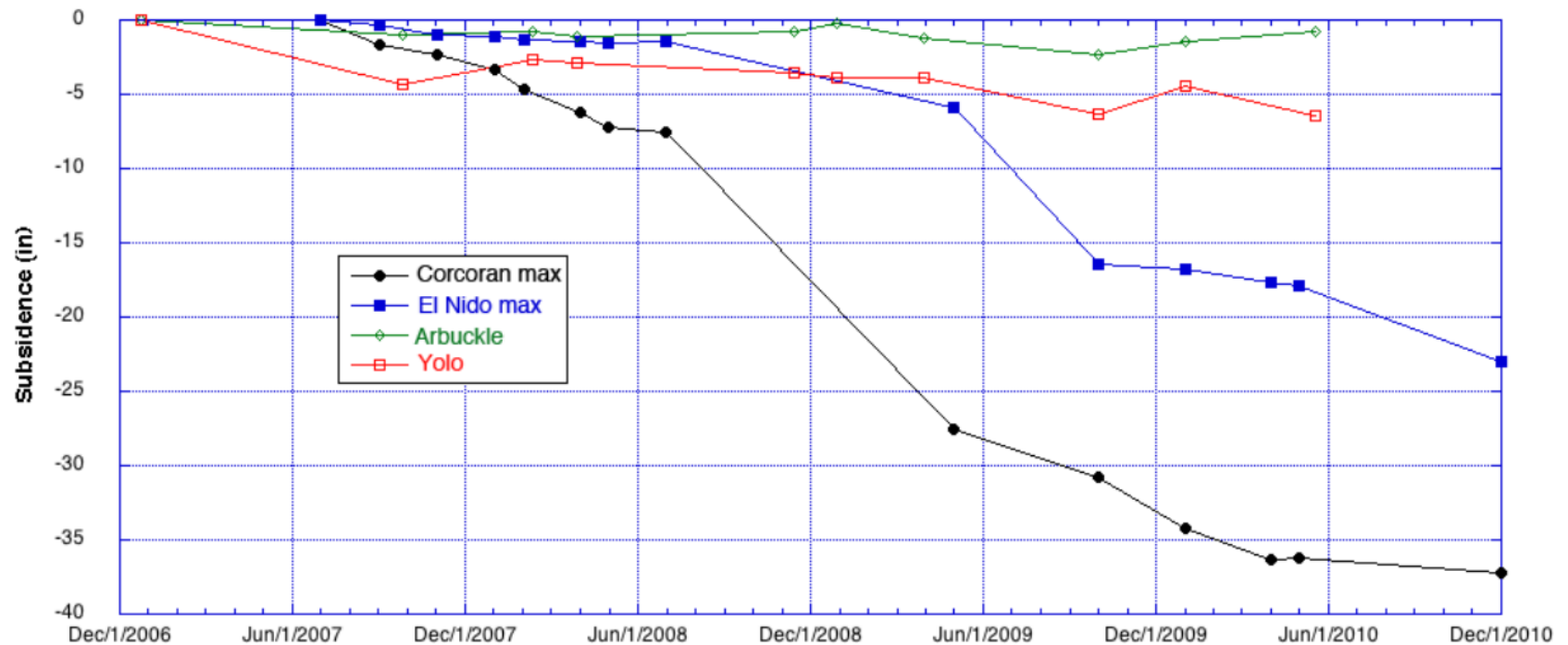
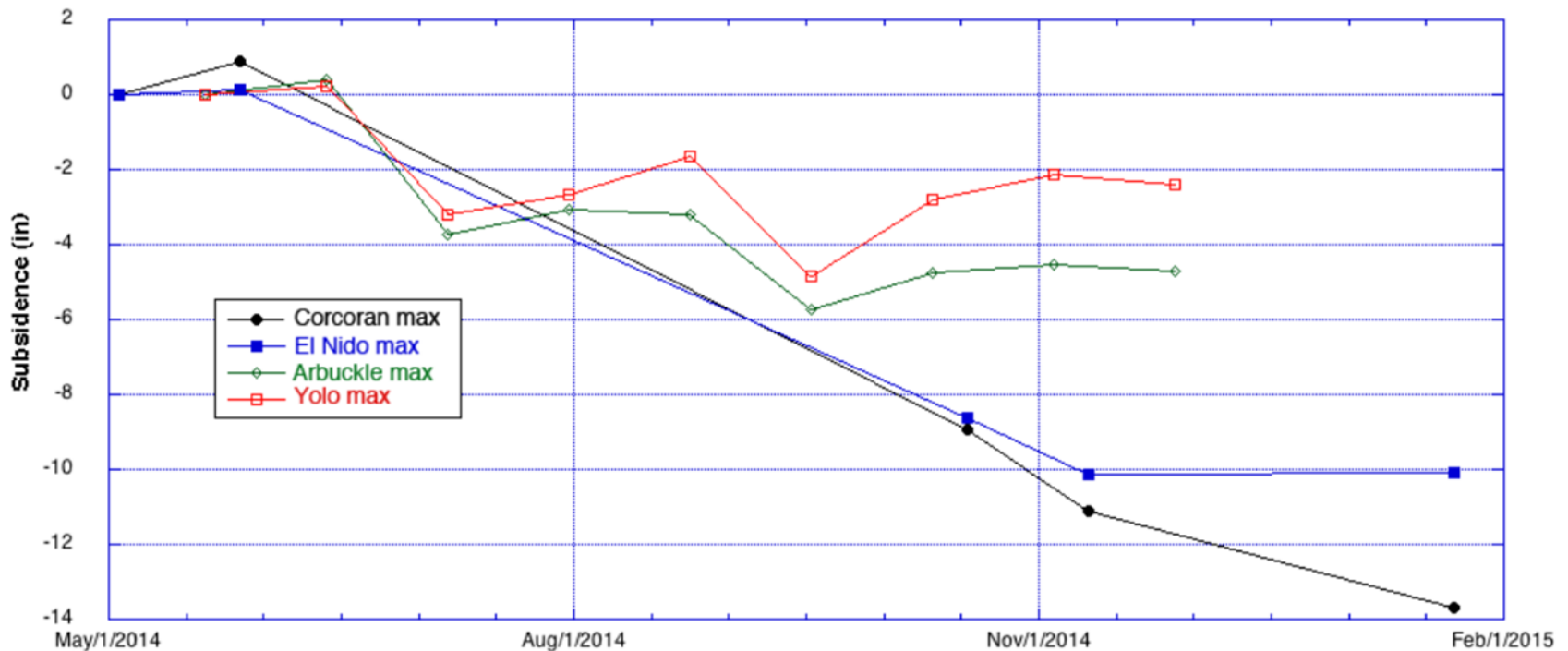


Figure 3

May – Nov 2014

- ...totaling about 5" for the last half of 2014



Thank-you! Questions?



Photo Credit: Sue Graue

<http://water.ca.gov/groundwater/>