DEPARTMENT OF WATER RESOURCES
Northern District
2440 Main St.
Red Bluff, CA 96080
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GROUNDWATER LEVEL COMPARISON REPORT
SACRAMENTO VALLEY and REDDING GROUNDWATER BASINS
CHANGE IN GROUNDWATER ELEVATIONS SPRING 2006 TO SPRING 2009

The Spring 2006 to Spring 2009 Groundwater Level Comparison Report summarizes the change in groundwater elevations from March 2006 to March 2009 in the northern Sacramento Valley monitoring wells as measured by the Department of Water Resources (DWR) Northern District and DWR monitoring cooperators. Northern Sacramento Valley groundwater levels are measured up to four times a year as part of our ongoing data collection program. Many of the wells have over 30 years of monitoring history, with the longest active monitoring well dating back to 1921, or 88 years. The groundwater level data provide valuable information regarding seasonal fluctuations and long-term changes in groundwater level trends over time. The groundwater level data presented in this report includes the Sacramento Valley and Redding groundwater basin portions of Butte, Colusa, Glenn, Tehama, and Shasta counties.

This report was prepared to clarify the current groundwater level conditions as they relate to the conditions that existed prior to the ongoing period of drought that began with a dry winter in late 2006 to early 2007. This report is a direct comparison of groundwater levels in wells that were measured in March 2006 and the same wells that were measured in March 2009. It should be noted that 2006 was considered Wet Year according to the Sacramento River Index.

The groundwater level monitoring grid includes active and inactive wells drilled by varying methods, under varying designs, and for varying uses. Types of well use include domestic, irrigation, observation and other (stock, unused, etc) wells. Wells may be constructed over discreet aquifer intervals or multiple aquifer zones. The total depth of monitoring grid wells ranges from 18 feet below ground surface (ft-bgs), to 1,380 ft-bgs; with screened intervals ranging from 8 to 1,310 ft-bgs. The wide variety of well uses and construction provides the opportunity to examine the groundwater level response to seasonal and long-term changes in climate and land use over multiple aquifer zones.

Static groundwater level data from 458 monitoring wells were analyzed by well use and well depth for the March 2006 versus March 2009 monitoring periods. Wells that were pumping or had been recently pumped at the time of measurement were excluded from the analysis due to inherent uncertainties associated with pumping level data. It is important to note that the change in groundwater elevation data represents the individual change which occurred in one well over two monitoring periods. Daily and seasonal changes in groundwater levels are also occurring and are influenced by many factors, such as a nearby well pumping, changing land use, weather, precipitation, and surface water supply, among others.

Seasonal and long-term changes in groundwater levels in individual wells are best examined with hydrographs. Hydrographs for each of the monitoring wells can be obtained at DWR's Water Data Library (http://wdl.water.ca.gov). Regional evaluation of seasonal or long-term changes in groundwater levels are typically evaluated through groundwater contour mapping. Annual groundwater elevation contours, along with copies of this report, are available online at DWR Northern District's website:
http://www.nd.water.ca.gov/PPAs/GroundwaterBasins/GroundwaterLevel/index.cfm

Groundwater elevation is determined by subtracting the measured depth to groundwater in a well from the ground surface elevation, and is expressed as feet-mean sea level (ft-msl). The change in groundwater elevation was calculated by subtracting the March 2006 measurement from the March 2009 measurement for each of the measured wells. A change in groundwater level indicated by a positive number indicates that the groundwater level was higher in March 2009 than it was in March 2006. A change in groundwater level indicated by a negative number indicates that the groundwater level was lower in March 2009 than it was in March 2006.

The groundwater level data that were analyzed for this report are summarized below and are listed in Tables 1 and 2, and illustrated in Plates 1 through 4. Table 1 shows the change in groundwater elevation by well depth and Table 2 shows the change in groundwater elevation by well use. Also provided are three plates that show the locations of the wells by well depth, well type, and change in groundwater level from March 2006 to March 2009. Plate 1 shows monitoring wells with depths ranging from 0 to 200 feet; Plate 2 shows monitoring wells with depths ranging from 201 to 600 feet; and Plate 3 shows monitoring wells with depths ranging from 601 to 1,380 feet. Plate 4 shows the locations of observation wells only, by well depth and by the change in groundwater level, from March 2006 to March 2009.

GENERAL SUMMARY:

- ✓ On average, groundwater levels were down by about 7.5 feet (-7.5 ft) in the northern Sacramento Valley and the Redding Basins in March 2009 compared to March 2006.

- ✓ The greatest decrease in groundwater elevation was on the west side of the Sacramento Valley in Glenn County in one deep observation well that had a decline of 34.1 feet (-34.1 ft) in March 2009 compared to March 2006.

- ✓ The greatest increase in groundwater elevation was in a Redding Basin domestic well with a groundwater elevation 3.2 feet (+3.2 ft) higher in March 2009 than in March 2006.

- ✓ Groundwater levels were down, on average, in all well types:

    - domestic wells: 6.8 feet (-6.8 ft)
    - irrigation wells: 8.6 feet (-8.6 ft)
    - observation wells: 7.4 feet (-7.4 ft)
    - other well types: 6.8 feet (-6.8 ft)

- ✓ Groundwater levels were also down, on average, for all well depths:

    - 0 to 200 feet deep: 7.0 feet (-7.0 ft)
    - 201 feet and 600 feet deep: 7.5 feet (-7.5 ft)
    - 601 and 1380 feet deep: 8.8 feet (-8.8 ft)
    - unknown well depth: 9.1 feet (-9.1 ft)

- ✓ Looking at the average groundwater level decline by county:

    Sacramento Valley Groundwater Basin
    - Butte: 7.5 feet (-7.5 ft)
    - Colusa: 7.0 feet (-7.0 ft)
    - Glenn: 9.6 feet (-9.6 ft)
    - Southern Tehama: 6.3 feet (-6.3 ft)

    Redding Basin
    - Northern Tehama/Shasta: 4.5 feet (-4.5 ft)

FOLLOWING ARE THE TABLES AND PLATES SUMMARIZING THE GROUNDWATER LEVEL DATA COLLECTED:

TABLES

Table 1. Change in Groundwater Elevation by Well Depth

Table 2. Change in Groundwater Elevation by Well Use

PLATES

Plate 1. Sacramento Valley Change in Groundwater Elevation Map
Spring 2006 to Spring 2009
Monitoring Wells Up to 200 Feet in Depth

Plate 2. Sacramento Valley Change in Groundwater Elevation Map
Spring 2006 to Spring 2009
Monitoring Wells 200 Feet to 600 Feet in Depth

Plate 3. Sacramento Valley Change in Groundwater Elevation Map
Spring 2006 to Spring 2009
Monitoring Wells Over 600 Feet in Depth

Plate 4. Sacramento Valley Change in Groundwater Elevation Map
Spring 2006 to Spring 2009
Dedicated Groundwater Observation Wells

Table 1. Change in Groundwater Elevation by Well Depth

DEPARTMENT OF WATER RESOURCES

SPRING GROUNDWATER ELEVATION MEASUREMENTS

NORTHERN SACRAMENTO VALLEY & REDDING BASINS, CALIFORNIA

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH

SPRING 2006 to SPRING 2009

	All Well Depths	Well Depth			
		0 to 200 ft-bgs	200 to 600 ft-bgs	600 to 1,380 ft-bgs	Unknown
BUTTE					
Maximum Increase in GWE* (ft)	0.0	0.0	0.0	0.0	0.0
Maximum Decrease in GWE (ft)	-20.6	-17.3	-20.6	-17.4	-17.8
Average GWL Change (ft)	-7.5	-6.4	-7.7	-8.4	-13.0
Range of GWL Change (ft)	20.6	17.3	20.6	17.4	17.8
Number of Wells	86	34	35	11	4
COLUSA					
Maximum Increase in GWE* (ft)	0.0	0.0	0.0	0.0	0.0
Maximum Decrease in GWE (ft)	-30.1	-15.2	-25.2	-13.3	-30.1
Average GWL Change (ft)	-7.0	-5.6	-7.3	-6.7	-12.4
Range of GWL Change (ft)	30.0	15.2	25.2	13.3	30.1
Number of Wells	61	22	25	9	5
GLENN					
Maximum Increase in GWE* (ft)	0.4	0.0	0.0	0.0	0.0
Maximum Decrease in GWE (ft)	-34.1	-26.3	-25.8	-34.1	-21.3
Average GWL Change (ft)	-9.6	-8.0	-9.3	-15.6	-9.3
Range of GWL Change (ft)	35.0	26.3	25.8	34.1	21.3
Number of Wells	127	51	50	16	10
TEHAMA					
Maximum Increase in GWE* (ft)	0.5	0.5	0.0	0.0	0.3
Maximum Decrease in GWE (ft)	-20.8	-17.3	-20.8	-14.1	-12.0
Average GWL Change (ft)	-6.3	-6.9	-6.3	-4.5	-6.1
Range of GWL Change (ft)	21.2	17.8	20.8	14.1	12.3
Number of Wells	156	59	65	20	12
REDDING BASIN					
Maximum Increase in GWE* (ft)	3.2	0.0	3.2	0.0	
Maximum Decrease in GWE (ft)	-10.9	-6.9	-8.0	-10.9	
Average GWL Change (ft)	-4.5	-4.3	-4.2	-10.9	
Range of GWL Change (ft)	14.1	6.9	11.2	10.9	
Number of Wells	30	15	14	1	0
TOTAL					
Maximum Increase in GWE* (ft)	3.2	0.5	3.2	0.0	0.3
Maximum Decrease in GWE (ft)	-34.1	-26.3	-25.8	-34.1	-30.1
Average GWL Change (ft)	-7.5	-7.0	-7.5	-8.8	-9.1
Range of GWL Change (ft)	37.3	26.8	29.0	34.1	30.4
Number of Wells	460	181	189	57	31

Note: A positive number indicates that groundwater levels were higher in March 2009 than in March 2006; a negative number indicates that groundwater levels were lower in March 2009 than in March 2006.

*GWE=Groundwater Elevation

Table 2. Change in Groundwater Elevation by Well Use

DEPARTMENT OF WATER RESOURCES

SPRING GROUNDWATER ELEVATION MEASUREMENTS

NORTHERN SACRAMENTO VALLEY & REDDING BASINS, CALIFORNIA

CHANGE IN GROUNDWATER ELEVATION BY WELL USE

SPRING 2006 to SPRING 2009

	All Well Depths	Well Use			
		Domestic	Irrigation	Observation	Other
BUTTE					
Maximum Increase in GWE* (ft)	0.0	0.0	0.0	0.0	0.0
Maximum Decrease in GWE (ft)	-20.6	-20.6	-18.7	-17.4	-17.8
Average GWL Change (ft)	-7.5	-9.9	-8.1	-5.5	-7.3
Range of GWL Change (ft)	20.6	20.6	18.7	17.4	17.8
Number of Wells	84	18	29	28	9
COLUSA					
Maximum Increase in GWE* (ft)	0.0	0.0	0.0	0.0	0.0
Maximum Decrease in GWE (ft)	-30.1	-12.9	-30.1	-25.2	-14.3
Average GWL Change (ft)	-7.0	-5.0	-8.6	-6.8	-7.3
Range of GWL Change (ft)	30.1	12.9	30.1	25.2	14.3
Number of Wells	61	18	24	12	7
GLENN					
Maximum Increase in GWE* (ft)	0.0	0.0	0.0	0.0	0.0
Maximum Decrease in GWE (ft)	-34.1	-26.3	-27.0	-34.1	-14.8
Average GWL Change (ft)	-9.7	-7.4	-11.2	-9.8	-7.1
Range of GWL Change (ft)	34.1	26.3	27.0	34.1	14.8
Number of Wells	127	26	43	52	6
TEHAMA					
Maximum Increase in GWE* (ft)	0.5	0.0	0.0	0.5	0.3
Maximum Decrease in GWE (ft)	-20.8	-14.3	-20.8	-14.1	-10.7
Average GWL Change (ft)	-6.3	-6.1	-7.1	-5.7	-5.5
Range of GWL Change (ft)	21.3	14.3	20.8	14.6	11.0
Number of Wells	156	50	53	41	12
REDDING BASIN					
Maximum Increase in GWE* (ft)	3.2	3.2	0.0	0.0	0.0
Maximum Decrease in GWE (ft)	-10.9	-6.9	-6.1	-10.9	-8.0
Average GWL Change (ft)	-4.5	-3.0	-3.2	-5.3	-5.1
Range of GWL Change (ft)	14.1	10.1	6.1	10.9	8.0
Number of Wells	30	7	4	14	5
TOTAL					
Maximum Increase in GWE* (ft)	3.2	9.1	11.2	12.4	3.4
Maximum Decrease in GWE (ft)	-34.1	-16.8	-23.2	-25.8	-9.7
Average GWL Change (ft)	-7.5	-6.8	-8.6	-7.4	-6.8
Range of GWL Change (ft)	37.3	25.9	34.4	38.2	13.1
Number of Wells	458.0	119.0	153.0	147.0	39.0

Note: A positive number indicates groundwater levels higher in March 2009 than in March 2006; a negative number indicates that Groundwater levels were lower in March 2006 than in March 2009.

***GWE=Groundwater Elevation**