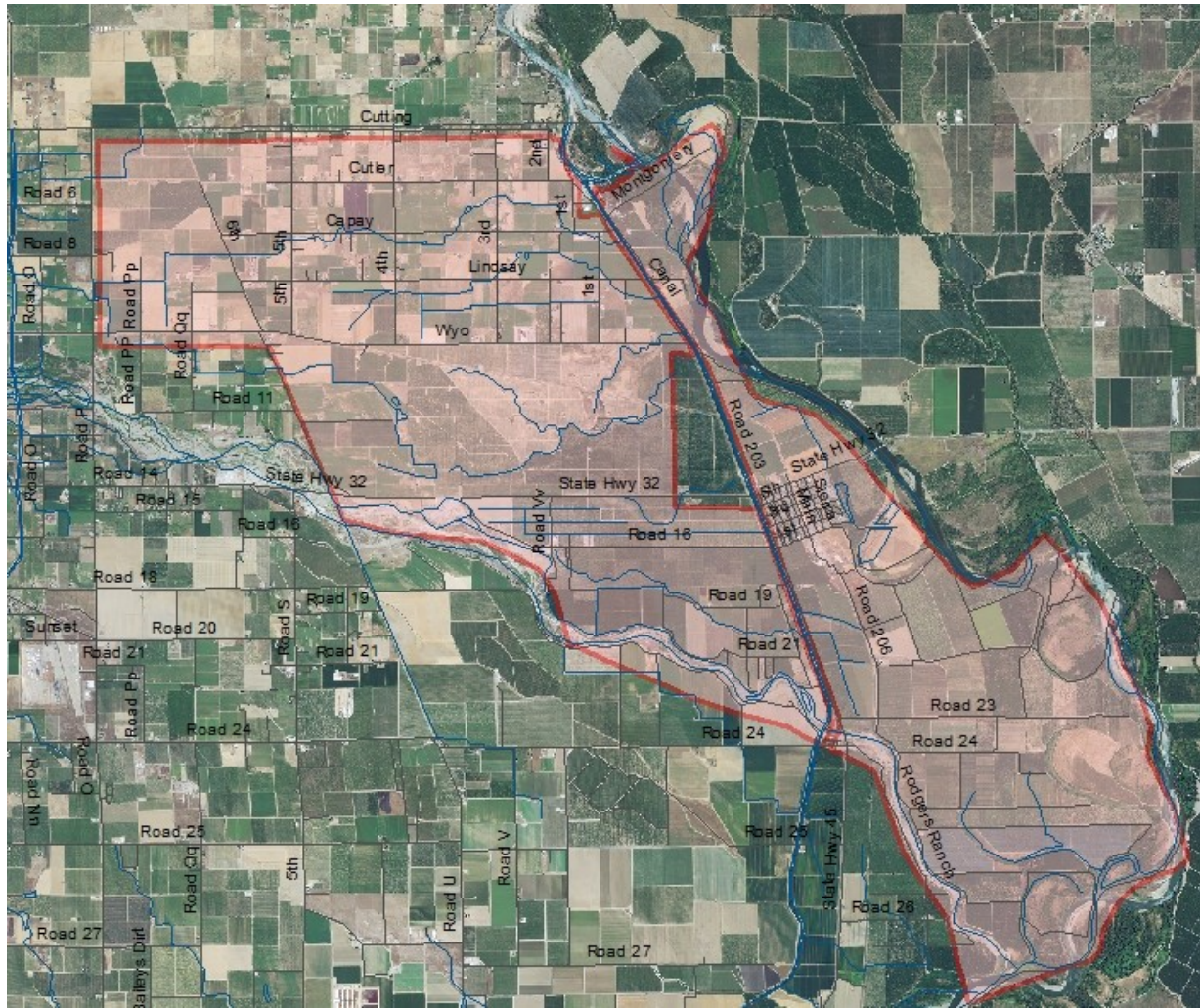


June 14 | 2011

Sub-Area 8 In-Lieu Feasibility Study



Presentation Purpose

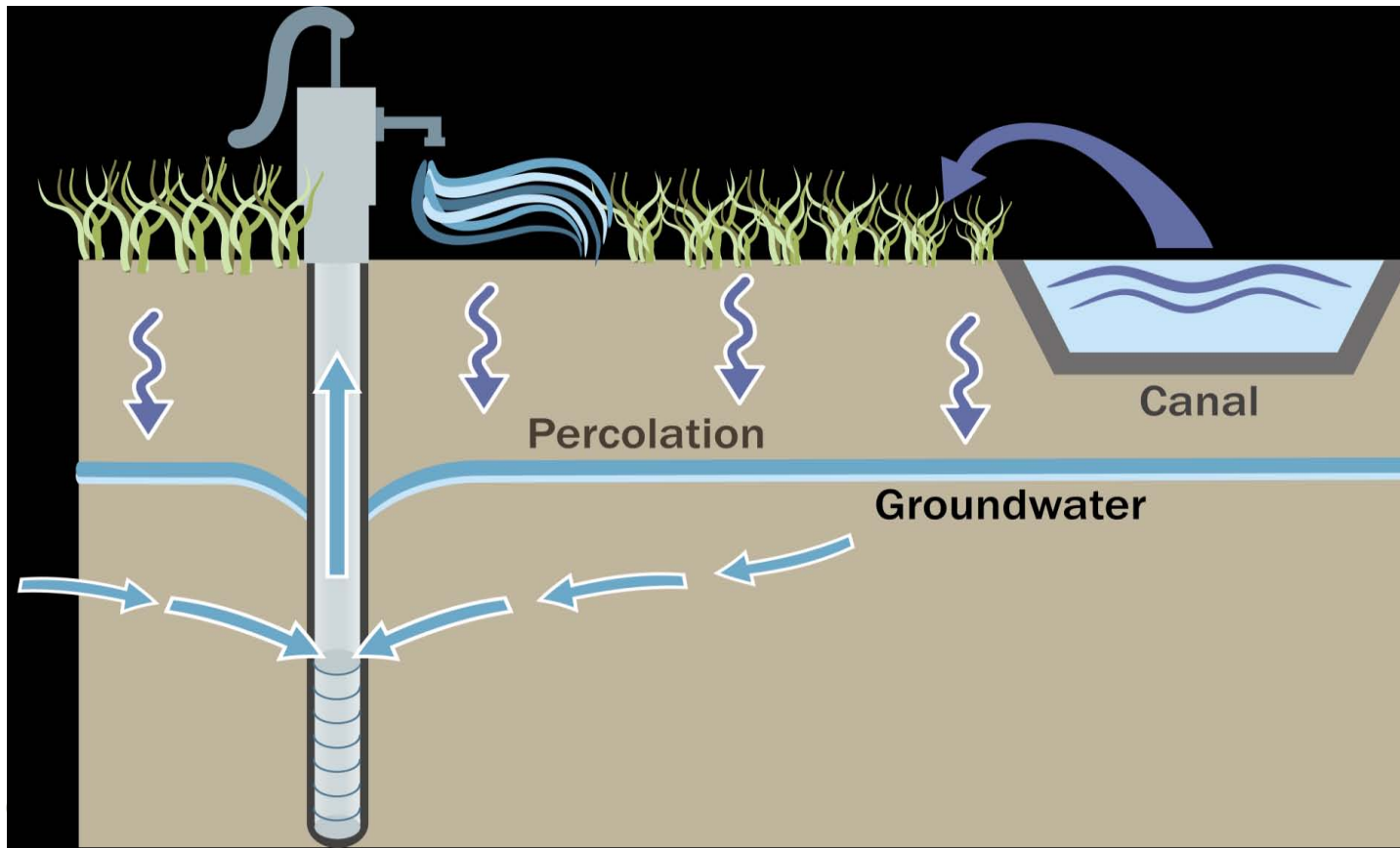
- Update WAC members about the study
- Solicit involvement from local stakeholders
 - Ask WAC members to discuss study with irrigators if appropriate
- Inform local stakeholders of study's planned field surveys

Presentation Overview

- Study goals
- Study area
- Why is this study being conducted?
- Study components
- Questions

What is In-Lieu Recharge?

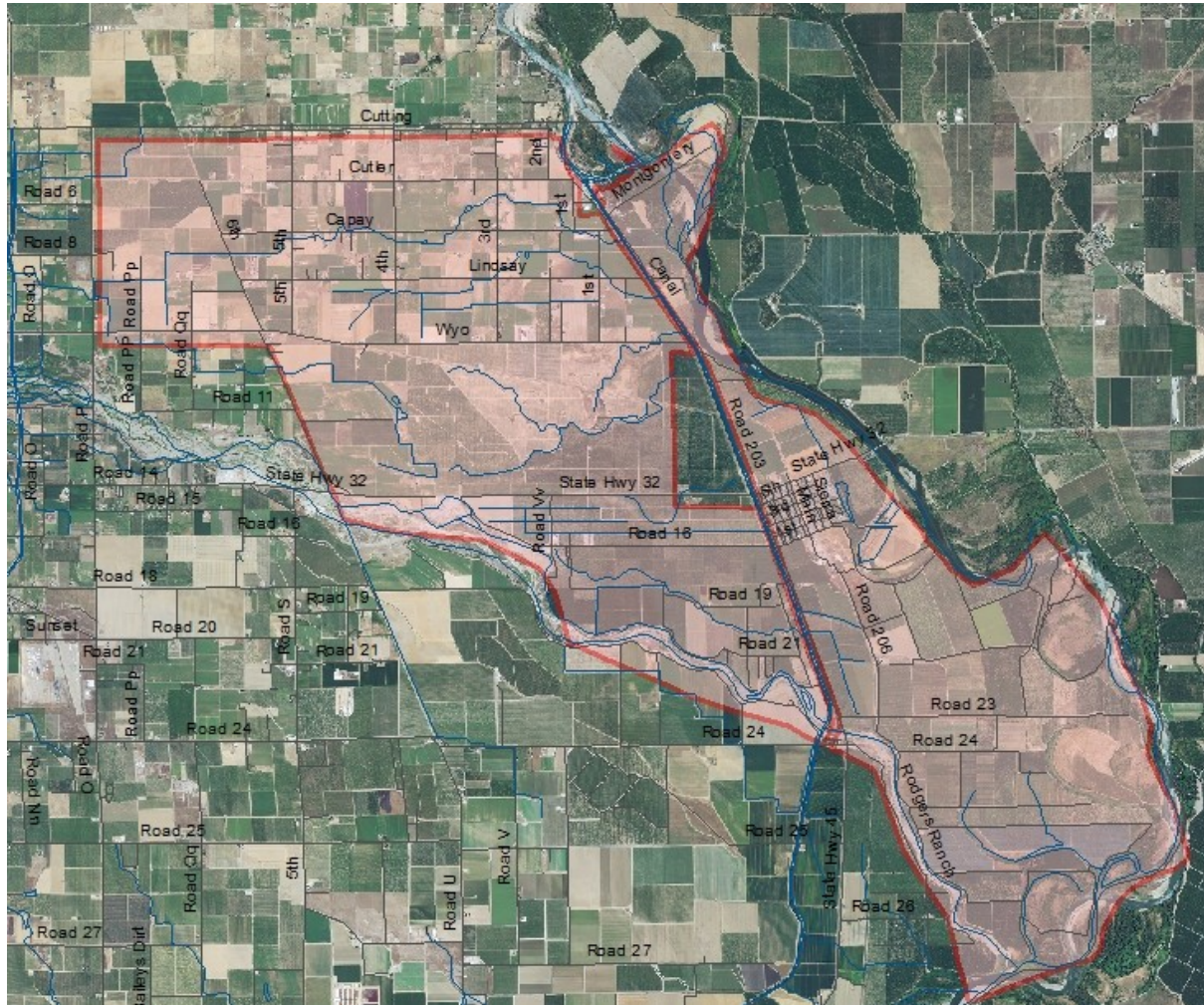
- **In-lieu recharge** is the practice of providing surface water to historic groundwater users, thereby leaving more groundwater in storage for later use.



Study Goals

- **Inform local irrigators about local groundwater**
- **Identify interested potential users of surface water**
- **Understand current land use and irrigation to help estimate how much surface water can be reasonably used**
- **Evaluate surface water delivery methods to interested potential users**
- **Develop implementation options and schedule**

Study Area

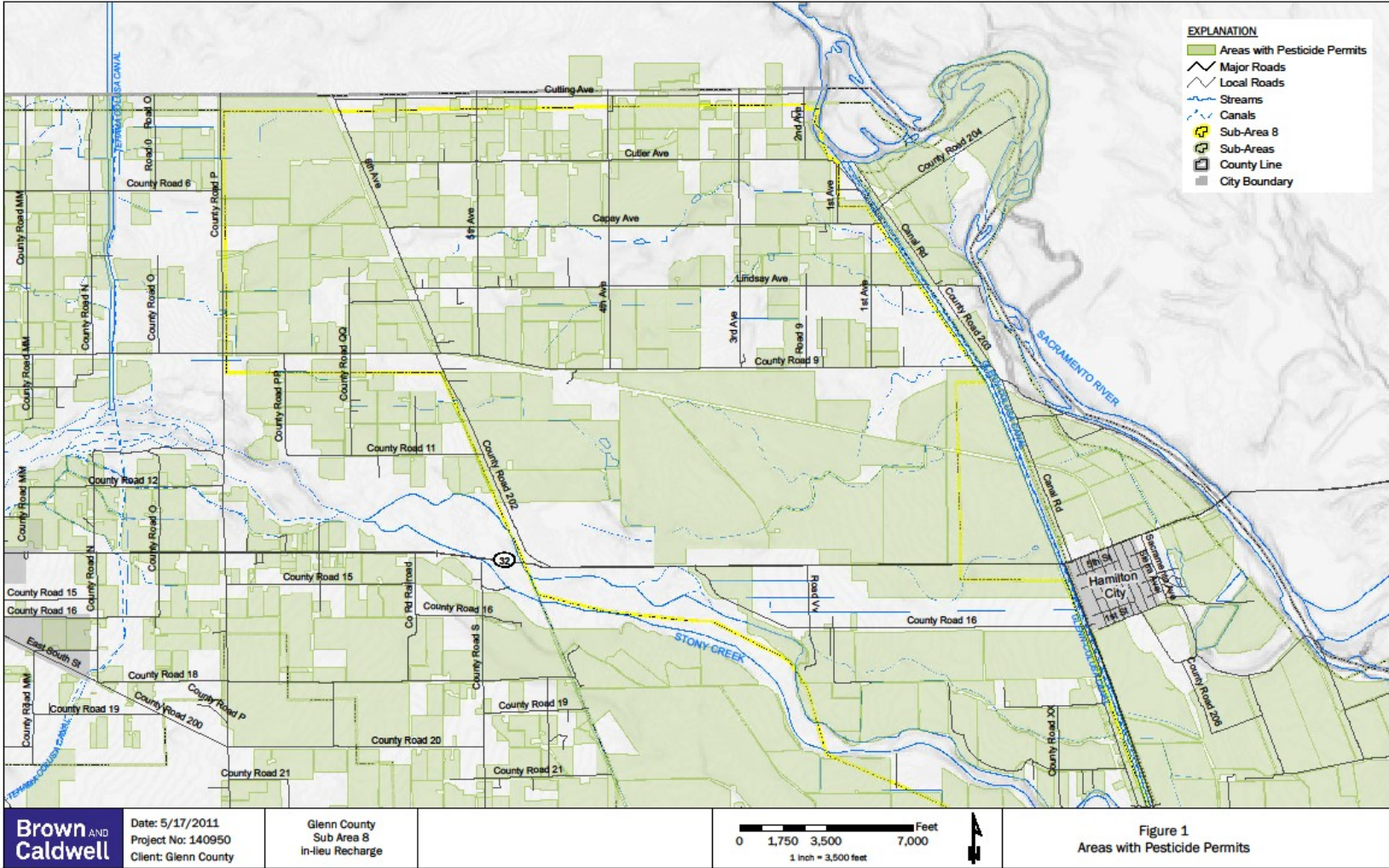


Why Perform This Study?

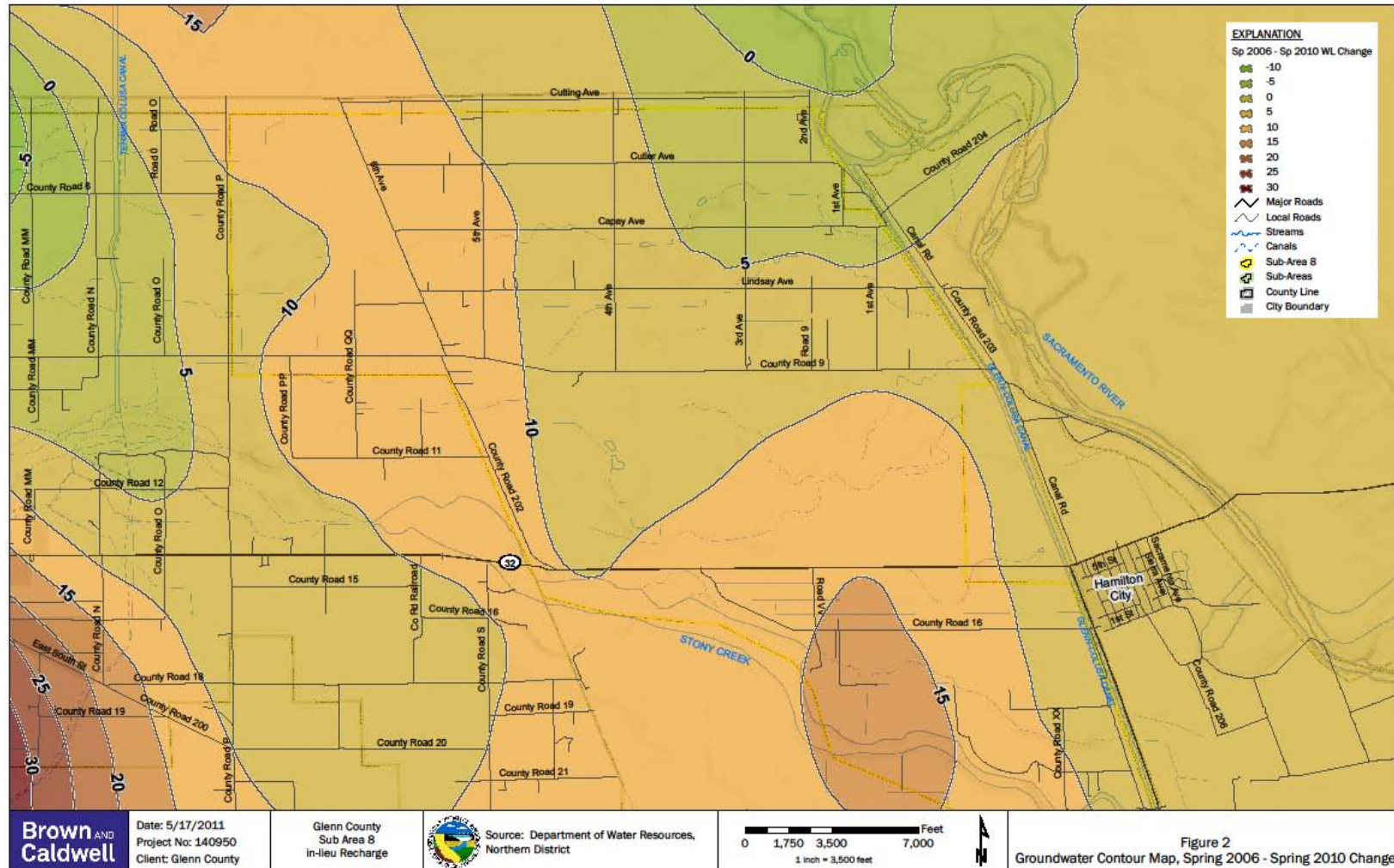
To improve water supply reliability

- **Study area is primarily reliant on groundwater for irrigation**
- **Groundwater in the region has declined over the past five years**
- **Groundwater levels fluctuate strongly during pumping season**
- **Irrigators utilizing surface water do not give up their right to pump groundwater**
- **Having two sources of supply increases supply reliability**

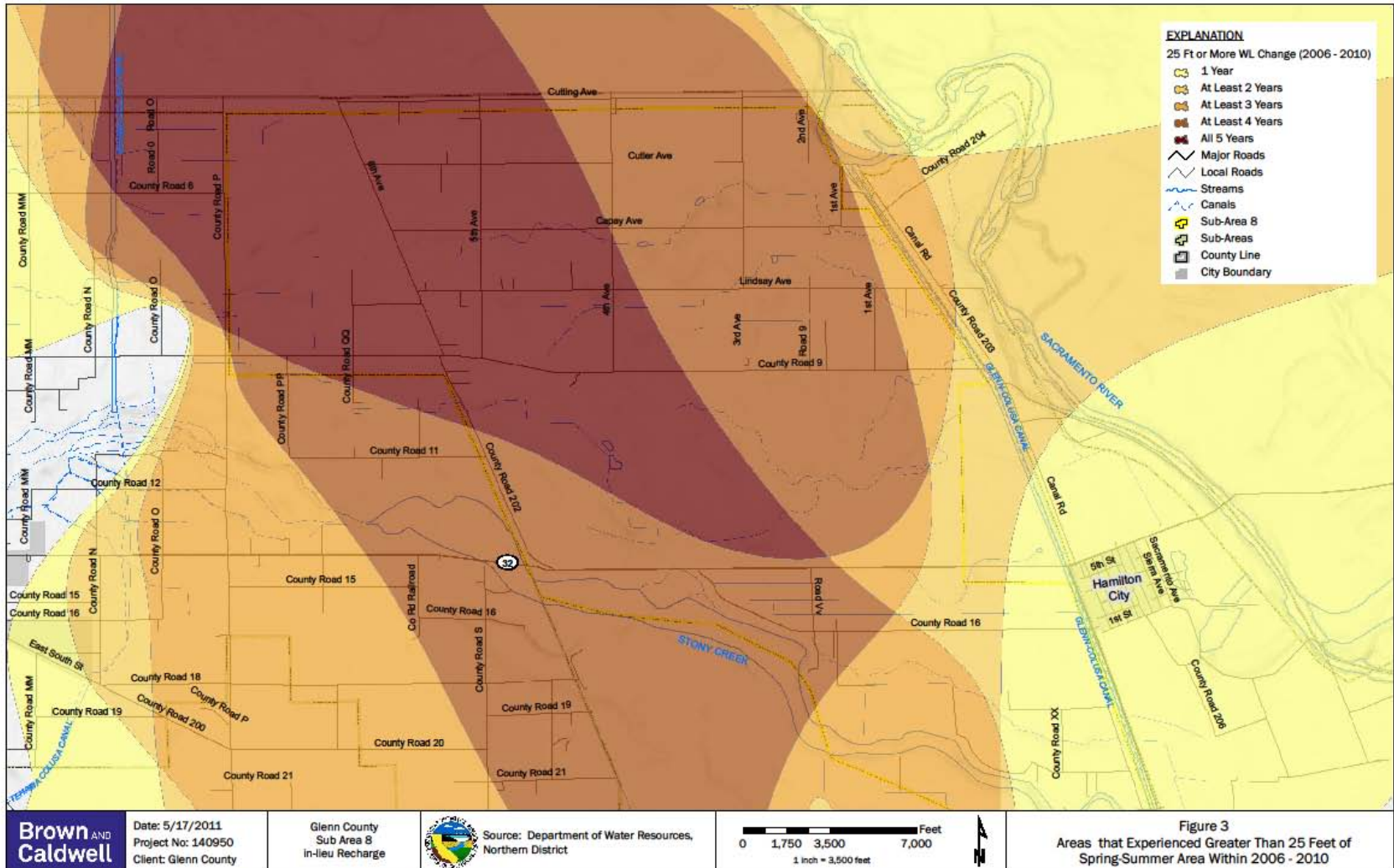
Known Agricultural Land Use



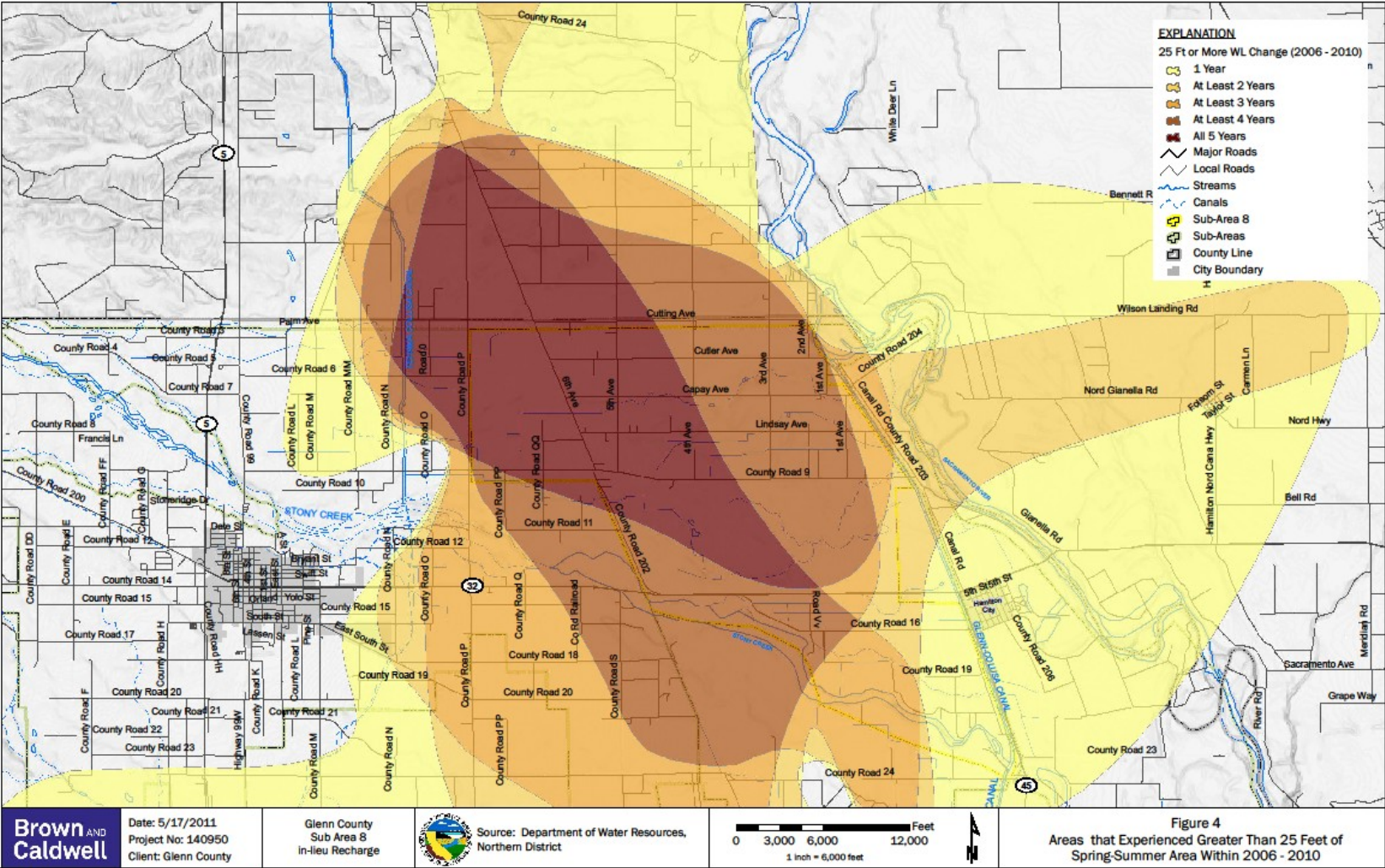
Project Need: Decrease in Groundwater Levels 2006 to 2010



Project Need: Change in Groundwater Levels



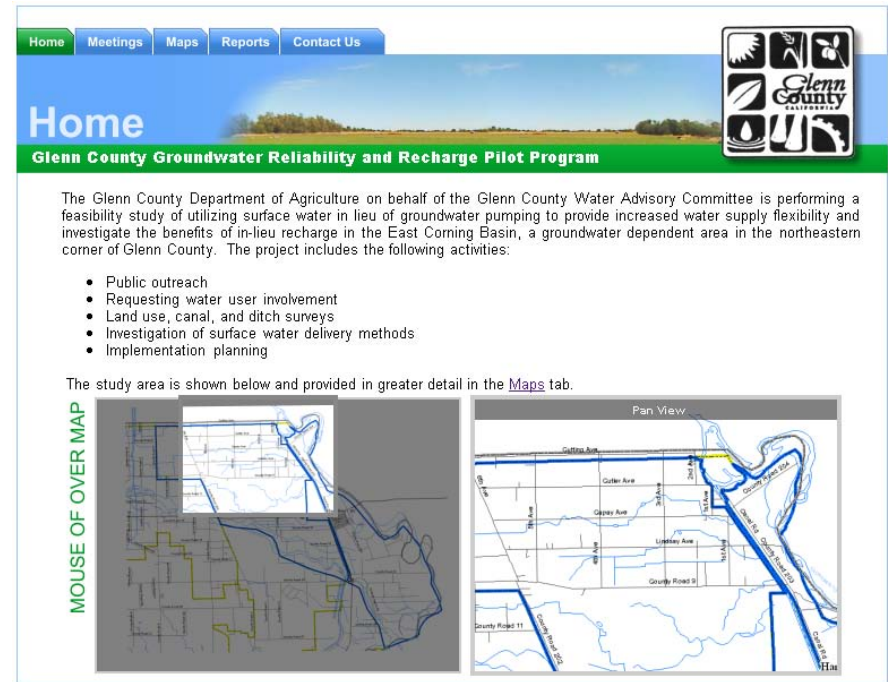
Project Need: Change in Groundwater Levels



Study Components - Outreach

Goals:

- Identify willing irrigators who are interested in utilizing surface water
- Inform members of the public about the study.
- Public meetings
- Website – www.glennwac-eastcorning-recharge.org
- Posters
- Advisory committee meetings in Glenn and Tehama County
- Newsletters



Home Meetings Maps Reports Contact Us

Home

Glenn County Groundwater Reliability and Recharge Pilot Program

The Glenn County Department of Agriculture on behalf of the Glenn County Water Advisory Committee is performing a feasibility study of utilizing surface water in lieu of groundwater pumping to provide increased water supply flexibility and investigate the benefits of in-lieu recharge in the East Corning Basin, a groundwater dependent area in the northeastern corner of Glenn County. The project includes the following activities:

- Public outreach
- Requesting water user involvement
- Land use, canal, and ditch surveys
- Investigation of surface water delivery methods
- Implementation planning

The study area is shown below and provided in greater detail in the [Maps](#) tab.

MOUSE OVER MAP

Pan View

Study Components – Understanding Current Use

- Goal: identify potential surface water use in the study area by using:
- Surveys
 - Land use survey
 - Well inventory
 - Canal and ditch reconnaissance
- Water demand estimates
- Field staff review of land use, canals and ditches.

Study Components – Analysis and Delivery

- Goal: identify the most efficient and cost effective way to deliver surface water to interested irrigators
- Water cost estimation
- GIS review of existing geologic, soil, and groundwater data
- Preliminary canal layout

Study Components – Implementation Planning

- Goal: Identify funding, design, required administrative steps, materials and construction (canals, pipes, reports, etc)
- Work with interested participants
- Discuss best surface water delivery design
- Determine how to develop funding and infrastructure
- Develop implementation Schedule

Next Steps

- Next public meeting: June 15, 2011
- Updates to the project website at: www.glennwac-eastcorning-recharge.org
- Field visits to perform land use and canal reconnaissance
- Contact us:
 - Glenn County – Lisa Hunter or Lester Messina 530-934-6501
 - Brown and Caldwell – John Ayres 916-853-5394

Questions/Comments?



GLENN COUNTY SPRING 2011 GROUNDWATER LEVEL MEASUREMENTS

* WSE = REF PT- DEPTH BELOW REF PT (above sea level)

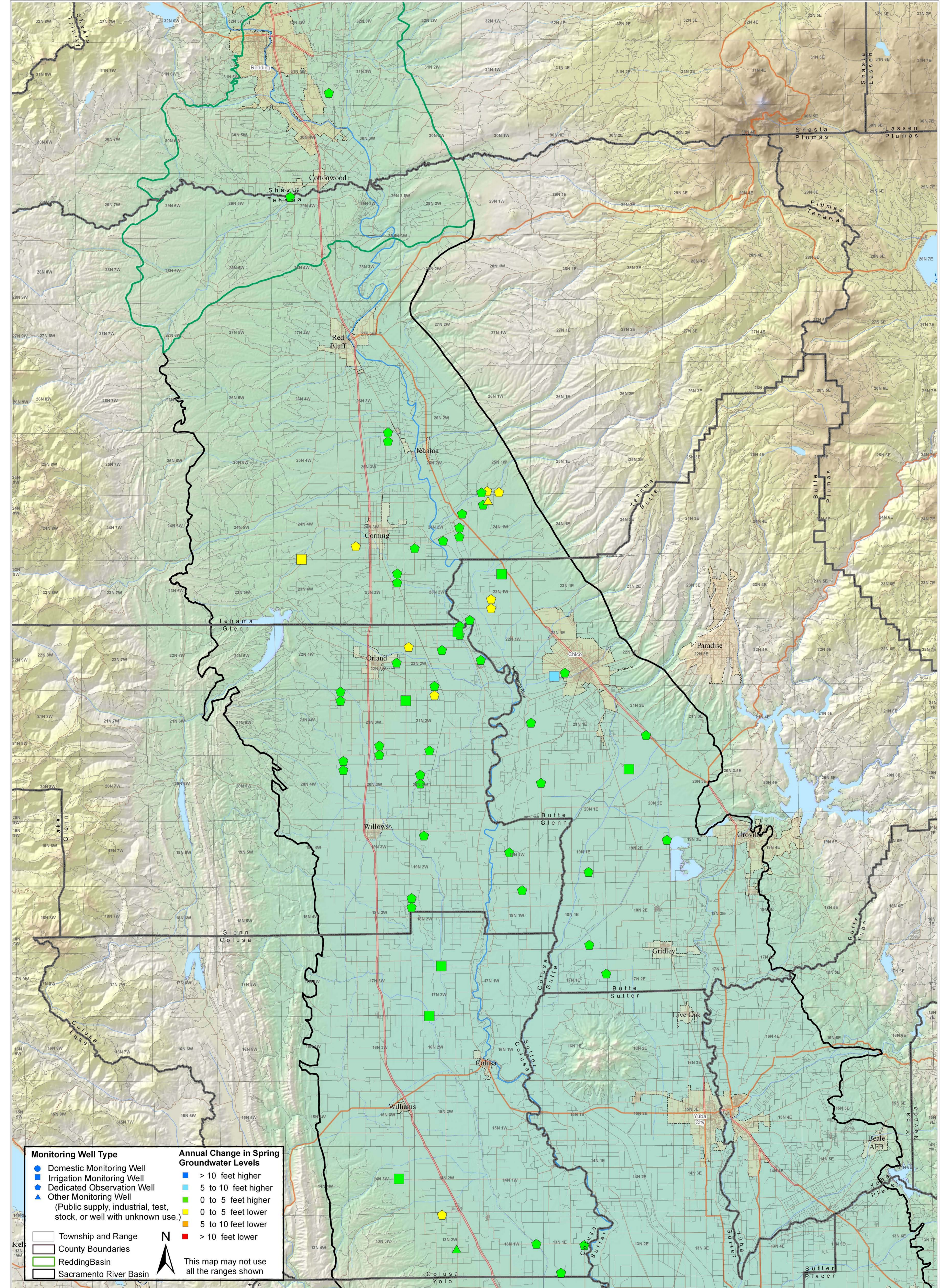
<u>SWN</u>	<u>MEASURE DATE</u>	<u>REF PT ELEV</u>	<u>GROUND SURFACE ELEV</u>	<u>DEPTH BELOW REF PT</u>	<u>SPRING 11 WSE*</u>	<u>BMO LEVEL 1</u>	<u>BMO LEVEL 2</u>	<u>BMO LEVEL 3</u>	<u>2010 TO 2011</u>
<u>BOS Dist 3 Sub-area 10</u>									
21N03W33A04M	4/7/2011	175	174	52.5	122.5	131	131	119.5	↑
21N02W31M01M	4/6/2011	162.1	161	32.7	129.4	131.2	131.2	123.8	↑
20N03W12C01M	4/6/2011	160	159	36.5	123.5	124.6	124.6	117	↓
20N03W23G02M	4/4/2011	147	146	23.8	123.2	118	118	112	N/C
20N03W33J01M	4/7/2011	137.3	136	6.5	130.8	113.6	113.6	104.7	↑
CALWater 002-01	4/1/2011	134	134	14	120	116.1	116.1	111.4	↑
<u>BOS Dist 5 Sub-area 9</u>									
21N02W02B02M	4/5/2011	163	162.8	20.6	142.4	136.1	136.1	130.23	↑
21N02W09M02M	4/6/2011	179.5	179	37	142.5	142	142	132.8	↑
21N02W23G01M	4/6/2011	152.5	152	24.6	127.9	125.1	125.1	118.7	↑
<u>East Corning Basin Sub-area 8</u>									
21N01W04N01M	4/5/2011	135.3	135	12.2	123.1	115.6	115.6	112.2	↑
22N02W11Q01M	4/5/2011	165	164	18.6	146.4	139.6	139.6	133.8	↑
22N01W29K01M	4/5/2011	142.3	142	10.1	132.2	119.9	119.9	112.7	↑
<u>Orland/Artois Sub-area 5</u>									
21N03W31H01M	4/11/2011	187.5	187	74.2	113.3	123	123	103	↓
20N03W07K03M	4/7/2011	166	166	36.4	129.6	113	113	91	↑
20N03W17P01M	4/4/2011	154.5	153	15.7	138.8	120	120	103	↓
20N04W12F02M	4/4/2011	187.5	187	49.9	137.6	129	129	106	↓
21N03W18B02M	4/7/2001	222	221.6	112.8	109.2	139	139	119	↑
21N04W24A02M	4/8/2011	231.5	230	123.4	108.1	129	129	111	↓
22N02W31C01M	4/5/2011	204	203	17	187	183	183	176	N/C
21N03W12C02M	4/4/2011	204	202	31.7	172.3	172	172	164	↑
21N03W11G01M	4/6/2011	200.3	200	29	171.3	170	170	162	↑
22N03W34A01M	4/5/2011	233.5	233	13	220.5	218	218	213	↓
21N03W22H01M	4/5/2011	202	202	58.1	143.9	150	150	139	↓
21N02W09M02M	4/6/2011	179.5	179	37	142.5	144	144	135	↑
21N03W24P01M	4/6/2011	178.5	178	44.3	134.2	137	137	124	↑
<u>Orland Unit Water Users Association Sub-area 4</u>									
22N03W03D01M	4/5/2011	268.5	268	75.9	192.6	186.6	186.6	181.6	↑
22N03W17E01M	4/5/2011	282.5	283	13.2	269.3	268.1	268.1	264.9	N/A
22N03W12Q03M	4/5/2011	230.5	230	29.8	200.7	185.5	185.5	181.5	↑
22N03W21F02M	4/5/2011	263	262	21.4	241.6	239.5	239.5	235.6	↑
22N03W30C01M	4/5/2011	285.5	285	102.1	183.4	174.9	174.9	165	↓
22N02W20Q01M	4/5/2011	199.5	199	11.4	188.1	184.2	184.2	179.3	↑
22N02W21D01M	4/5/2011	198.5	198	21.1	177.4	171.3	171.3	164.4	↑
22N03W34A01M	4/5/2011	233.5	233	13	220.5	218.1	218.1	213.8	↑

GLENN COUNTY SPRING 2011 GROUNDWATER LEVEL MEASUREMENTS

* WSE = REF PT- DEPTH BELOW REF PT (above sea level)

<u>SWN</u>	<u>MEASURE DATE</u>	<u>REF PT ELEV</u>	<u>GROUND SURFACE ELEV</u>	<u>DEPTH BELOW REF PT</u>	<u>SPRING 11 WSE*</u>	<u>BMO LEVEL 1</u>	<u>BMO LEVEL 2</u>	<u>BMO LEVEL 3</u>	<u>2010 TO 2011</u>
<u>Glenn-Colusa Sub-area 11</u>									
19N02W29Q01M	4/4/2011	90	90	1.8	88.2	85.1	85.1	75.1	↑
19N03W26P01M	4/4/2011	101	98	2.4	98.6	94.7	94.7	89.2	↑
20N02W02J01M	4/4/2011	125.5	125	7.8	117.7	115.9	115.9	112.4	↑
20N02W11A01M	4/4/2011	123.5	123	2.7	120.8	114.6	114.6	108	↑
20N02W11A02M	4/4/2011	123	123	9.3	113.7	108.7	108.7	88.8	↑
20N02W11A03M	4/4/2011	123.5	123	12.2	111.3	96.5	96.5	72.7	↑
20N02W13G01M	4/4/2011	113.4	113	3.5	109.9	107.5	107.5	105.6	↑
20N02W29G01M	4/4/2011	117.5	117	6.3	111.2	109.2	109.2	107.5	↑
<u>Provident ID Sub-area 12</u>									
19N02W13J01M	4/4/2011	86.6	86	5.2	81.4	78	78	72	↑
18N02W36B01M	4/4/2011	73.6	73	5.6	68	65	65	60	↑
19N02W34F01M	4/4/2011	84.5	83	3	81.5	79	79	76	↑
19N02W36H01M	4/4/2011	82.4	81.4	2.7	79.7	75	75	70	↑
<u>Princeton-Codora-Glenn ID Sub-area 14</u>									
19N02W13J01M	4/4/2011	86.6	86	5.2	81.4	78	78	72	↑
18N02W36B01M	4/4/2011	73.6	73	5.6	68	65	65	60	↑
19N02W34F01M	4/4/2011	84.5	83	3	81.5	79	79	76	↑
19N02W36H01M	4/4/2011	82.4	81.4	2.7	79.7	75	75	70	↑
<u>Kanawha Water District Sub-area 7</u>									
KWD-1	4/1/2011	154.3	154	10	144.3				↑
KWD-2	4/1/2011	161.35	160	9	152.35				↑
KWD-3	4/1/2011	140.4	139	8	132.4				↑
<u>Glide Water District Sub-area 6</u>									
GWD-1	4/1/2011	156.75	156	24	132.75				↑
GWD-2	4/1/2011	158.2	158	15	143.2				↑
GWD-3	4/1/2011	174.75	174	15	159.75				↑
<u>RD 2106 & 1004 Sub-areas 15&16</u>									
19N01W15D01M	4/4/2011	93.4	91	7.1	86.3	78	78	75	↓
19N01W27R01M	4/4/2011	81.5	81	6.7	74.8	67	67	63	↑
18N01W17G01M	4/4/2011	79	79	6.2	72.8	61	61	55	↑
18N01W22L01M	4/4/2011	70.5	70	4.8	65.7	63	63	61	N/A
<u>Western Canal Sub-area 17</u>									
18N01E05D01M	3/30/2011	75	75	3.5	71.5	64	64	62	↓
19N01W13Q01M	3/30/2011	85.9	85.9	2.5	83.4	65	65	60	↓
<u>Willow Creek Mutual Sub-area 13</u>									
18N02W18K01M	4/4/2011	80.8	81	5.9	74.9	72.2	72.2	70.7	↑

	BMO Alert Stage 1 or 2
	BMO Alert Stage 3
↑	Groundwater Level up from previous year
↓	Groundwater Level down from previous year



Monitoring Well Type		Annual Change in Spring Groundwater Levels	
	Domestic Monitoring Well		> 10 feet higher
	Irrigation Monitoring Well		5 to 10 feet higher
	Dedicated Observation Well		0 to 5 feet higher
	Other Monitoring Well (Public supply, industrial, test, stock, or well with unknown use.)		0 to 5 feet lower
	Township and Range		5 to 10 feet lower
	County Boundaries		> 10 feet lower
	Redding Basin	This map may not use all the ranges shown	
	Sacramento River Basin		

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**SPRING 2010 TO SPRING 2011
SACRAMENTO VALLEY CHANGE IN GROUNDWATER ELEVATION MAP
(Deep monitoring and composite wells within the confined aquifer)**

Northern Region Office
Department of Water Resources
2440 Main Street
Red Bluff, California 96080
(530) 529-7300
<http://www.nd.water.ca.gov/index.cfm>



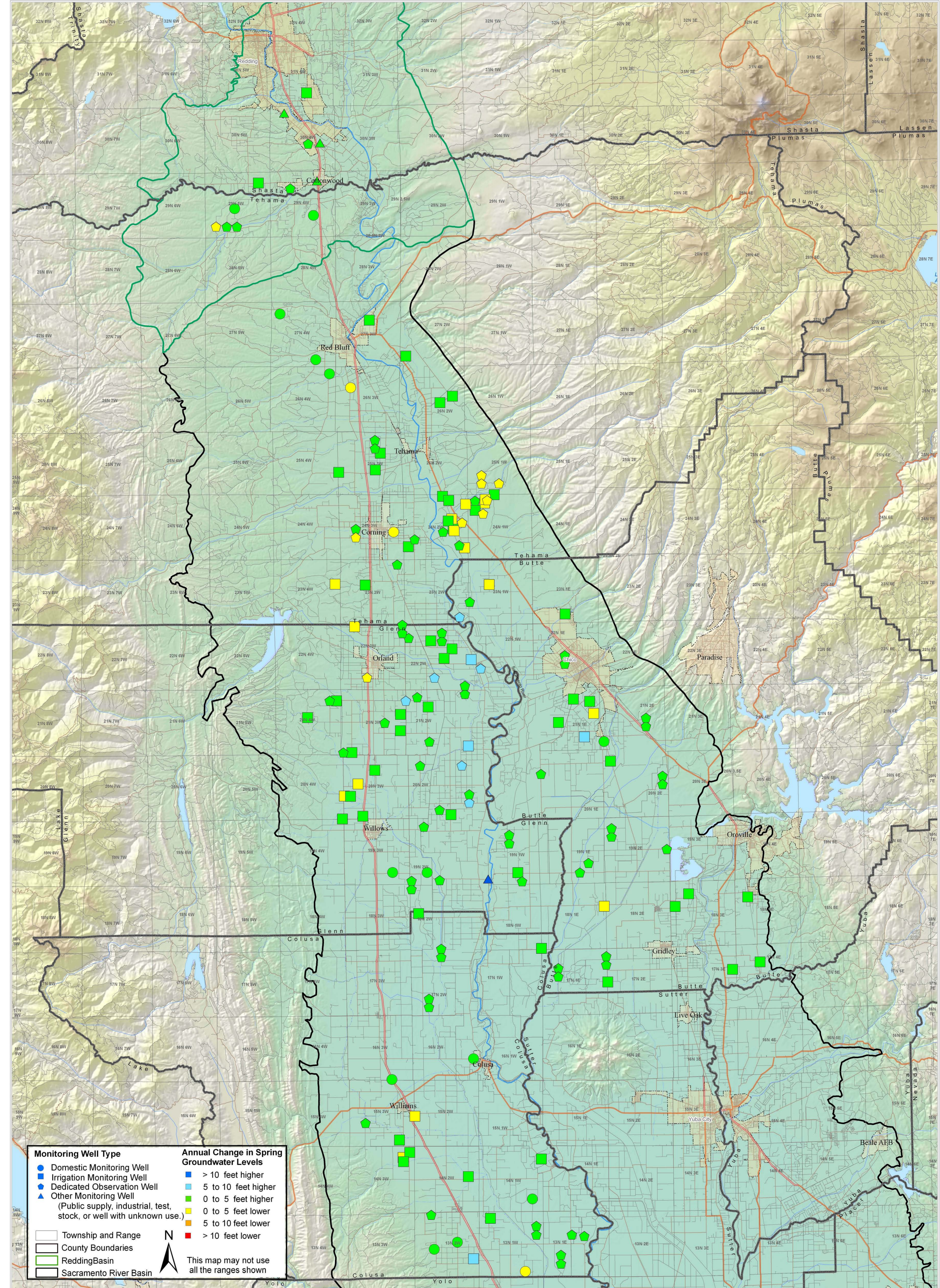
DATE: May 2011

SCALE: 0 1 2 4 6 Miles

BY: R. Hull

LOCATION: R:\Sections\DCM\BASE_DATA\GROUNDWATER LEVELS\GW_Change_Stats_Analysis Reports\2011\2010_2011_Spring

PLATE 3.



Monitoring Well Type		Annual Change in Spring Groundwater Levels	
	Domestic Monitoring Well		> 10 feet higher
	Irrigation Monitoring Well		5 to 10 feet higher
	Dedicated Observation Well		0 to 5 feet higher
	Other Monitoring Well (Public supply, industrial, test, stock, or well with unknown use.)		0 to 5 feet lower
	Township and Range		5 to 10 feet lower
	County Boundaries		> 10 feet lower
	Redding Basin	This map may not use all the ranges shown	
	Sacramento River Basin		

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DATE: May 2011

SCALE: 0 1 2 4 6 Miles

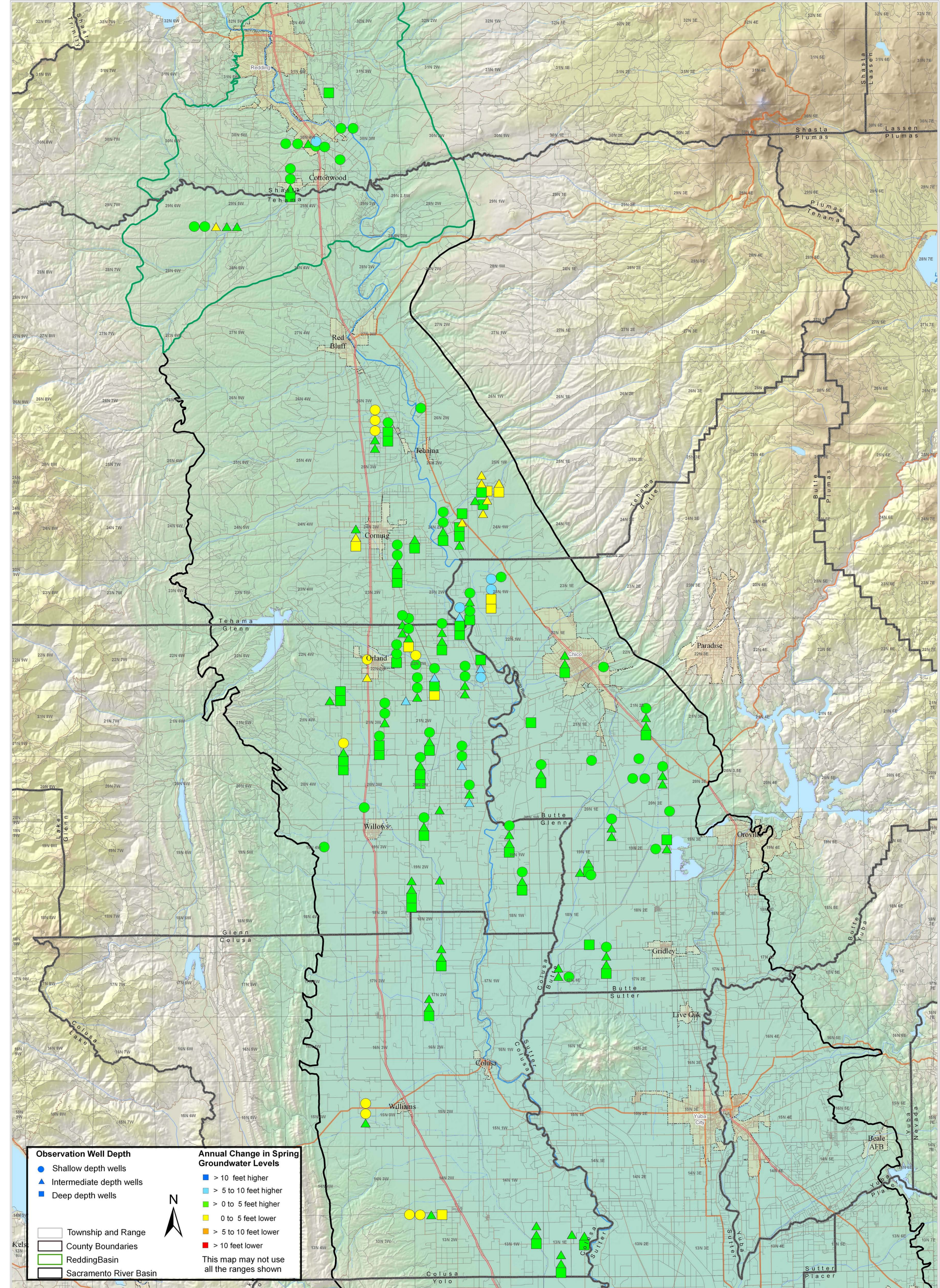
SPRING 2010 TO SPRING 2011
SACRAMENTO VALLEY CHANGE IN GROUNDWATER ELEVATION MAP
(Intermediate depth monitoring wells within the semi-confined and confined aquifers)

BY: R. Hull

LOCATION: R:\Sections\DCM\BASE_DATA\GROUNDWATER LEVELS\GW_Change_Stats_Analysis Reports\2011\2010_2011_Spring

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PLATE 2.



<p>Observation Well Depth</p> <ul style="list-style-type: none"> ● Shallow depth wells ▲ Intermediate depth wells ■ Deep depth wells 	<p>Annual Change in Spring Groundwater Levels</p> <ul style="list-style-type: none"> ■ > 10 feet higher ■ > 5 to 10 feet higher ■ > 0 to 5 feet higher ■ 0 to 5 feet lower ■ > 5 to 10 feet lower ■ > 10 feet lower
<p>Legend</p> <ul style="list-style-type: none"> Township and Range County Boundaries Redding Basin Sacramento River Basin 	<p>This map may not use all the ranges shown</p>

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DATE: May 2011

**SPRING 2010 TO SPRING 2011
SACRAMENTO VALLEY CHANGE IN GROUNDWATER ELEVATION MAP
(For dedicated observation wells)**

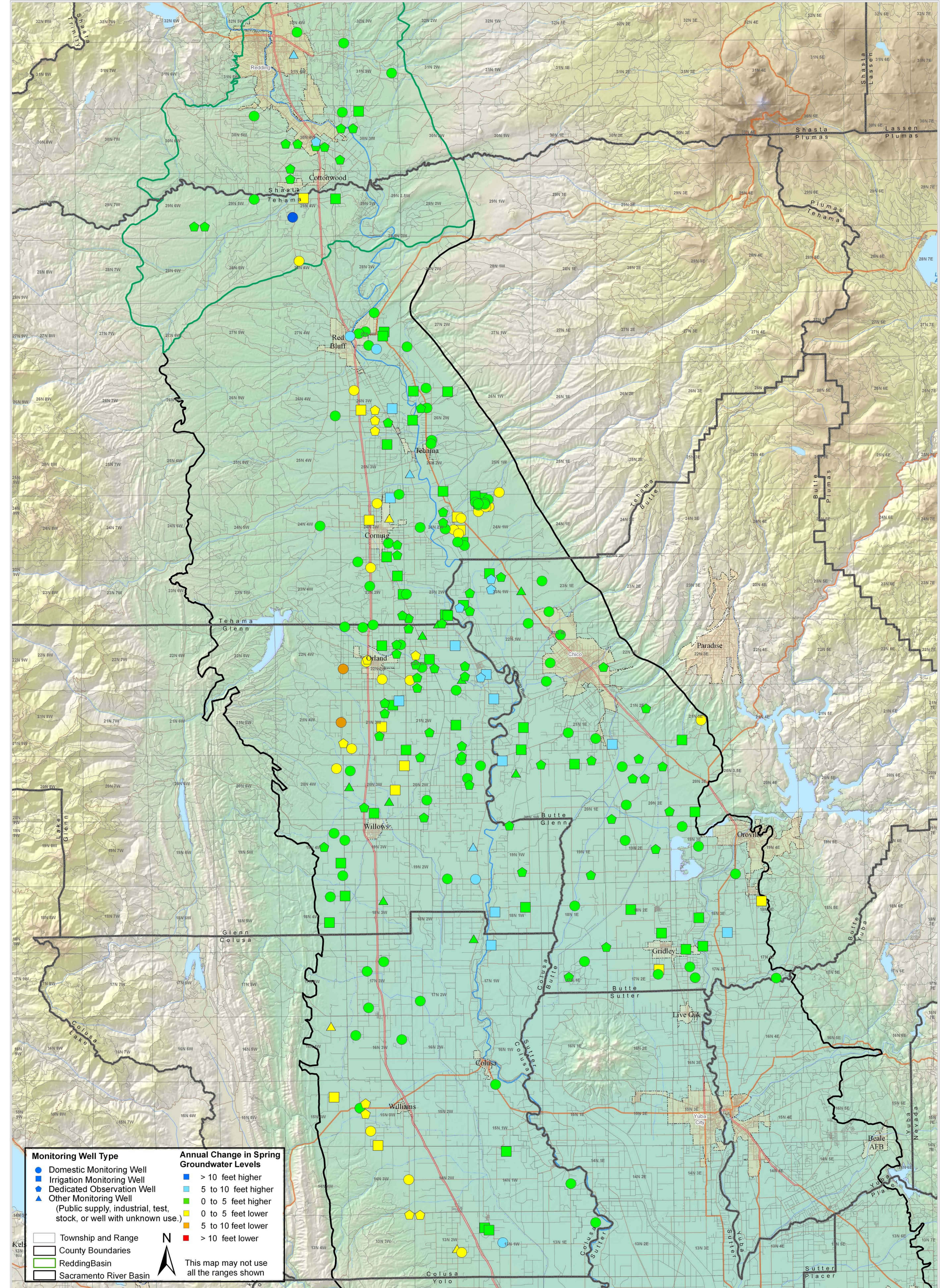
BY: R. Hull

LOCATION: R:\Sections\DCM\BASE_DATA\GROUNDWATER LEVELS\GW_Change_Stats_Analysis Reports\2011\2010_2011_Spring

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PLATE 4.





Monitoring Well Type		Annual Change in Spring Groundwater Levels	
	Domestic Monitoring Well		> 10 feet higher
	Irrigation Monitoring Well		5 to 10 feet higher
	Dedicated Observation Well		0 to 5 feet higher
	Other Monitoring Well (Public supply, industrial, test, stock, or well with unknown use.)		0 to 5 feet lower
			5 to 10 feet lower
			> 10 feet lower
	Township and Range		This map may not use all the ranges shown
	County Boundaries		
	Redding Basin		
	Sacramento River Basin		

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NORTHERN REGION OFFICE

DATE: May 2011

SCALE: 0 1 2 4 6 Miles


SPRING 2010 TO SPRING 2011
SACRAMENTO VALLEY CHANGE IN GROUNDWATER ELEVATION MAP
(For unconfined aquifer monitoring wells - Shallow construction)

BY: R. Hull

LOCATION: R:\Sections\DCM\BASE_DATA\GROUNDWATER LEVELS\GW_Change_Stats_Analysis Reports\2011\2010_2011_Spring

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PLATE 1.



**CHANGE IN GROUNDWATER ELEVATION
BY WELL DEPTH**

SPRING 2010 to SPRING 2011

	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
BUTTE				
Maximum Increase in GWE** (ft)	8.3	8.3	5.6	5.1
Maximum Decrease in GWE (ft)	-1.5	-0.9	-1.2	-1.5
Average GWL Change (ft)	2.1	2.4	1.7	1.5
Number of Wells	106	59	33	14
COLUSA				
Maximum Increase in GWE** (ft)	9.4	9.4	6.6	4.4
Maximum Decrease in GWE (ft)	-2.3	-2.3	-1.5	-2
Average GWL Change (ft)	1.3	0.9	1.6	1.5
Number of Wells	66	27	29	10
GLENN				
Maximum Increase in GWE** (ft)	10.6	8.9	10.6	4.5
Maximum Decrease in GWE (ft)	-8.4	-8.4	-3	-1.2
Average GWL Change (ft)	2.2	1.9	2.9	1.7
Number of Wells	154	78	52	24
TEHAMA				
Maximum Increase in GWE** (ft)	8.5	8.5	4.7	2.8
Maximum Decrease in GWE (ft)	-3.8	-2	-3.8	-2.6
Average GWL Change (ft)	1	1.4	0.5	0.6
Number of Wells	130	72	42	16
SHASTA COUNTY (Redding)				
Maximum Increase in GWE** (ft)	10.3	10.3	3.8	2.1
Maximum Decrease in GWE (ft)	-4.5	-4.5	-0.3	1.8
Average GWL Change (ft)	2	2.3	1.3	2
Number of Wells	38	24	12	2
TOTAL				
Maximum Increase in GWE** (ft)	10.6	10.3	10.6	5.1
Maximum Decrease in GWE (ft)	-8.4	-8.4	-3.8	-2.6
Average GWL Change (ft)	1.7	1.9	1.7	1.4
Number of Wells	494	260	168	66

Note: A positive number indicates that groundwater levels were higher in 2011 than in 2010; a negative number indicates that groundwater levels were lower in 2011 than in 2010.

*** Shallow Well Depth = Unconfined aquifer generally above 200 ft deep. Intermediate Well Depth = Semi-confined and Confined aquifers generally between 200 and 600 feet deep. Deep Well Depth = Confined Aquifers more than 600 feet deep.**

****GWE=Groundwater Elevation**