

Groundwater Levels Northern Sac Valley

Dept. of Water Resources
Northern Region Office

Roy Hull, Geologist

Prepared for
Glenn County WAC
February 12th, 2013

Agenda for Glenn County WAC

- Glenn County Geology
- Precipitation
- Land use
 - Crop type, irrigation type, and water use (2003-2009)
- Review 2011 and 2012 GW elevation change maps
 - Brief map introduction
 - Spring, Summer, and Fall
 - Intermediate aquifer
 - The county numbers
 - Select hydrographs
- Closing and questions

Glenn County

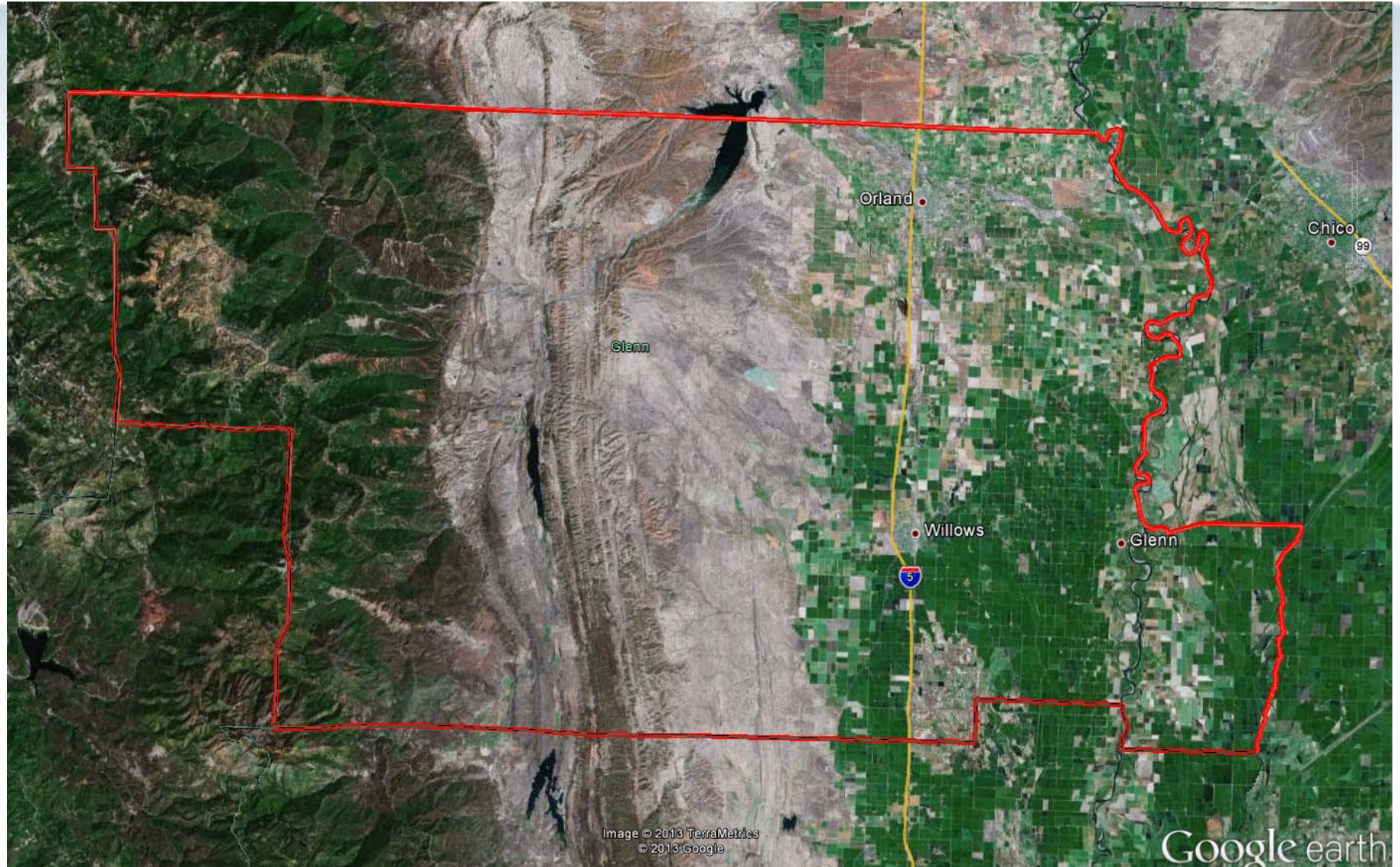
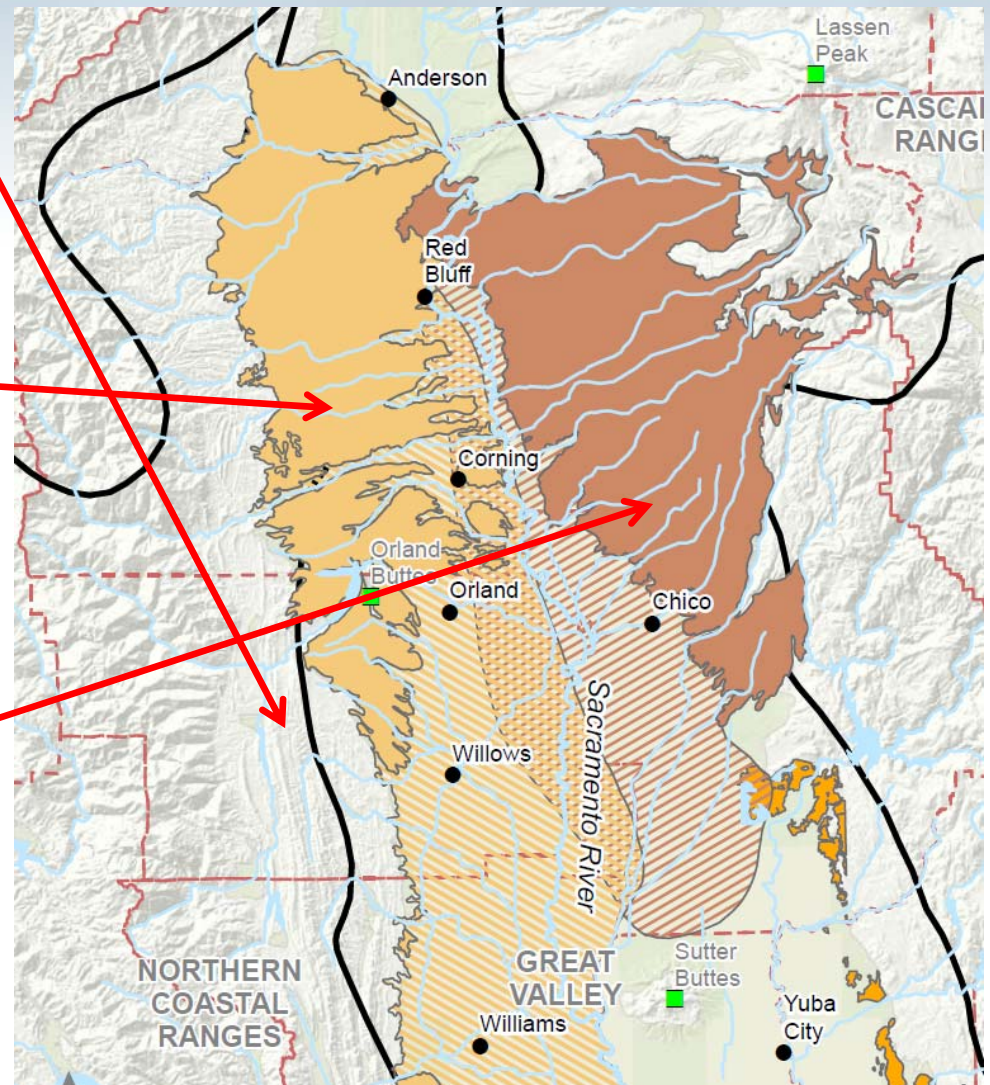


Image © 2013 TerraMetrics
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Google earth

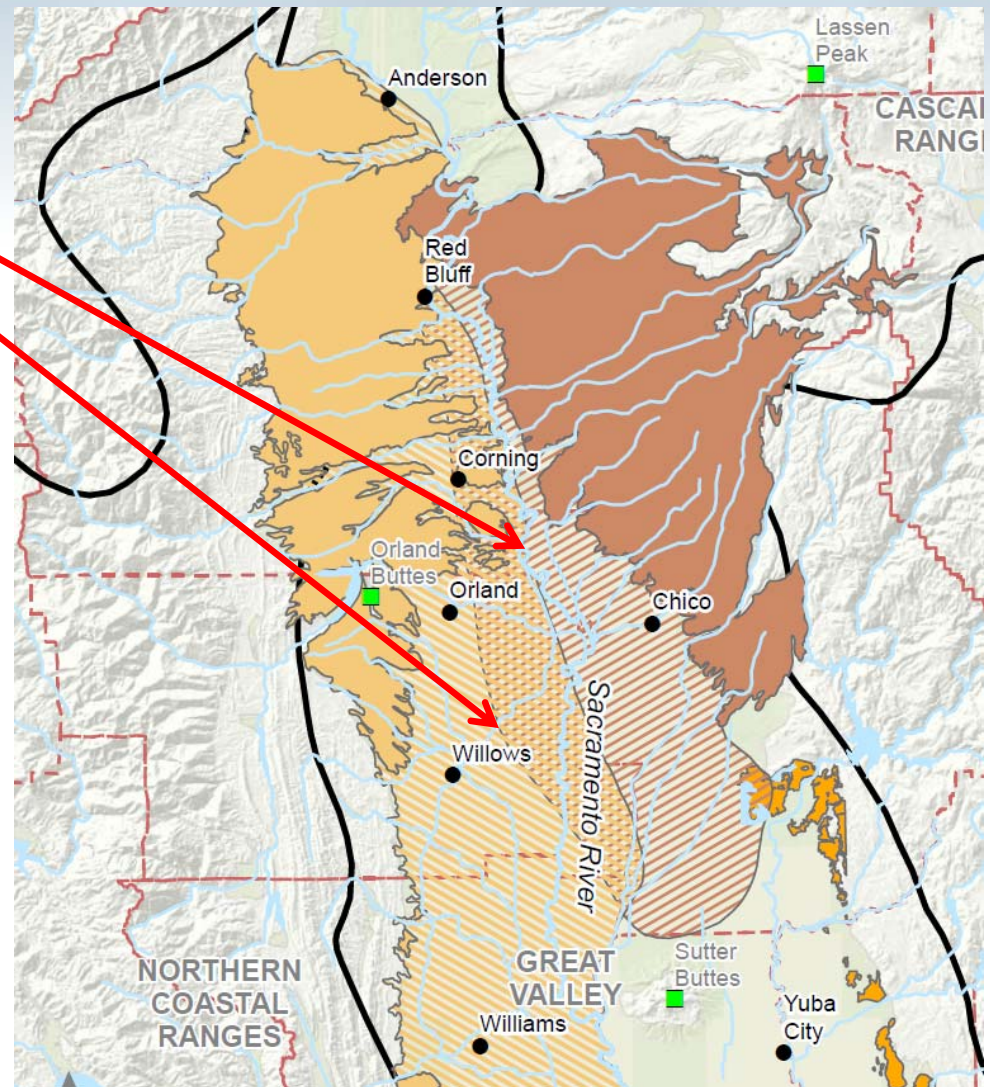
Primary Deposits

- Great Valley Sequence
 - Marine deposit
 - ~160 to 65mya
 - Poor WQ
- Tehama Formation
 - Alluvial fan deposits
 - Coastal/Klamath Mts.
 - > 3.3 – 1.8mya
 - **Primary GW**
- Tuscan Formation
 - Primarily debris flows
 - 3.3 – 1.8mya



Primary Deposits

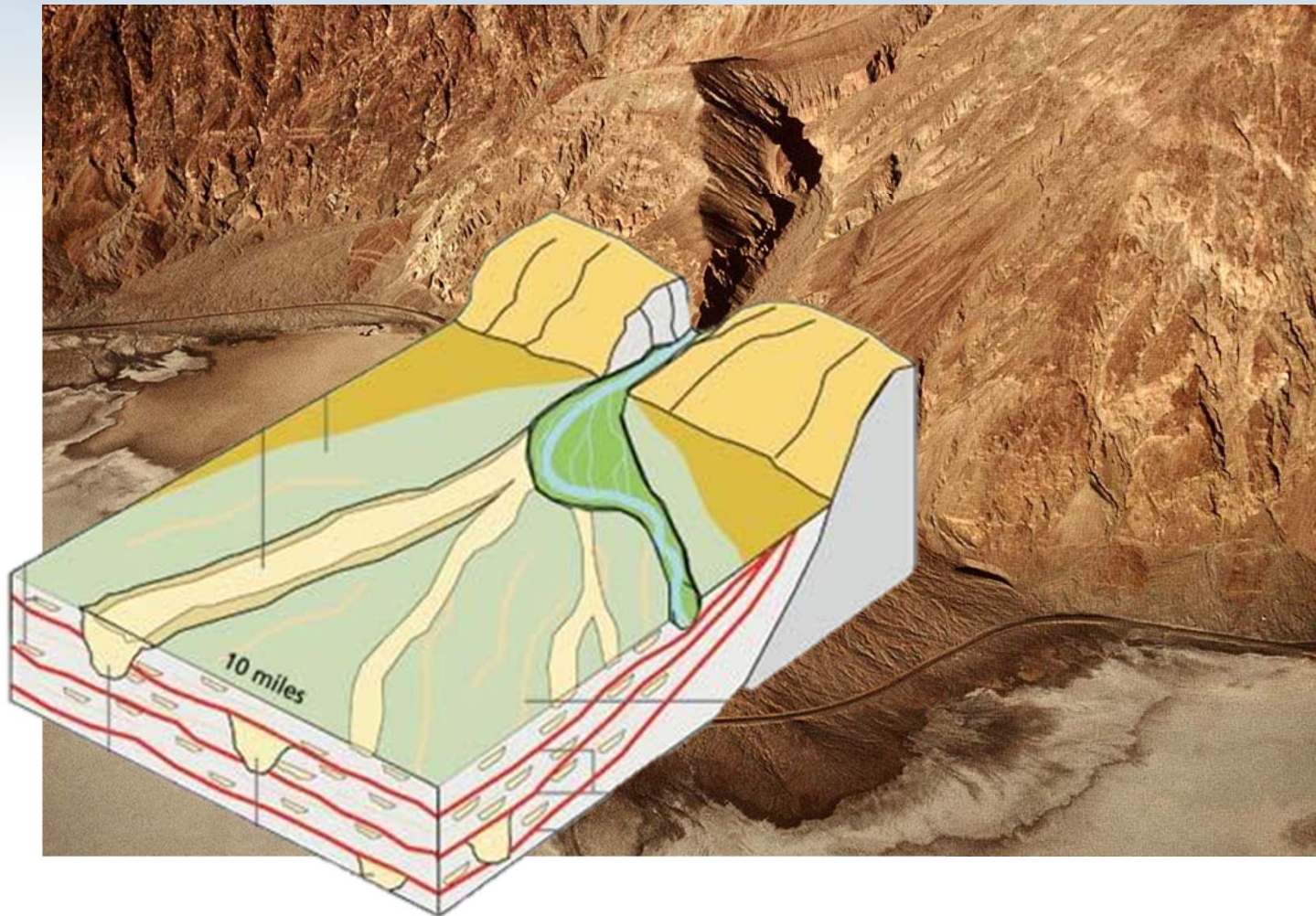
- Q deposits
 - Quaternary
 - < 1.8my
 - Ancient and recent
 - River/Flood Plane
 - River Channel
 - Gravel, loam, sand, clay, and silt
 - Unconfined Aquifer
 - AG, ranching



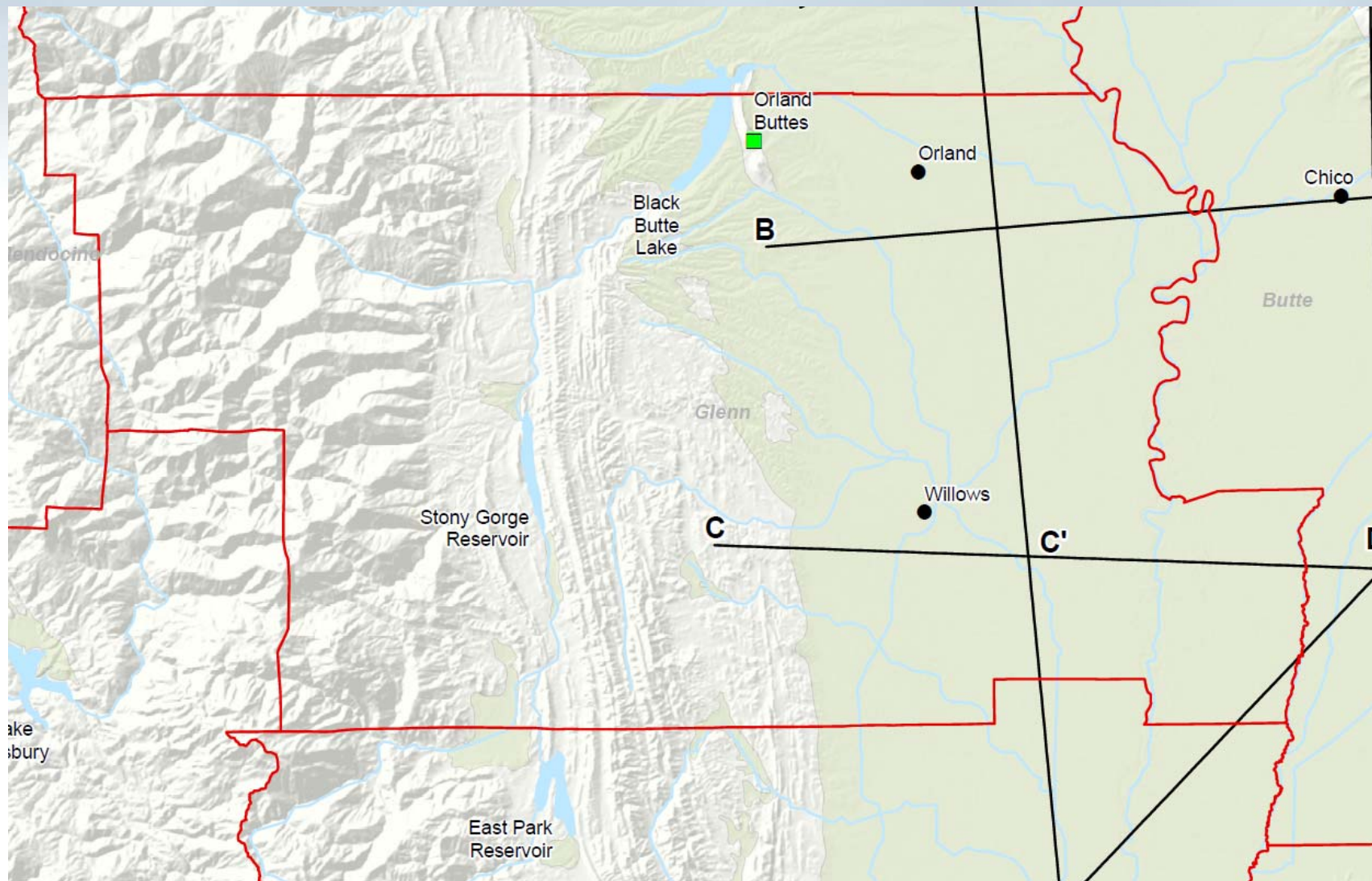
Alluvial Fan



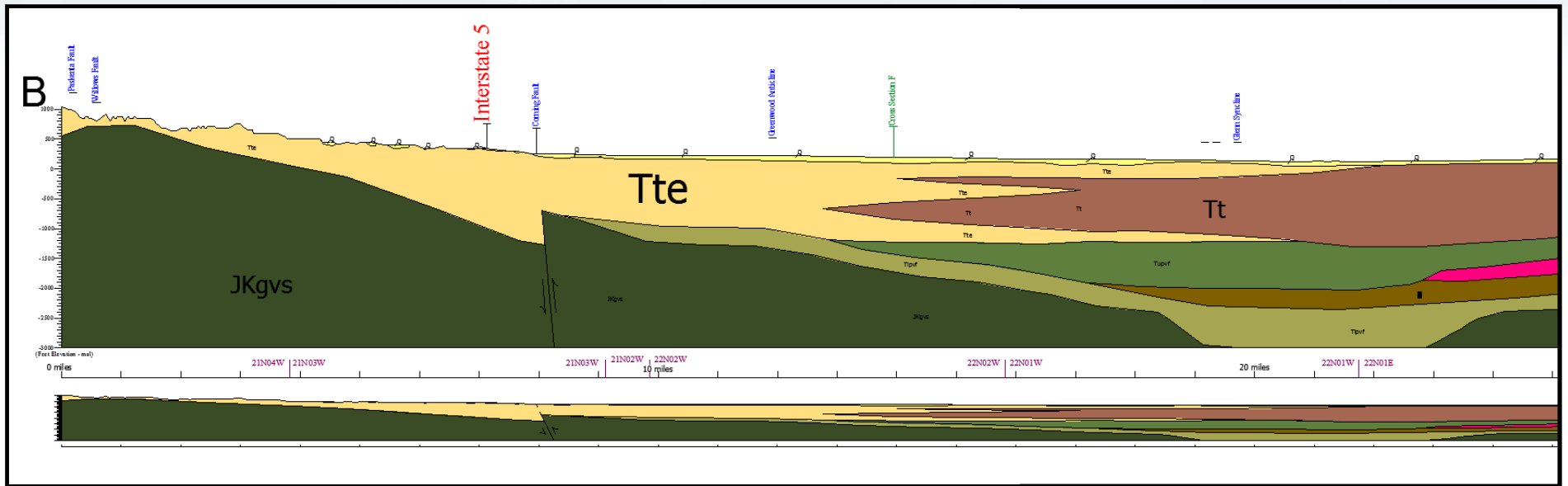
Alluvial Fan



Geologic Cross Sections



B – South of Orland

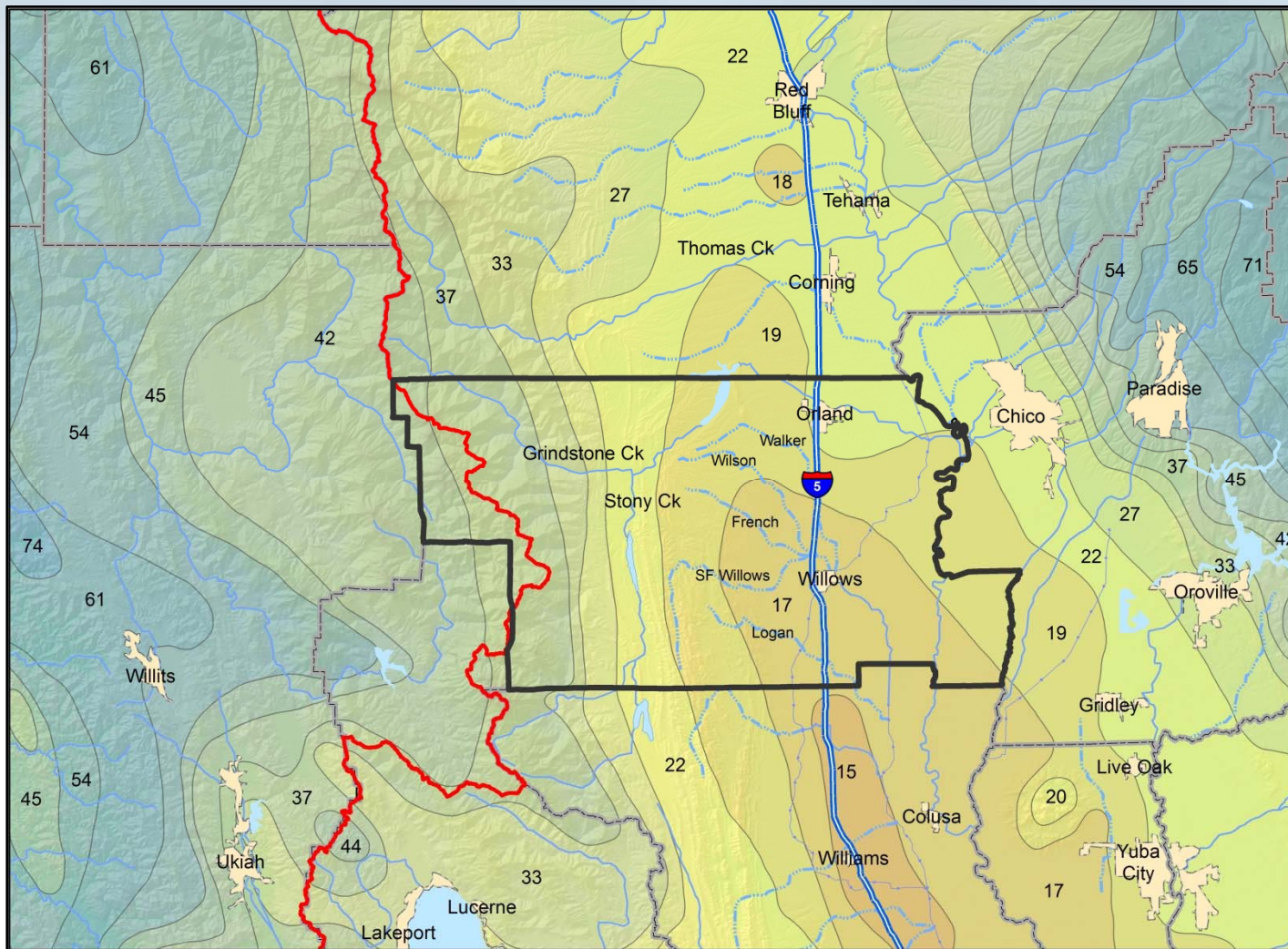


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Precipitation

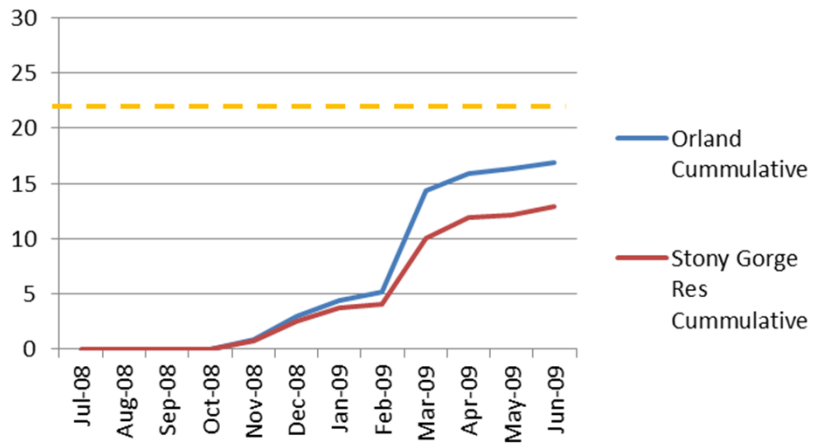
50yr average (1951-2000)



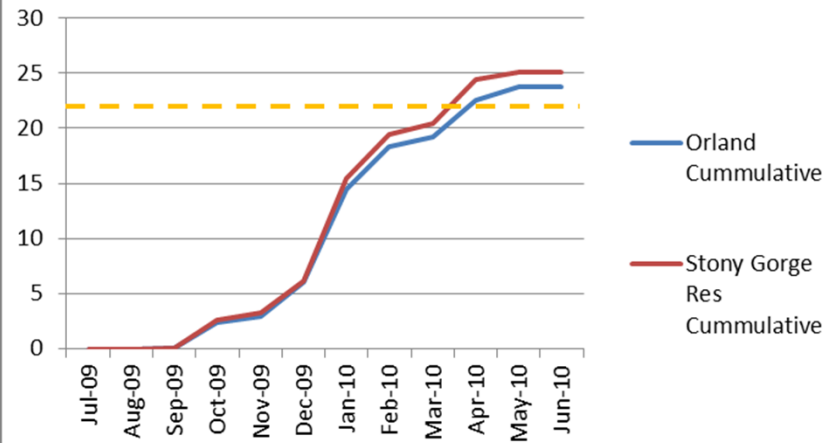
ISOHYET

Real Precipitation

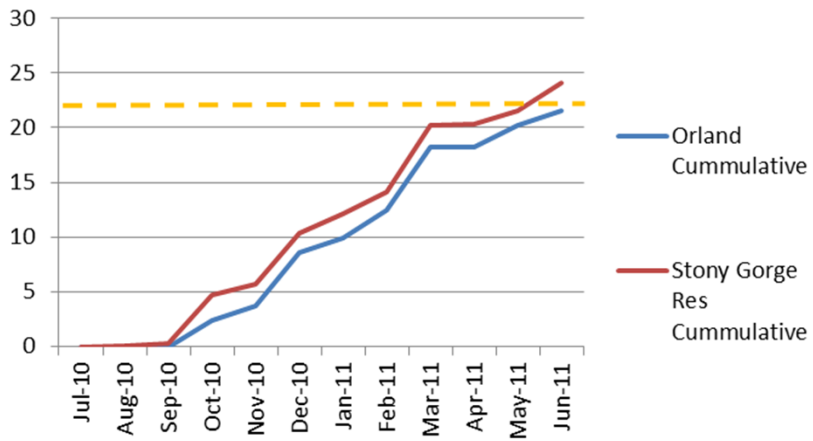
Precip 2008-2009



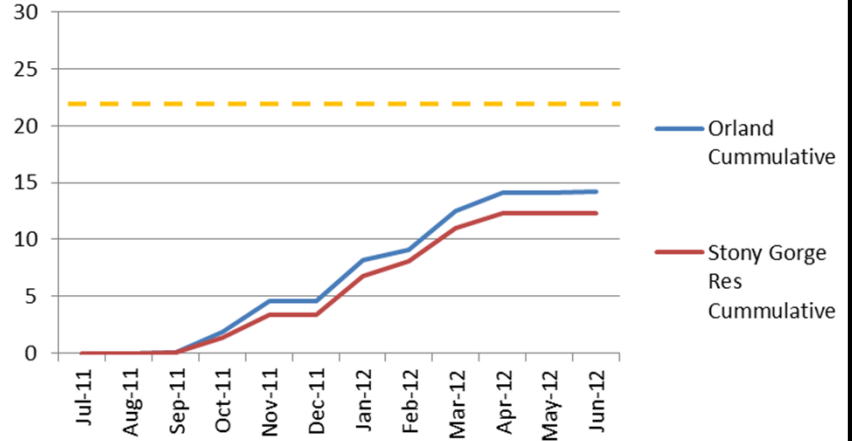
Precip 2009-2010



Precip 2010-2011

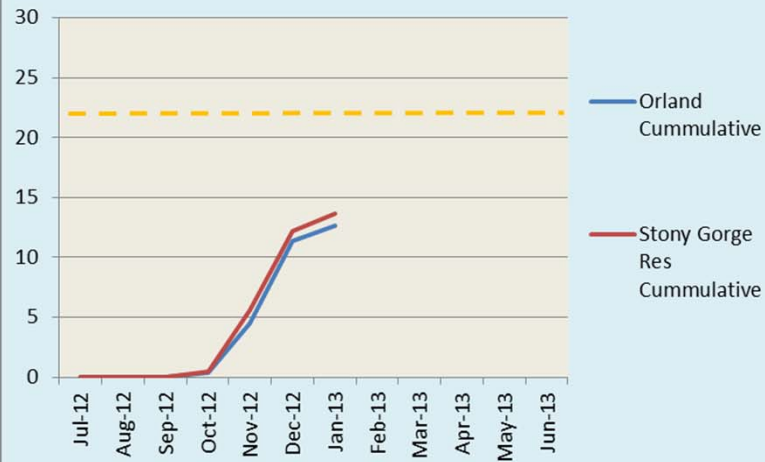


Precip 2011-2012

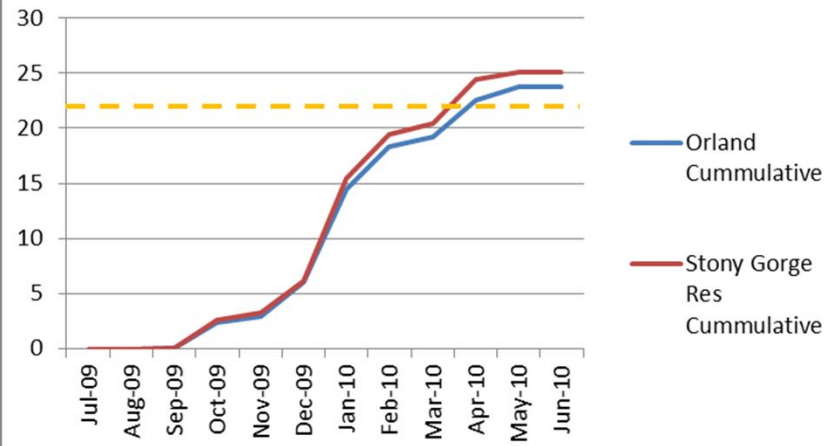


Real Precipitation

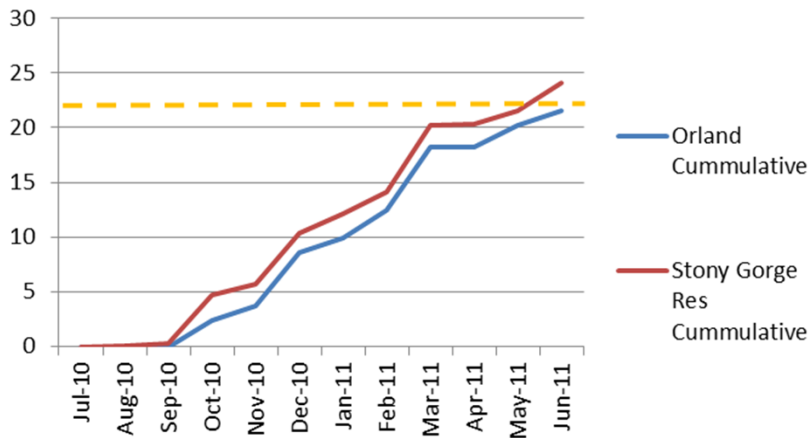
Precip 2012-2013



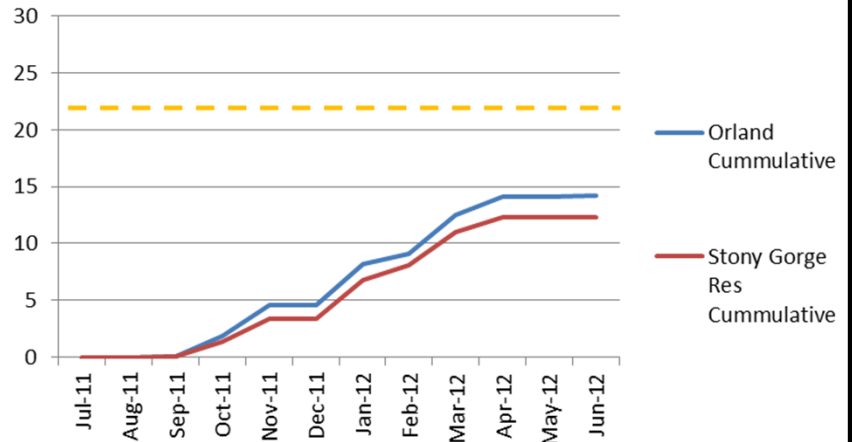
Precip 2009-2010



Precip 2010-2011



Precip 2011-2012



Great Valley Blockage



Agenda for Glenn County WAC

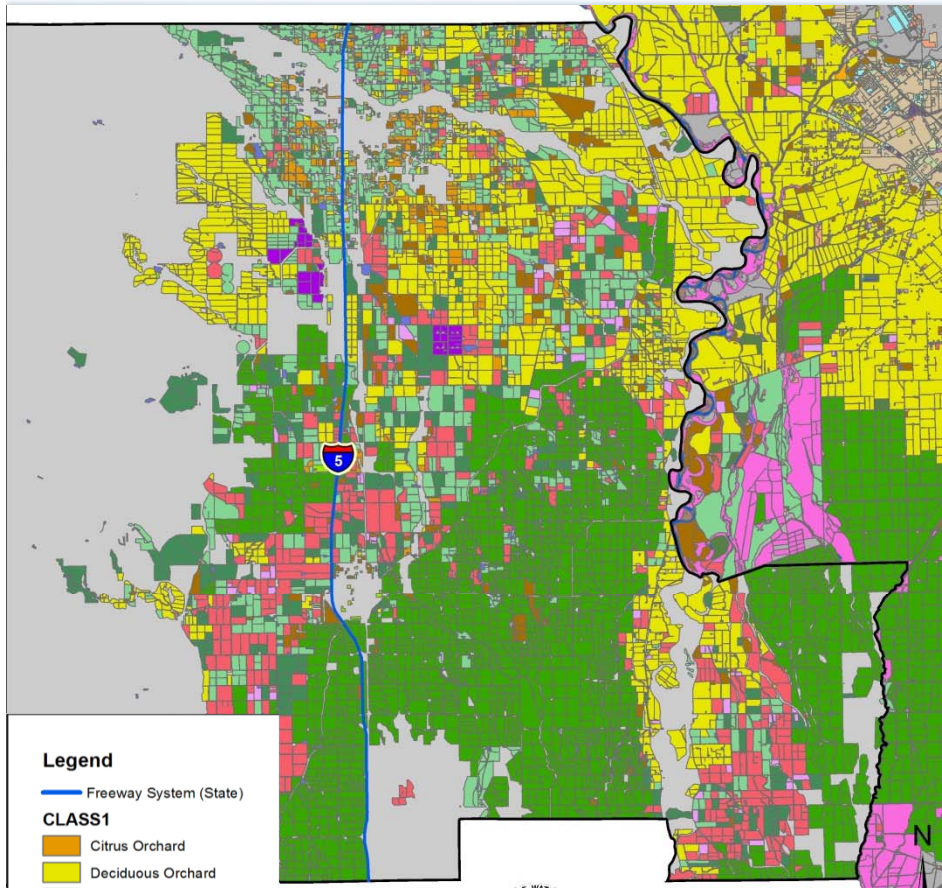
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Land Use

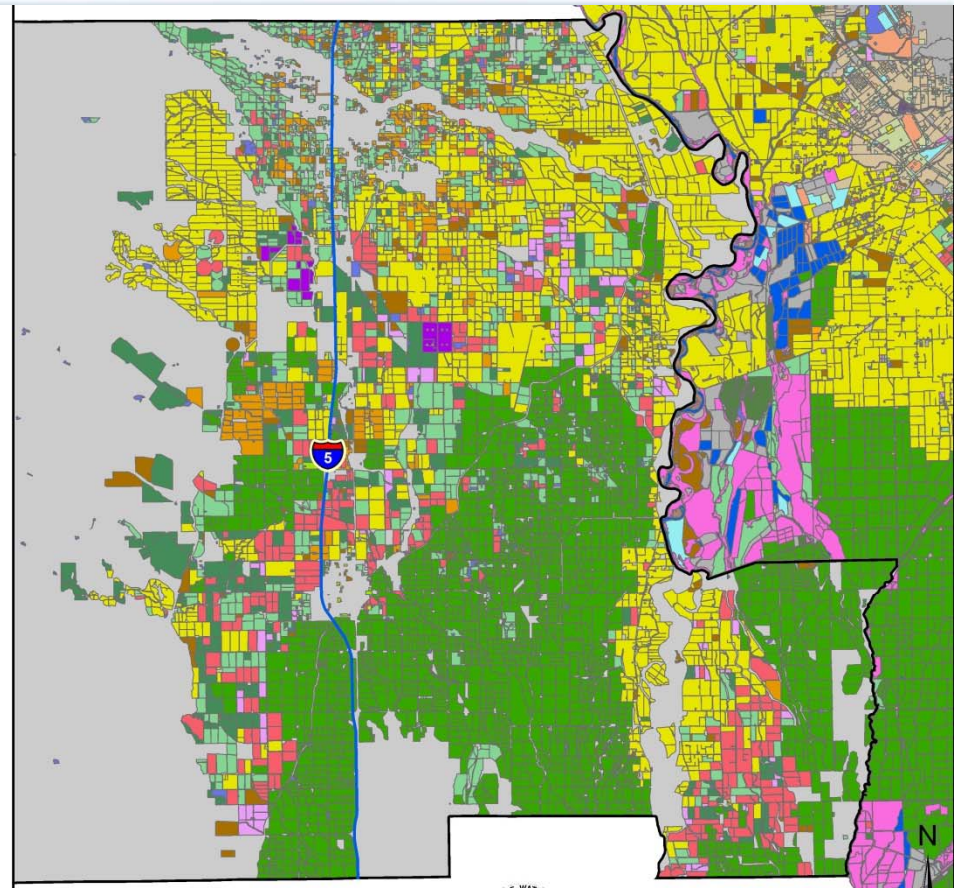
Greatest Change

	2003 Acres	% of Total	2009 Acres	% of Total	Inc/Dec Acres	% Change
Citrus Orchard	5,183	2%	9,805	4%	4,622	89%
Deciduous Orchard	53,652	21%	66,684	26%	13,032	24%
Field Crop	30,268	12%	21,081	8%	(9,187)	30%
Grain and Hay	21,760	8%	19,084	7%	(2,676)	12%
Idle	8,056	3%	6,226	2%	(1,830)	23%
Pasture	38,879	15%	35,433	14%	(3,446)	9%
Rice	90,644	35%	91,665	35%	1,021	1%
Semi-Ag	3,973	2%	4,182	2%	209	5%
Truck Crop	2,789	1%	4,283	2%	1,494	54%
Vineyard	1,438	1%	1,232	0%	(206)	14%
Urban Landscape	287	0%	237	0%	(50)	27%
	256,929		259,912		2,983	1%

Land Use Map



2003



2011

Legend

Freeway System (State)

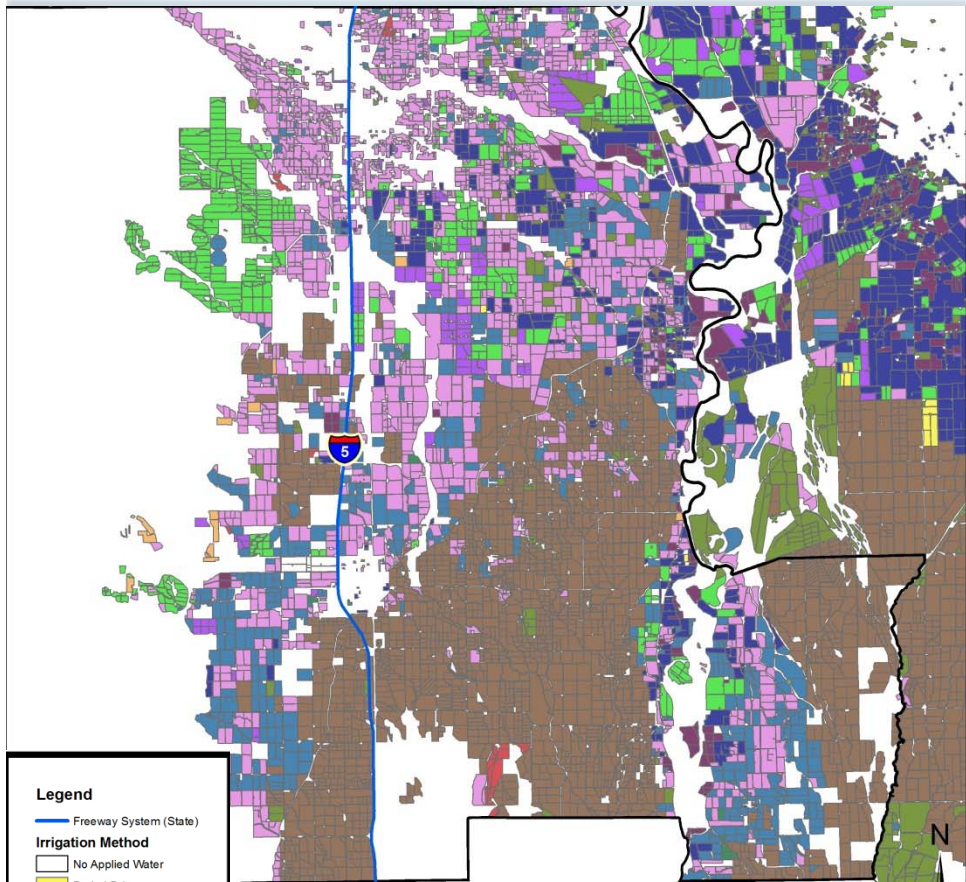
CLASS1

- Citrus Orchard
- Deciduous Orchard
- Field Crop
- Grain and Hay
- Idle
- Pasture
- Rice
- Semi-Ag
- Truck Crop
- Vineyard
- Urban Landscape

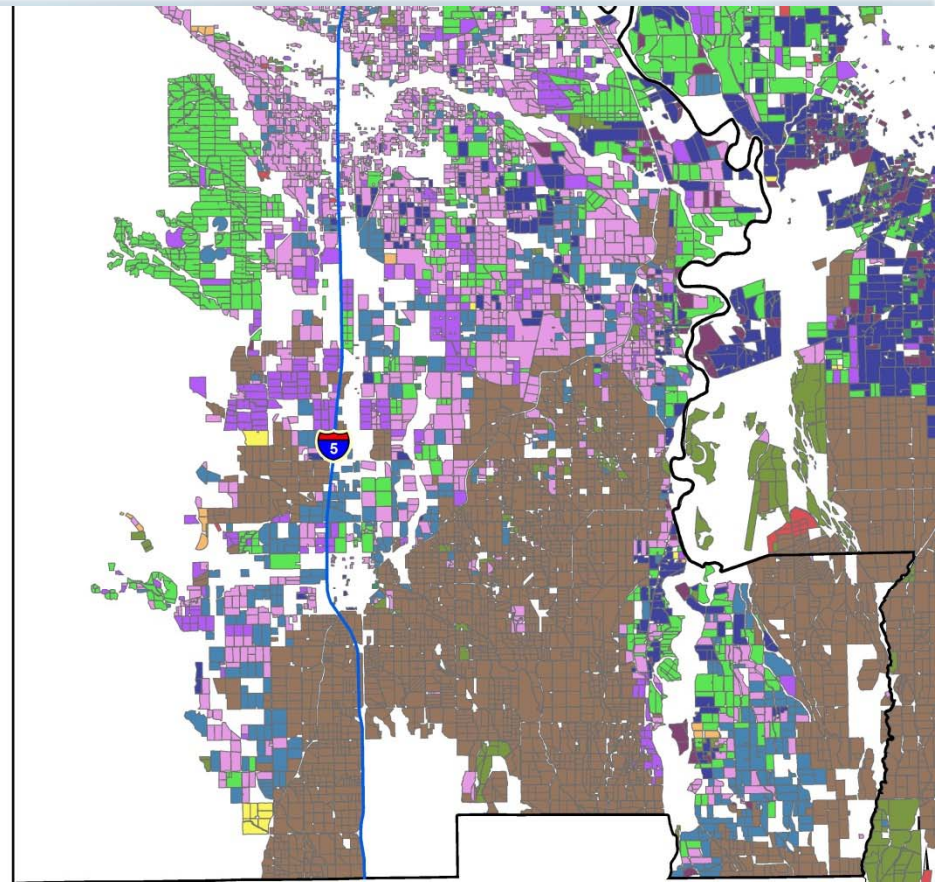
Irrigation Methods

	2003	% of		2009	% of		Inc/Dec	%
	Acres	Total		Acres	Total		Acres	Change
Surface Drip	5,086	2.2%		14,300	6.3%		9,214	181%
Micro Sprinkler	19,217	8.3%		28,127	12.4%		8,910	46%
Basin Irrigation	89,384	38.5%		91,960	40.5%		2,576	3%
Wild Flood	1,052	0.5%		302	0.1%		(750)	71%
Permanent Sprinkler	14,107	6.1%		9,813	4.3%		(4,294)	30%
Furrow Irrigation	29,506	12.7%		23,940	10.6%		(5,566)	19%
Border Strip	63,021	27.1%		50,668	22.3%		(12,353)	20%

Irrigations Methods Map



2003



2011

Legend

— Freeway System (State)

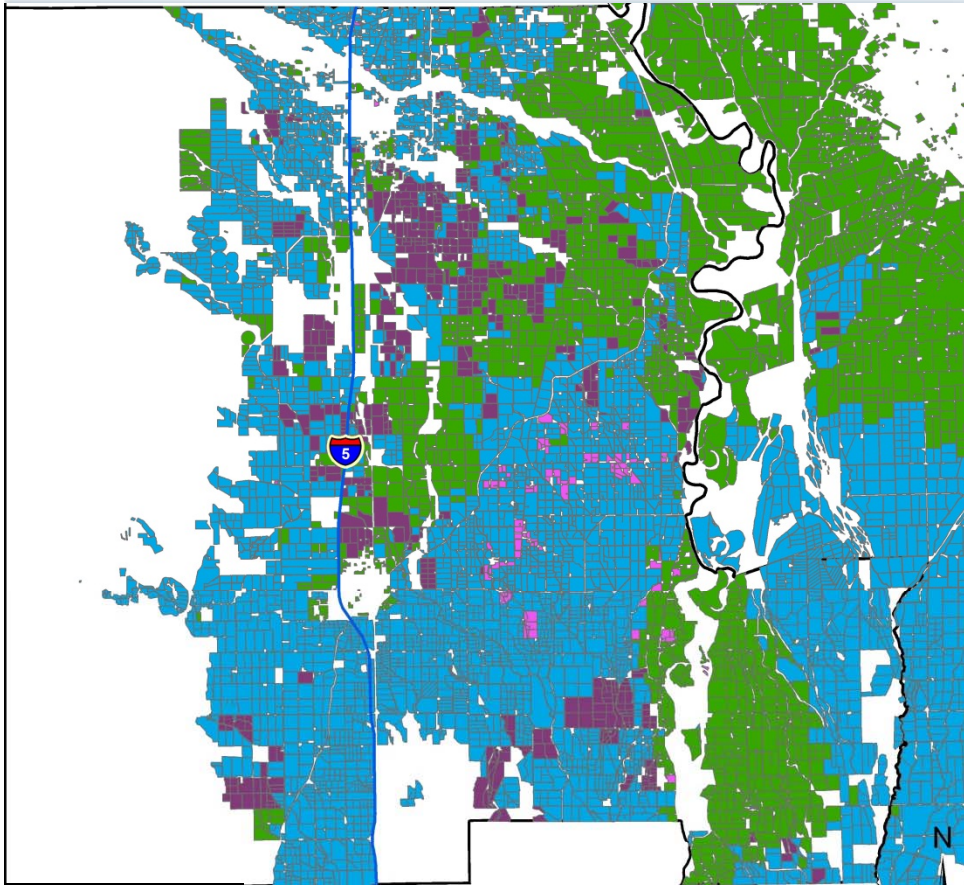
Irrigation Method

- No Applied Water
- Buried Drip
- Border Strip
- Surface Drip
- Furrow Irrigation
- Hand Move
- Micro Sprinkler
- Basin Irrigation
- Permanent Sprinkler
- Side Roll Sprinkler
- Solid Set Sprinkler
- Unknown
- Wild Flooding

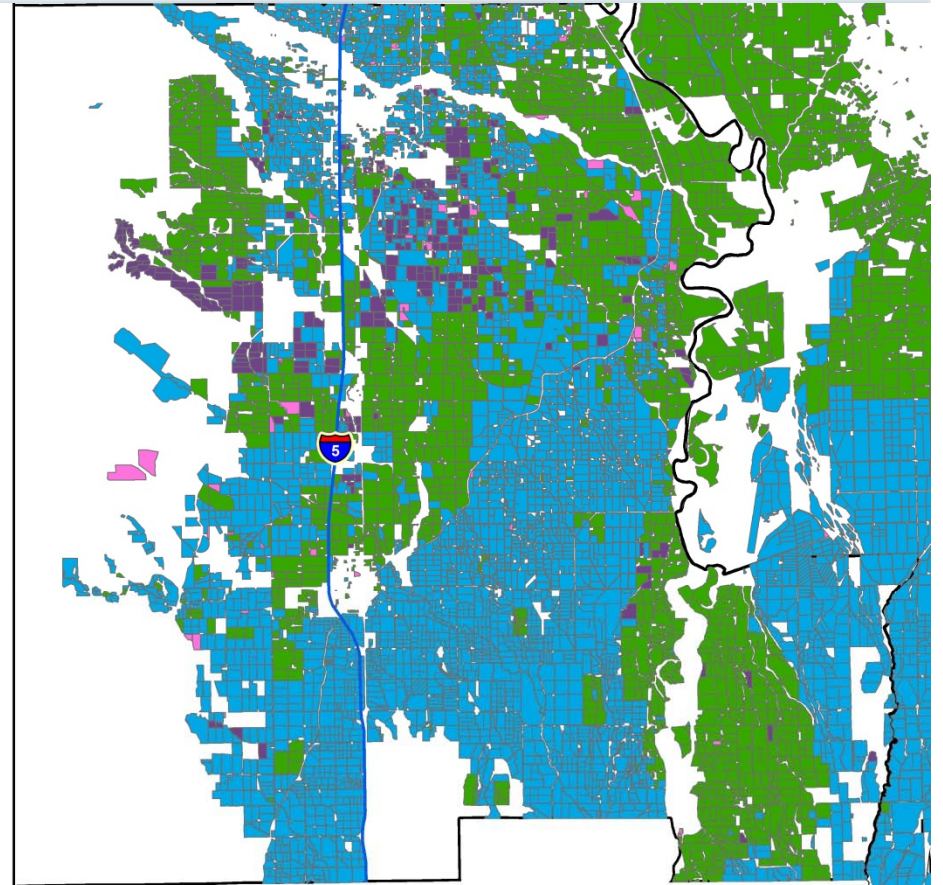
Water Source

	2003 Acres	% of Total	2009 Acres	% of Total	Inc/Dec Acres	% Change
Groundwater	69,087	29%	92,517	37%	23,430	34%
Mixed Source	23,706	10%	11,746	5%	(11,960)	50%
Surface Water	145,687	61%	140,749	57%	(4,938)	3%
Unknown	2,324	1%	2,191	1%	(133)	6%

Water Source Maps



2003



2011

Legend

— Freeway System (State)

WATERSOURC

□ No Applied Water

□ Surface

□ Mixed

□ Ground

□ Unknown

□ Reclaimed

Agenda for Glenn County WAC

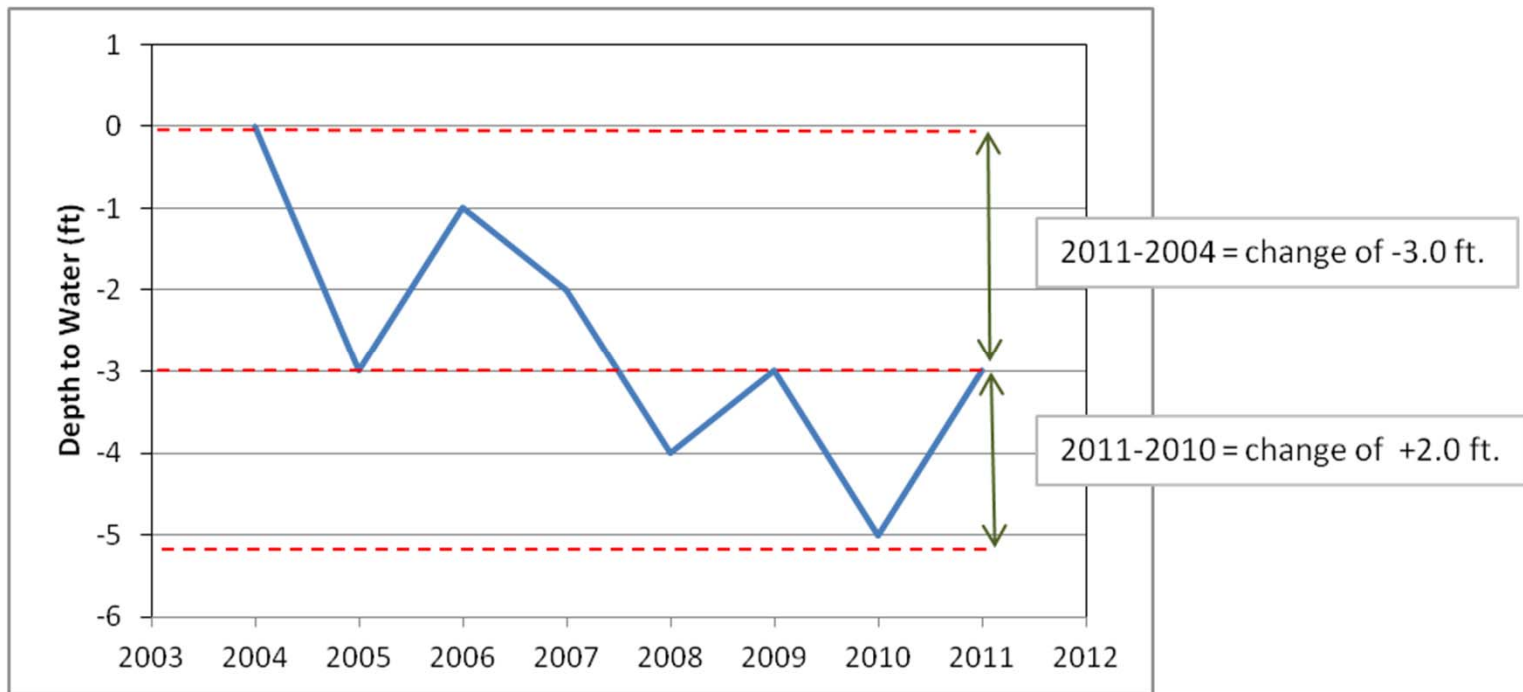
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Map Introduction

- Dots are actual measured data points
- Between are geospatial interpretations
- Shallow < 200ft
- Intermediate 201 to 600ft
- Deep > 600ft
- Difference or change in GW elevation

Map Introduction

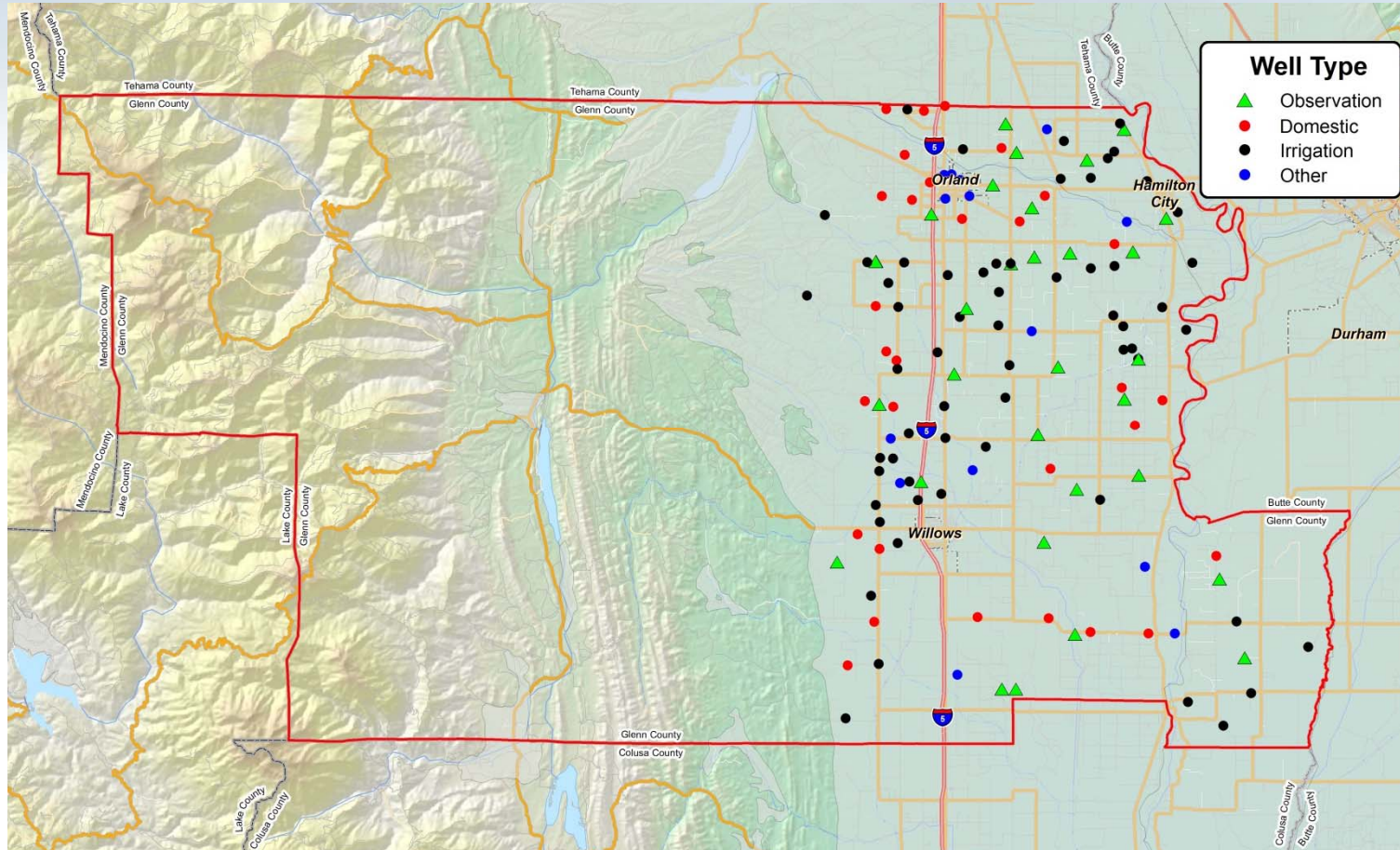
EXAMPLE COUNTY SPRING 2004 TO SPRING 2011 SPRING 2010 TO SPRING 2011
-3.0 +2.0



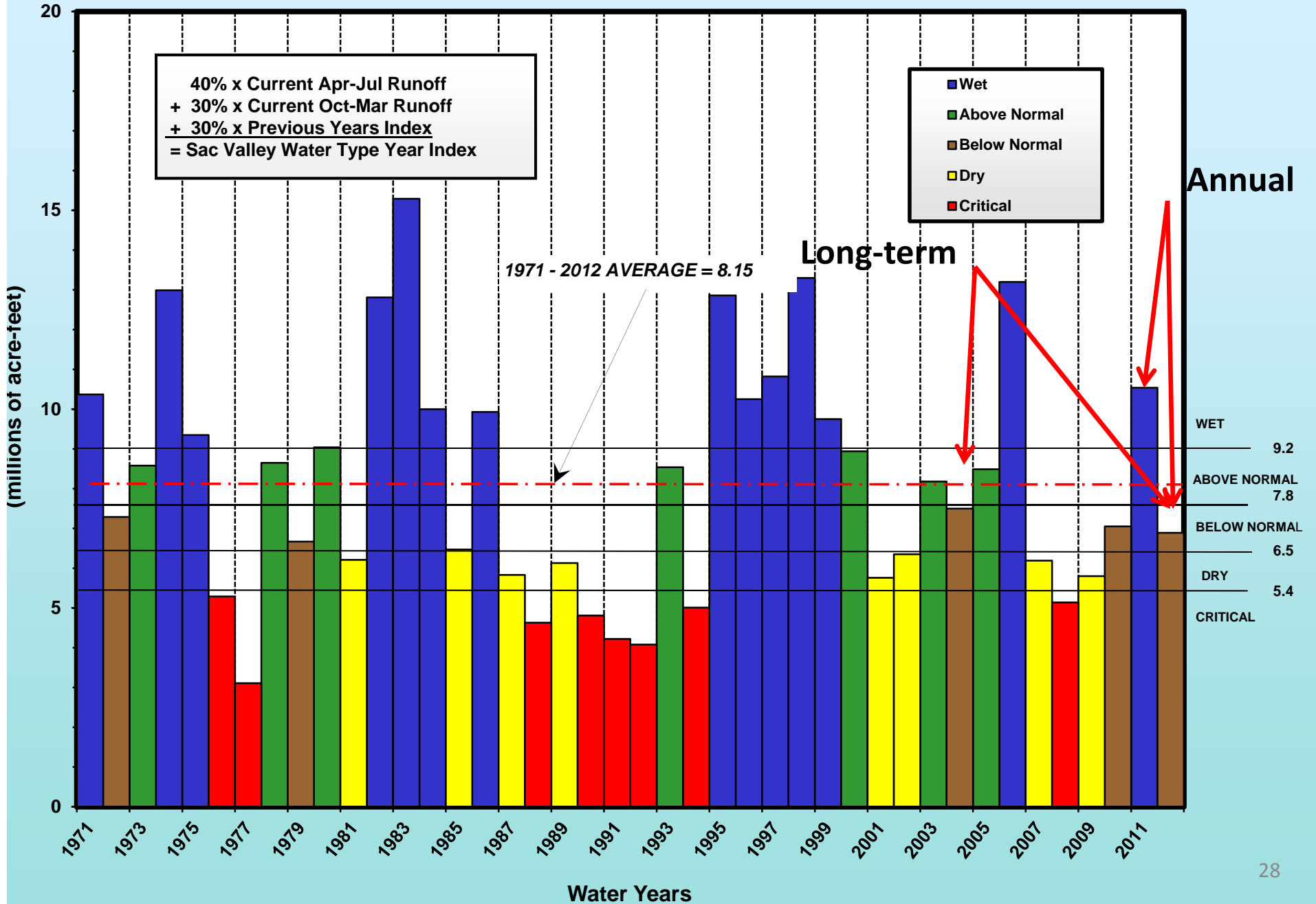
Map Introduction

- Maps vertical scale
 - Annual change 2ft
 - Long term change 5ft
- Series 2012 maps and charts are preliminary and are still subject to change

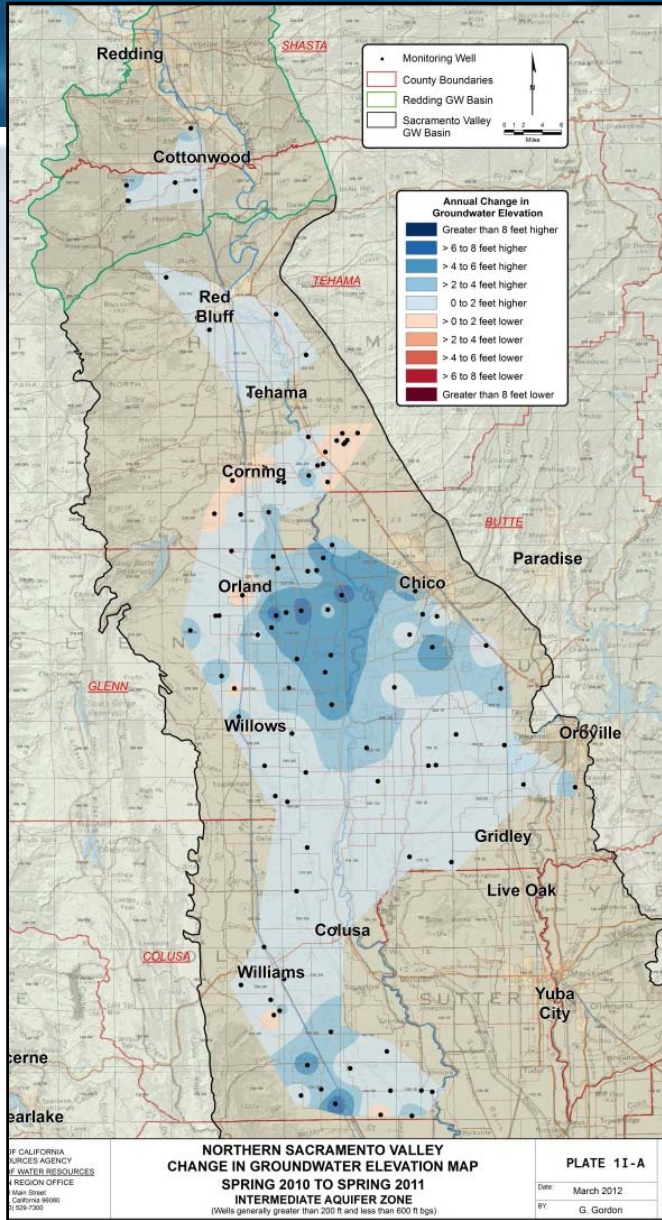
Glenn County GW Monitoring Wells



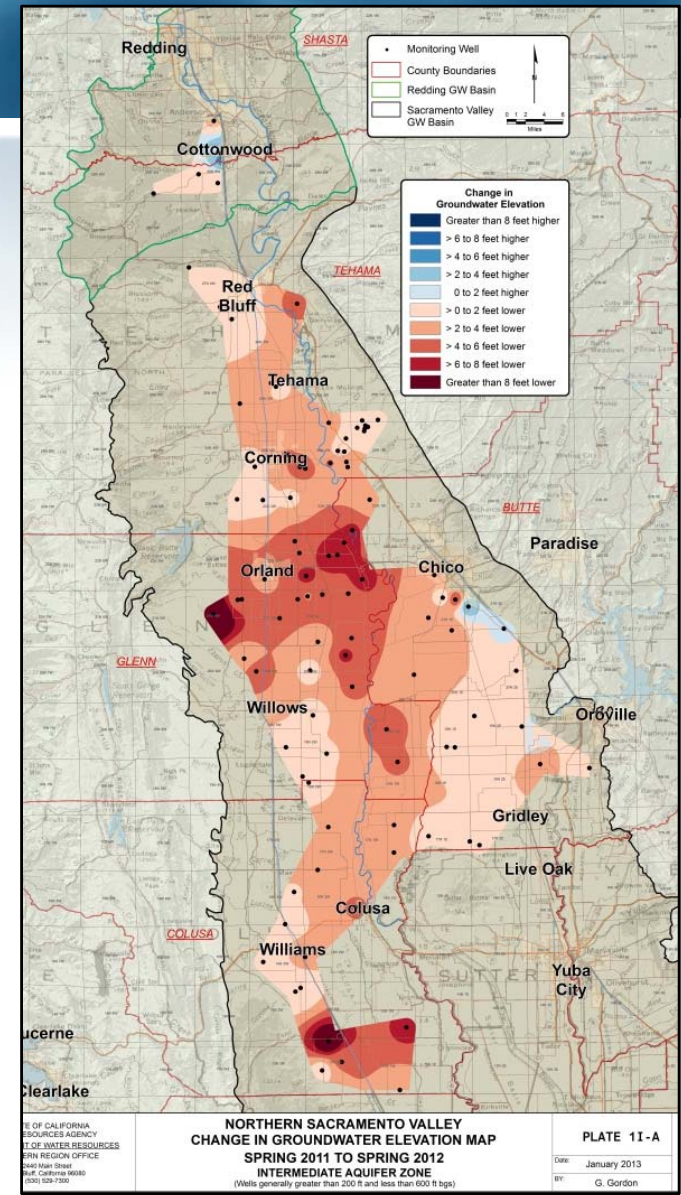
SACRAMENTO VALLEY WATER YEAR TYPE INDEX 1971-2012



Spring GWL Change - Intermediate Annual



2011



2012

Change in GW Elevation Table

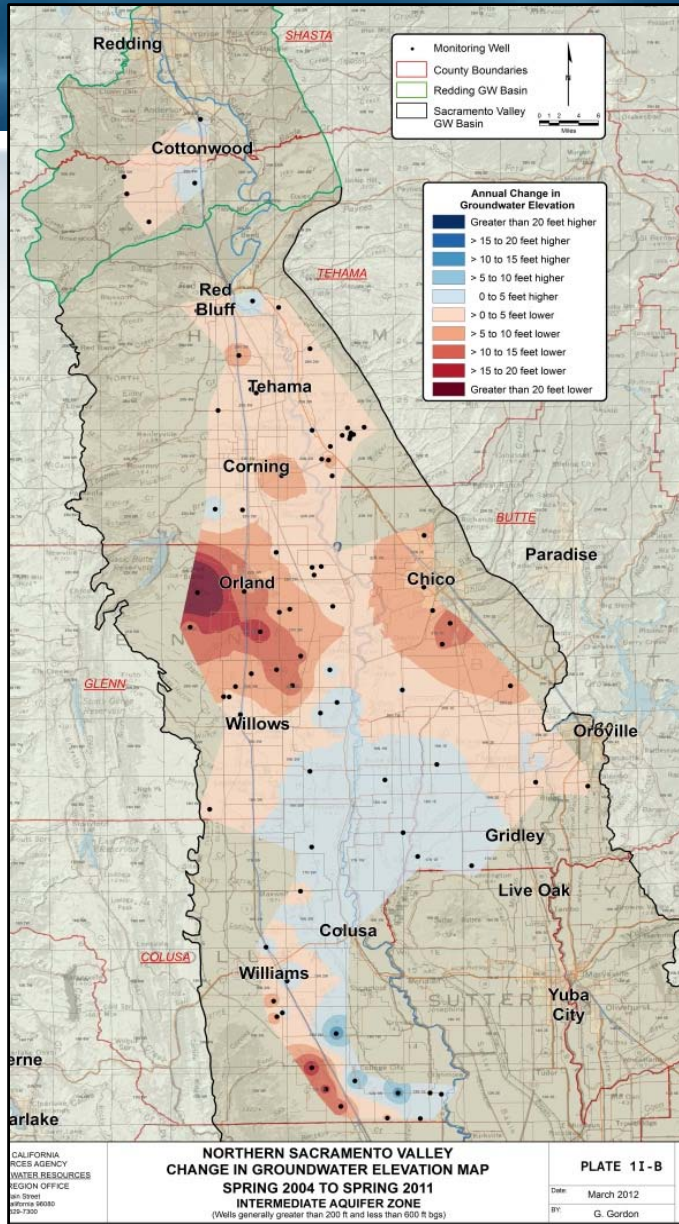
Spring Annual

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH				
SPRING 2010 to SPRING 2011				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	8.8	8.8	2.2	2.1
Maximum Decrease in GWE (ft)	0.9	0.9	1.3	2.1
Average GWL Change (ft)	2.6	2.7	1.8	2.1
Average Well Depth (ft)	218	145	483	770
Number of Wells	18	15	2	1
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	10.3	10.3	3.8	1.8
Maximum Decrease in GWE (ft)	-0.3	0.5	-0.3	1.8
Average GWL Change (ft)	2	2.8	1.2	1.8
Average Well Depth (ft)	320	152	426	865
Number of Wells	14	7	6	1
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	8.5	8.5	3.1	2.8
Maximum Decrease in GWE (ft)	-3.8	-1.6	-3.8	-2.6
Average GWL Change (ft)	1	1.4	0.4	0.6
Average Well Depth (ft)	307	124	401	848
Number of Wells	104	61	27	16
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	8.3	8.3	5.6	5.1
Maximum Decrease in GWE (ft)	-1.5	-0.9	0.5	-1.5
Average GWL Change (ft)	2.1	2.4	1.9	1.5
Average Well Depth (ft)	338	146	499	841
Number of Wells	93	56	23	14
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	8.9	8.9	7.5	4.5
Maximum Decrease in GWE (ft)	-8.4	-8.4	-0.6	-3.8
Average GWL Change (ft)	2.1	1.8	3	1.5
Average Well Depth (ft)	349	128	427	903
Number of Wells	134	73	37	24
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	9.4	9.4	6.6	4.4
Maximum Decrease in GWE (ft)	-2	-2	-1.5	-2
Average GWL Change (ft)	1.3	1.1	1.6	1.5
Average Well Depth (ft)	368	139	410	788
Number of Wells	59	23	26	10
TOTAL				
Maximum Increase in GWE (ft)	10.3	10.3	7.5	5.1
Maximum Decrease in GWE (ft)	-8.4	-8.4	-3.8	-3.8
Average GWL Change (ft)	1.7	1.9	1.8	1.3
Average Well Depth (ft)	332.0	134	432	857
Number of Wells	422	235	121	66

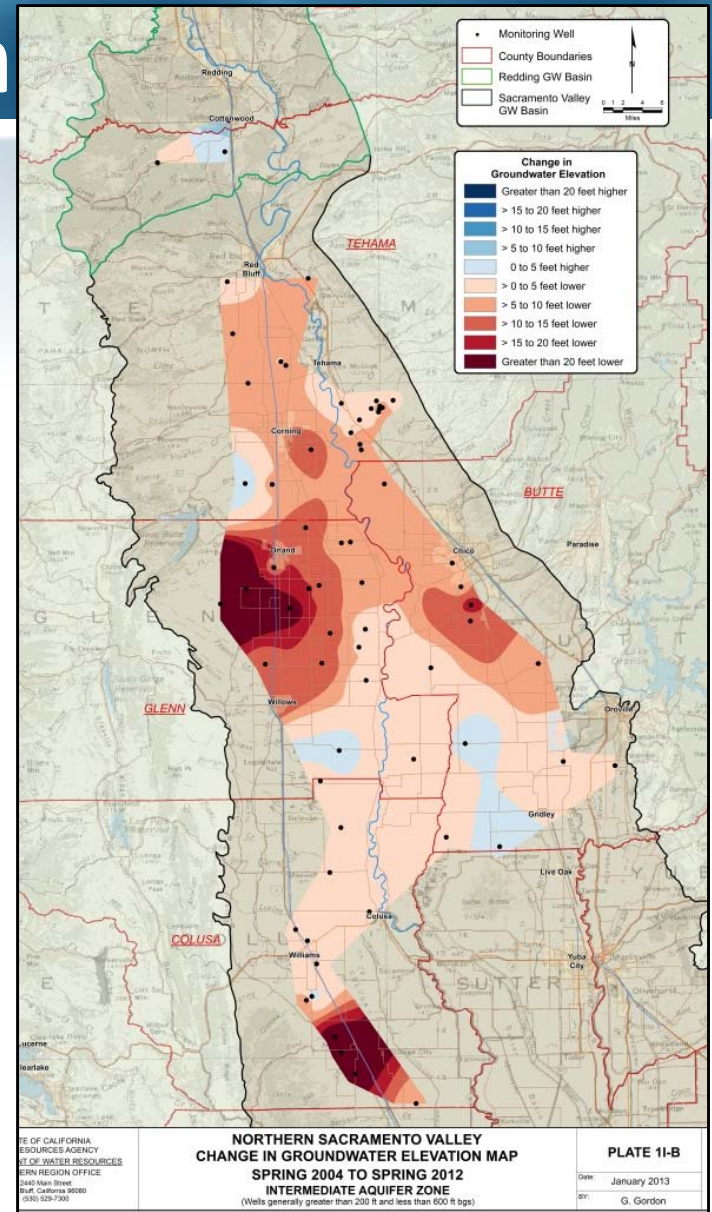
CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH				
SPRING 2011 to SPRING 2012				
	Total	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		0.3	9.5	NA
Maximum Decrease in GWE (ft)		-11.3	-2.2	-1.9
Average GWL Change (ft)		-3.1	2.3	-1.9
Average Well Depth (ft)		144	458	790
Number of Wells	19	14	3	2
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		1.1	0.5	NA
Maximum Decrease in GWE (ft)		-10.3	-1.2	-2.0
Average GWL Change (ft)		-2.9	-0.7	-2.0
Average Well Depth (ft)		133	456	865
Number of Wells	13	7	5	1
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		0.4	0.1	1.2
Maximum Decrease in GWE (ft)		-14.0	-4.9	-3.7
Average GWL Change (ft)		-3.3	-1.9	-1.4
Average Well Depth (ft)		129	388	846
Number of Wells	103	57	31	15
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		4.1	4.1	1.2
Maximum Decrease in GWE (ft)		-11.8	-6.2	-4.7
Average GWL Change (ft)		-2.6	-1.6	-1.6
Average Well Depth (ft)		147	487	881
Number of Wells	99	59	25	15
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		1.0	NA	8.9
Maximum Decrease in GWE (ft)		-12.2	-20.4	-10.5
Average GWL Change (ft)		-4.4	-4.9	-2.4
Average Well Depth (ft)		125	418	908
Number of Wells	134	72	35	27
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		1.3	NA	NA
Maximum Decrease in GWE (ft)		-12.5	-11.0	-3.1
Average GWL Change (ft)		-2.2	-2.8	-2.2
Average Well Depth (ft)		131	383	906
Number of Wells	55	24	20	11
TOTAL				
Maximum Increase in GWE (ft)		4.1	9.5	8.9
Maximum Decrease in GWE (ft)		-14.0	-20.4	-10.5
Average GWL Change (ft)		-3.3	-2.7	-2.0
Average Well Depth (ft)		134	421	885
Number of Wells	423	233	119	71

Spring GWL Change - Intermediate

Long Term



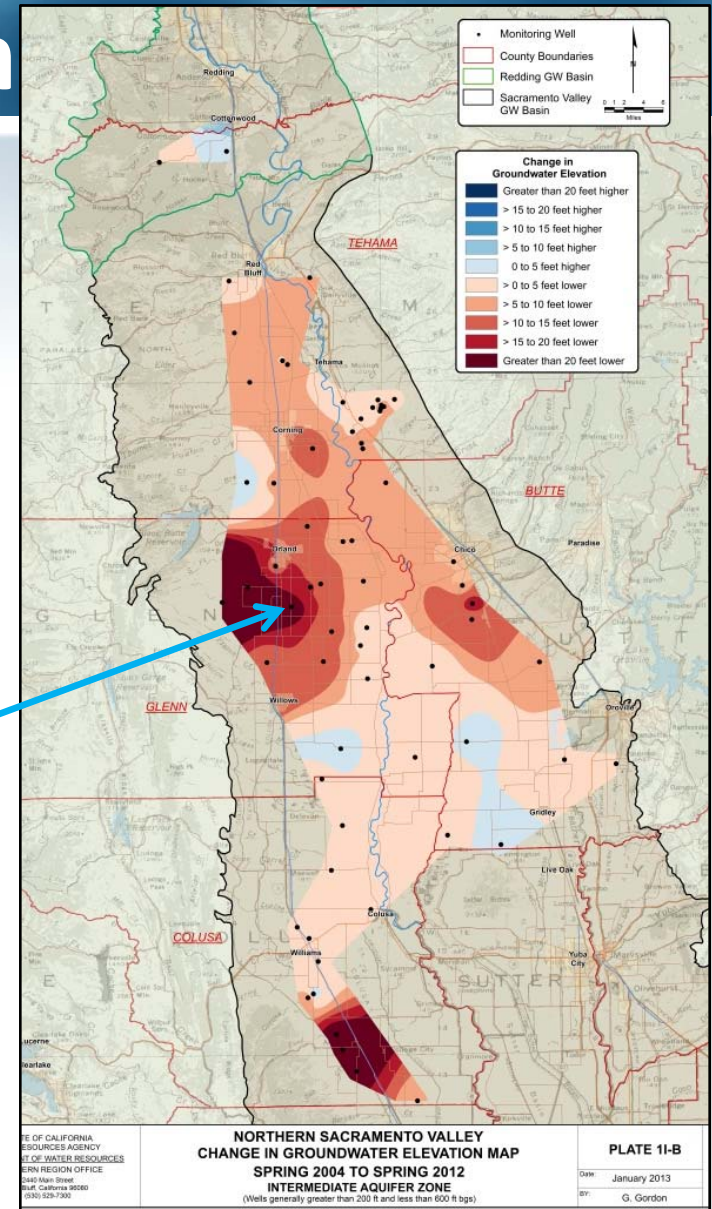
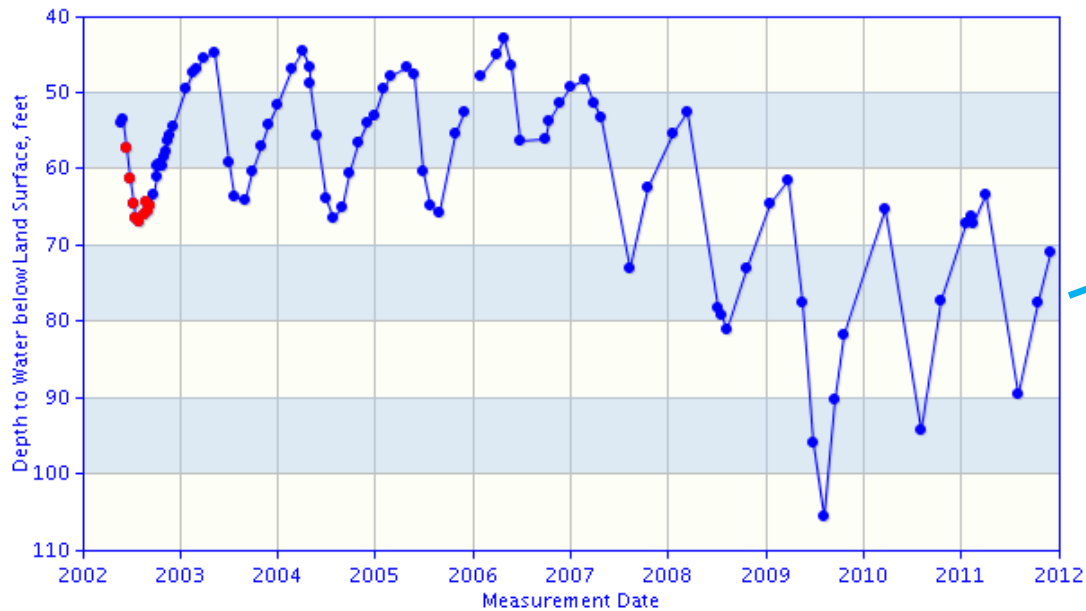
2011



2012

Spring GWL Change - Intermediate Long Term

Z1N03W23D001M --- Perforation Zone: 362 - 372 below land surface, feet.



2012

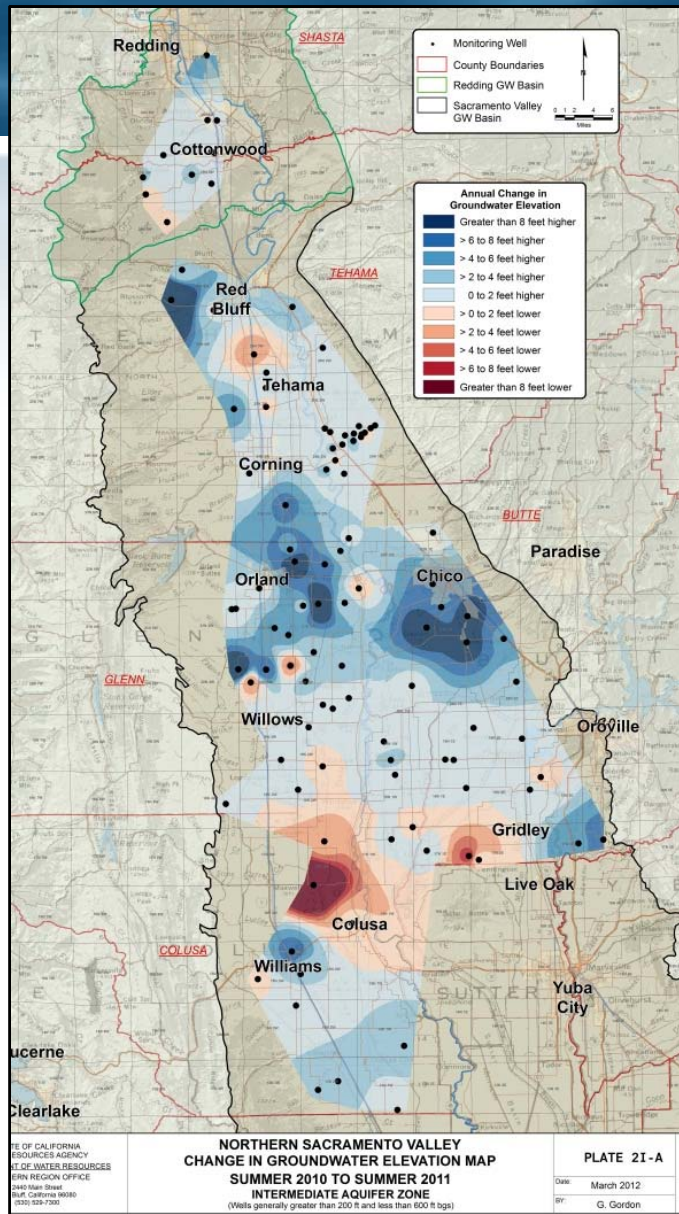
Change in GW Elevation Table

Spring Long-term

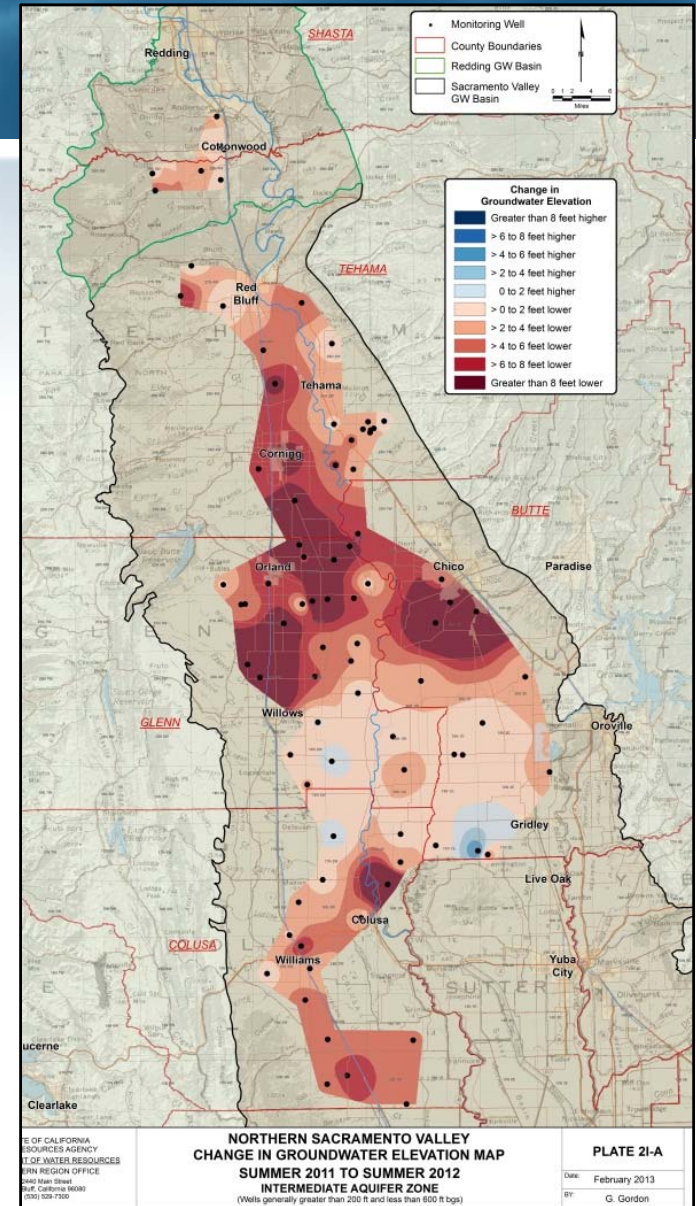
CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH SPRING 2004 to SPRING 2011				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	13.9	13.9	1.8	NA
Maximum Decrease in GWE (ft)	-3.1	-3.1	-1.6	NA
Average GWL Change (ft)	1.6	1.7	0.1	NA
Average Well Depth (ft)	206.7	145.3	385.0	NA
Number of Wells	17	15	2	0
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	7.3	7.3	3	NA
Maximum Decrease in GWE (ft)	-4.6	-4.3	-4.6	NA
Average GWE Change (ft)	-1.2	-0.9	-1.5	NA
Average Well Depth (ft)	300.1	160.6	416.3	NA
Number of Wells	11	5	6	0
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	6.0	6.0	2.8	-2.4
Maximum Decrease in GWE (ft)	-17.9	-17.9	-8.2	-3.6
Average GWE Change (ft)	-3.4	-3.5	-3.3	-3.0
Average Well Depth (ft)	250.0	132.1	397.2	815.8
Number of Wells	91	60	25	6
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	9.7	9.7	1.3	-3.0
Maximum Decrease in GWE (ft)	-14.8	-11.3	-14.8	-8.2
Average GWE Change (ft)	-2.1	-1.2	-4	-4.7
Average Well Depth (ft)	280.0	156	482.9	819.8
Number of Wells	69	49	14	6
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	6.6	6.6	3.3	2.8
Maximum Decrease in GWE (ft)	-43.5	-27.3	-43.5	-36.0
Average GWE Change (ft)	-4.9	-3.2	-6.2	-14.7
Average Well Depth (ft)	98.0	124.6	432.4	911.3
Number of Wells	98	62	29	7
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	11.9	8.0	11.9	7.1
Maximum Decrease in GWE (ft)	-17.4	-15.0	-17.4	-14.6
Average GWE Change (ft)	-1.6	-1.7	-0.7	-3.4
Average Well Depth (ft)	376.6	150.2	410.6	782.0
Number of Wells	56	23	22	11
TOTAL				
Maximum Increase in GWE (ft)	13.9	13.9	11.9	7.1
Maximum Decrease in GWE (ft)	-43.5	-27.3	-43.5	-36.0
Average GWE Change (ft)	-2.9	-3.5	-3.5	-6.2
Average Well Depth (ft)	282.3	138.9	423.8	826.5
Number of Wells	342	214	98	30

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH SPRING 2004 to SPRING 2012				
	Total	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		14.2	1.8	NA
Maximum Decrease in GWE (ft)		-6.4	-2.5	-1.9
Average GWL Change (ft)		-1.3	-1.4	-1.9
Average Well Depth (ft)		143	460	790
Number of Wells	22	16	4	2
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		NA	7.9	NA
Maximum Decrease in GWE (ft)		-8.3	NA	-2.0
Average GWL Change (ft)		-4.3	7.9	-2.0
Average Well Depth (ft)		132	425	865
Number of Wells	7	5	1	1
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		1.7	2.1	1.2
Maximum Decrease in GWE (ft)		-20.1	-13.1	-3.7
Average GWL Change (ft)		-7.3	-5.4	-1.4
Average Well Depth (ft)		127	390	846
Number of Wells	90	52	23	15
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		9.1	0.4	1.2
Maximum Decrease in GWE (ft)		-13.6	-16.2	-4.7
Average GWL Change (ft)		-4.0	-5.3	-1.6
Average Well Depth (ft)		150	457	881
Number of Wells	75	46	14	15
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		1.5	0.3	8.9
Maximum Decrease in GWE (ft)		-26.2	-35.4	-10.5
Average GWL Change (ft)		-7.1	-11.5	-2.4
Average Well Depth (ft)		125	438	908
Number of Wells	107	57	23	27
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		1.7	2.3	NA
Maximum Decrease in GWE (ft)		-16.4	-28.4	-3.1
Average GWL Change (ft)		-3.4	-7.0	-2.2
Average Well Depth (ft)		136	384	906
Number of Wells	42	17	14	11
TOTAL				
Maximum Increase in GWE (ft)		14.2	7.9	8.9
Maximum Decrease in GWE (ft)		-26.2	-35.4	-10.5
Average GWL Change (ft)		-5.5	-7.1	-2.0
Average Well Depth (ft)		134	419	885
Number of Wells	343	193	79	71

Summer GWL Change - Intermediate Annual



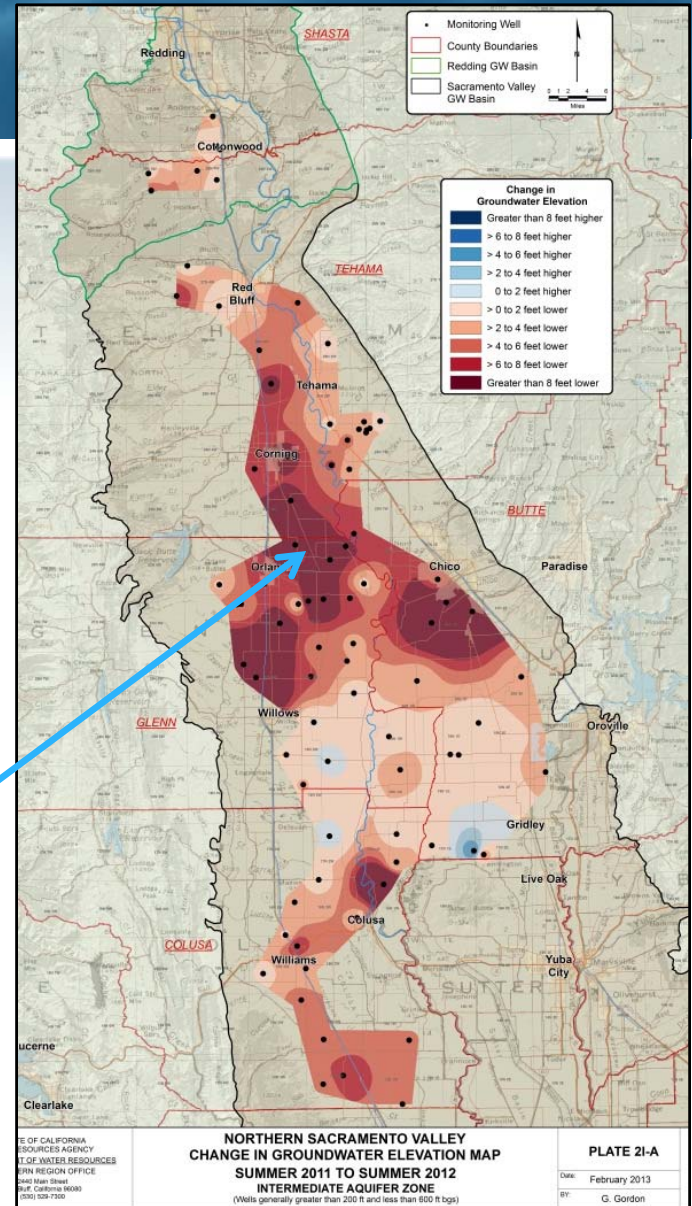
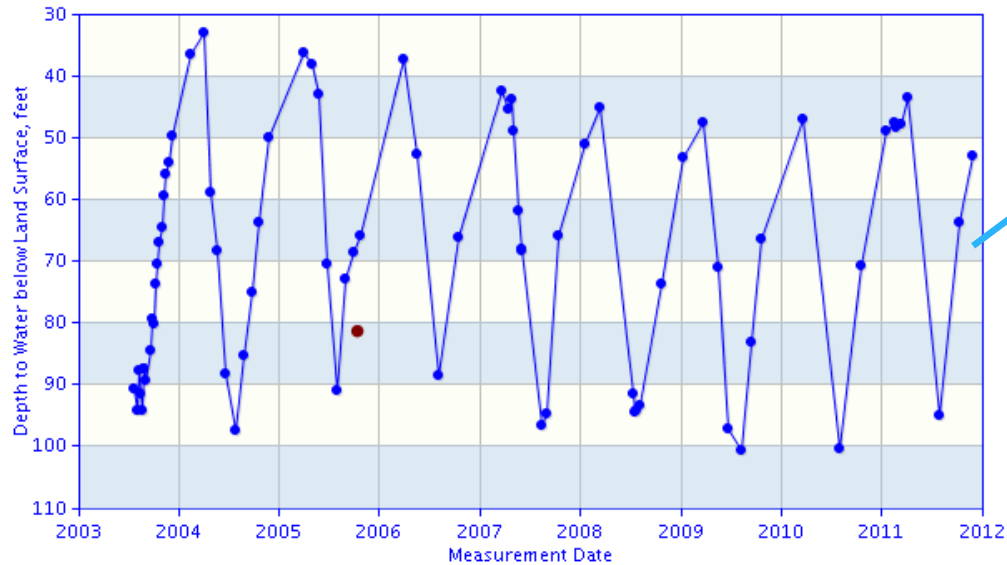
2011



2012

Summer GWL Change - Intermediate Annual

22N03W01R001M --- Perforation Zone: 470 - 480 below land surface, feet.



2012

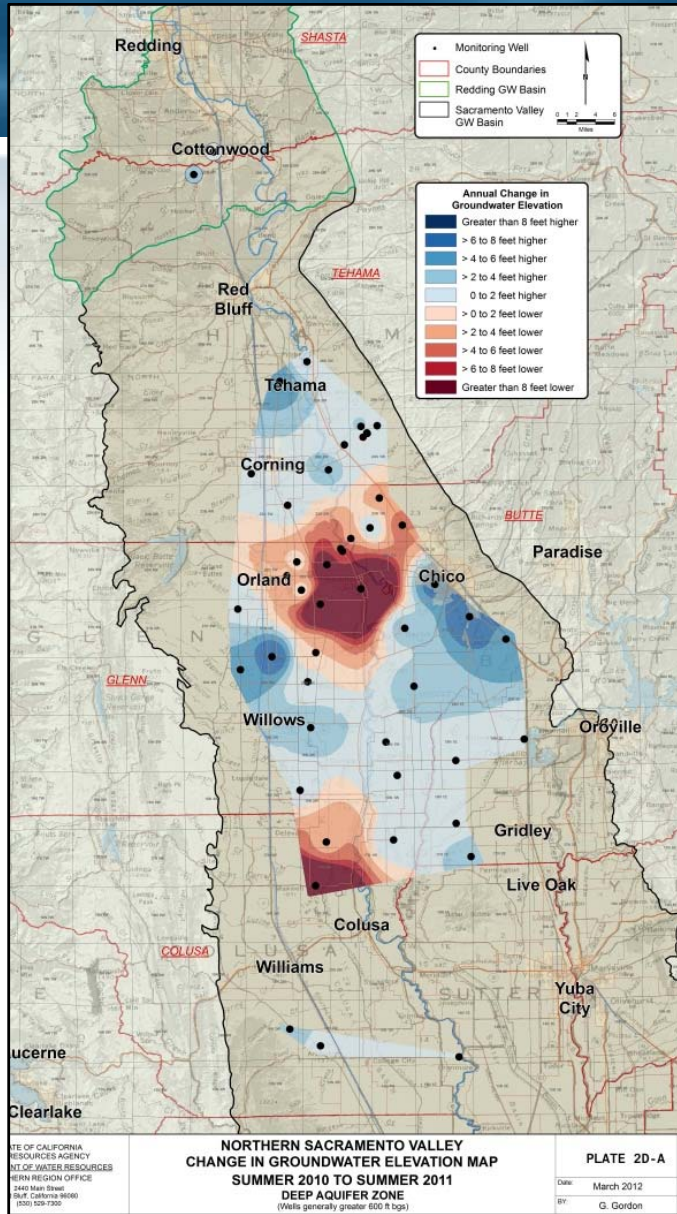
Change in GW Elevation Table

Summer Annual

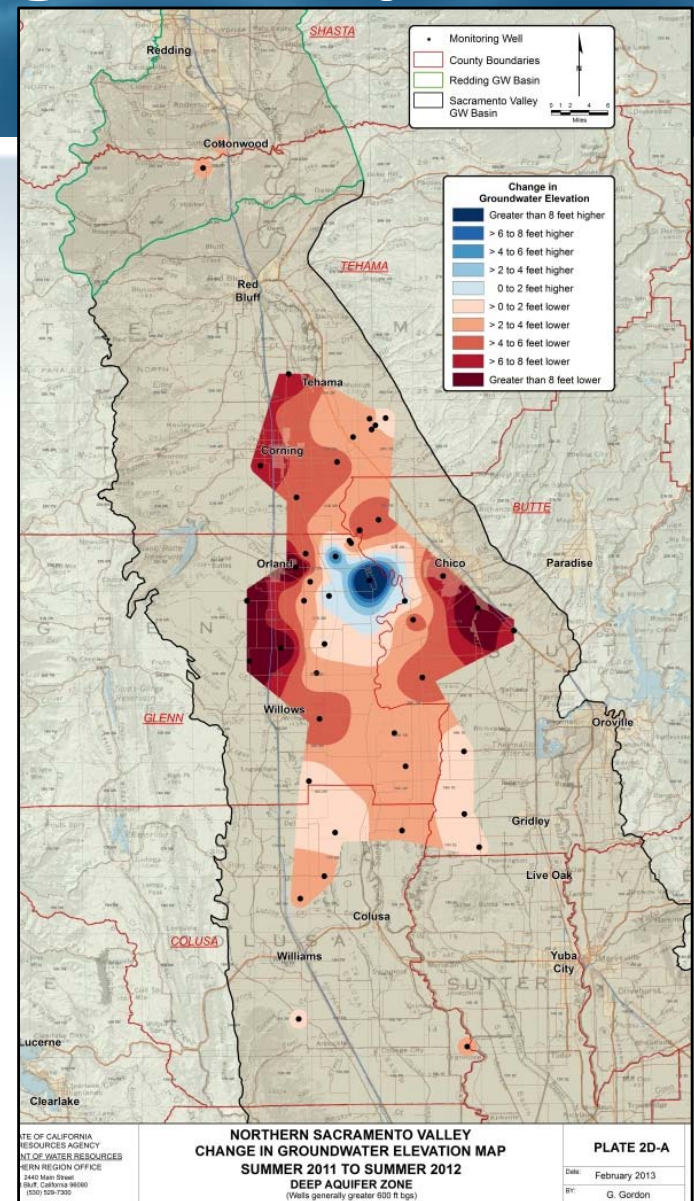
CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH SUMMER 2010 to SUMMER 2011				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	7.0	7.0	5.3	1.8
Maximum Decrease in GWE (ft)	0.0	0.0	1.2	1.5
Average GWL Change (ft)	2.2	2.3	2.1	1.7
Average Well Depth (ft)	269	145	405	790
Number of Wells	23	15	6	2
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	2.8	2.7	2.4	2.8
Maximum Decrease in GWE (ft)	-0.9	-0.7	-0.9	NA
Average GWL Change (ft)	0.9	0.9	0.7	2.8
Average Well Depth (ft)	320	165	420	865
Number of Wells	16	8	7	1
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	23.2	7.9	23.2	5.5
Maximum Decrease in GWE (ft)	-4.7	-4.7	-3.6	-0.3
Average GWL Change (ft)	1.6	1.5	2.0	1.6
Average Well Depth (ft)	307	131	399	857
Number of Wells	101	57	31	13
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	16.3	16.3	10.1	8.0
Maximum Decrease in GWE (ft)	-6.8	-1.7	-6.8	-4.8
Average GWL Change (ft)	3.2	3.9	2.5	1.9
Average Well Depth (ft)	367	176	457	840
Number of Wells	92	50	27	15
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	15.4	8.5	15.4	7.8
Maximum Decrease in GWE (ft)	-34.6	-5.0	-8.2	-34.6
Average GWL Change (ft)	0.9	1.7	2.7	-4.0
Average Well Depth (ft)	359	128	401	894
Number of Wells	125	63	38	24
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	11.1	11.1	6.9	3.7
Maximum Decrease in GWE (ft)	-17.5	-1.5	-17.1	-17.5
Average GWL Change (ft)	-0.2	0.9	-0.1	-3.7
Average Well Depth (ft)	338	140	370	834
Number of Wells	49	25	15	9
TOTAL				
Maximum Increase in GWE (ft)	23.2	16.3	23.2	8.0
Maximum Decrease in GWE (ft)	-34.6	-5.0	-17.1	-34.6
Average GWL Change (ft)	1.5	2.1	2.0	-1.1
Average Well Depth (ft)	339	144	410	862
Number of Wells	406	218	124	64

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH Summer 2011 to Summer 2012				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		0.2	NA	NA
Maximum Decrease in GWE (ft)		-7.2	-2.4	-2.3
Average GWL Change (ft)		-2.2	-1.4	-2.1
Average Well Depth (ft)		140	458	790
Number of Wells	21	16	3	2
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		0.3	NA	NA
Maximum Decrease in GWE (ft)		-3.3	-10.6	-3.8
Average GWL Change (ft)		-1.4	-3.2	-3.8
Average Well Depth (ft)		133	426	865
Number of Wells	14	7	6	1
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		3.6	0.4	NA
Maximum Decrease in GWE (ft)		-12.9	-9.4	-7.9
Average GWL Change (ft)		-5.6	-4.3	-4.3
Average Well Depth (ft)		133	399	840
Number of Wells	84	50	23	11
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		0.8	6.0	0.2
Maximum Decrease in GWE (ft)		-22.6	-13.6	-11.1
Average GWL Change (ft)		-5.3	-3.3	-5
Average Well Depth (ft)		152	488	912
Number of Wells	80	49	18	13
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		2.3	0.6	30.3
Maximum Decrease in GWE (ft)		-18.3	-32.8	-14.9
Average GWL Change (ft)		-4.3	-6.6	-2.8
Average Well Depth (ft)		124	408	908
Number of Wells	122	63	33	26
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		6.5	0.6	NA
Maximum Decrease in GWE (ft)		-15.5	-20.4	-4.7
Average GWL Change (ft)		-1.3	-3.8	-2.4
Average Well Depth (ft)		132	370	860
Number of Wells	51	23	20	8
TOTAL				
Maximum Increase in GWE (ft)		6.5	6.0	30.3
Maximum Decrease in GWE (ft)		-22.6	-32.8	-14.9
Average GWL Change (ft)		-4.3	-4.6	-3.5
Average Well Depth (ft)		135	415	856
Number of Wells	372	208	103	61

Summer GWL Change - Deep Annual

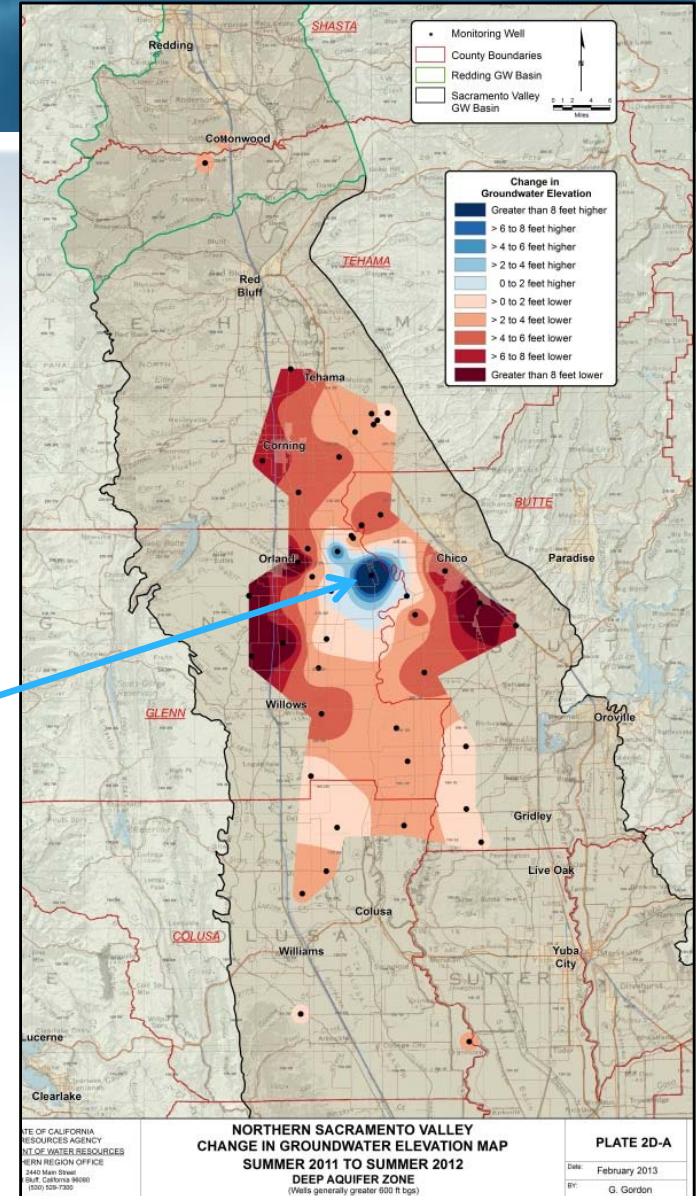
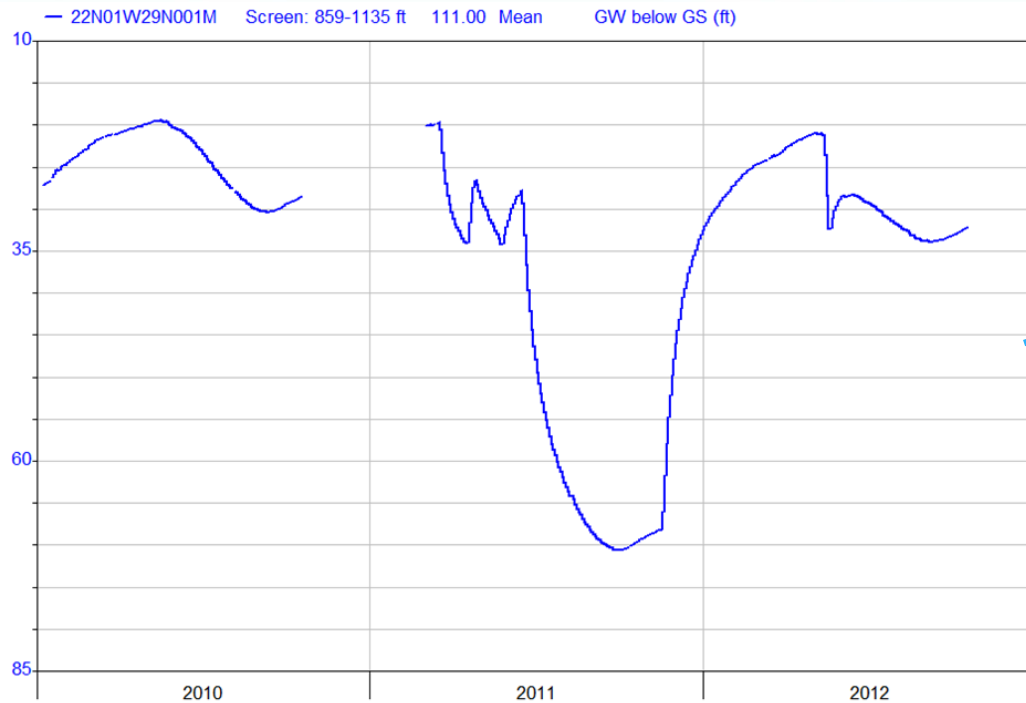


2011



2012

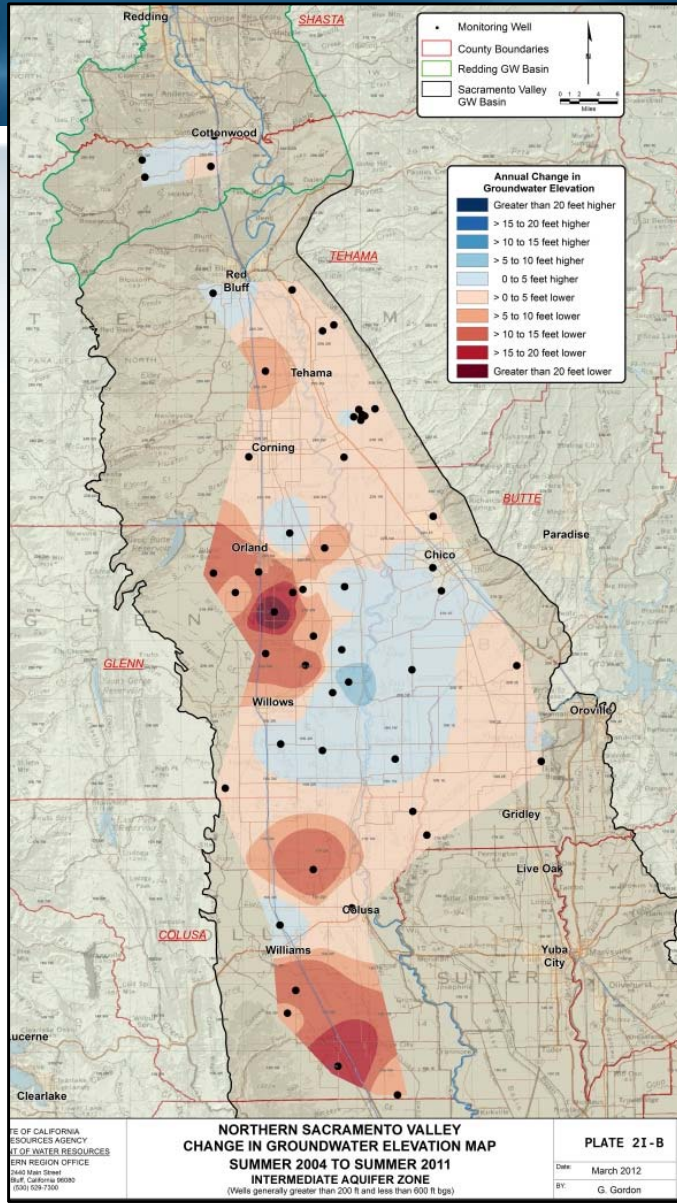
Summer GWL Change - Deep Annual



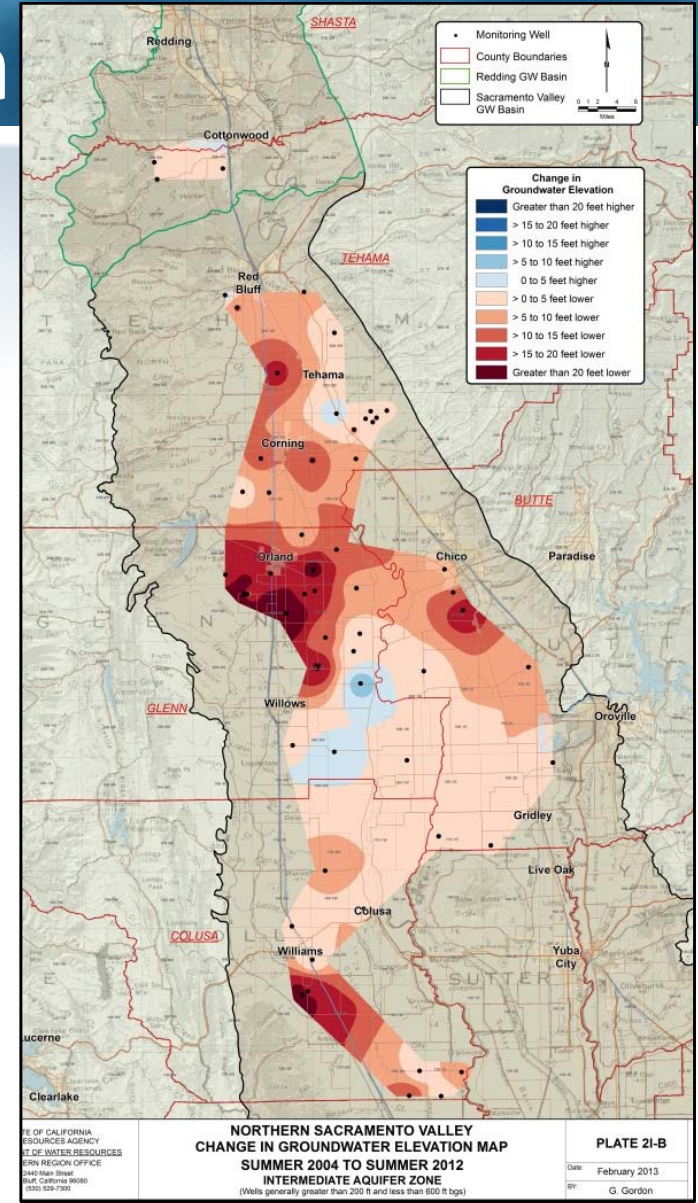
2012

Summer GWL Change - Intermediate

Long Term



2011



2012

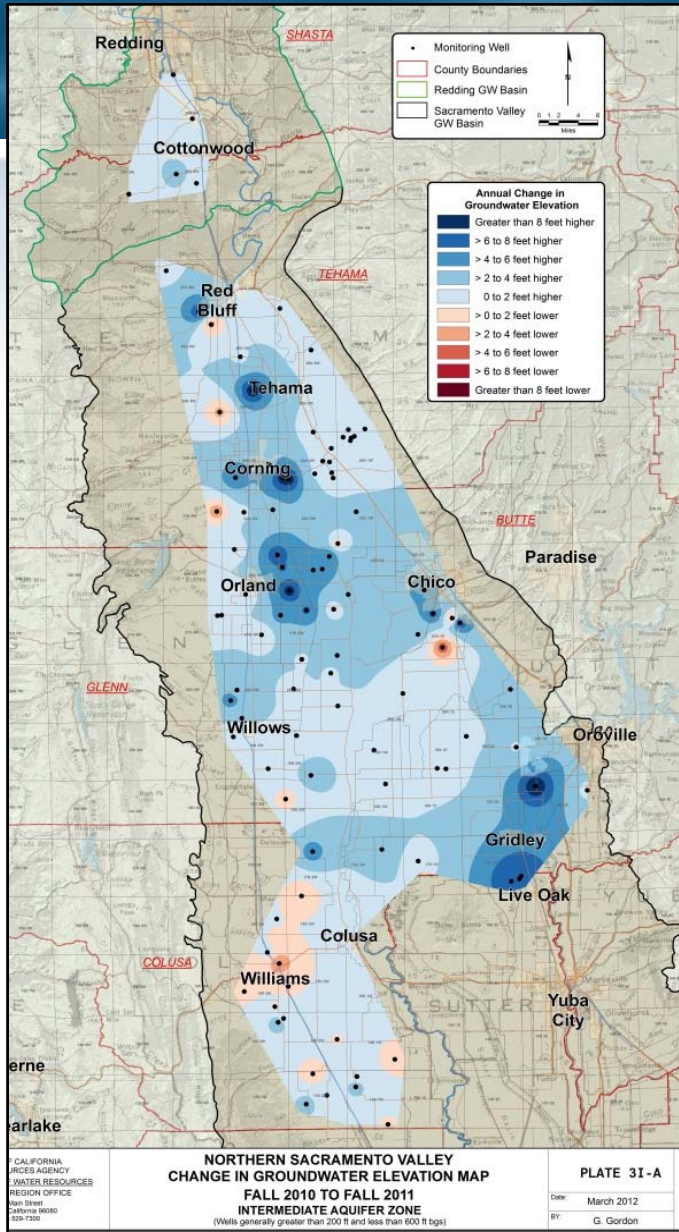
Change in GW Elevation Table

Summer Long-term

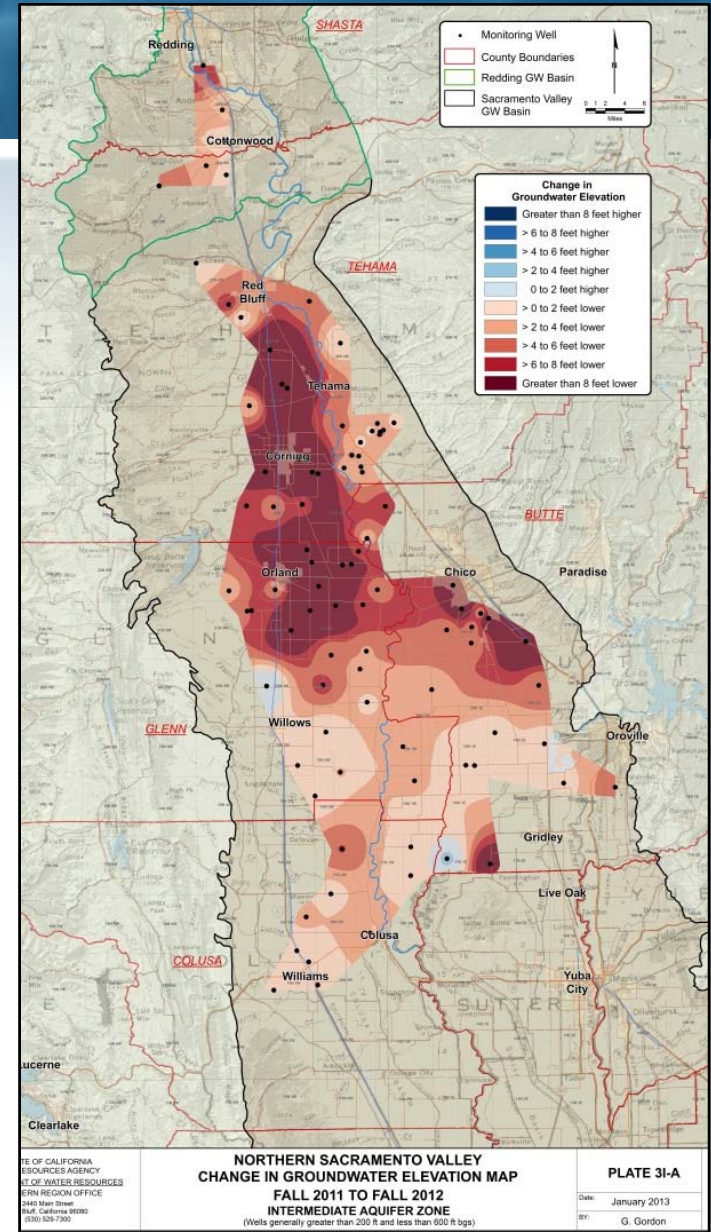
CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH SUMMER 2004 to SUMMER 2011				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	16.1	16.1	0.9	NA
Maximum Decrease in GWE (ft)	-10.9	-10.9	0.9	NA
Average GWL Change (ft)	0.4	0.3	0.9	NA
Average Well Depth (ft)	160.1	142.4	425.0	NA
Number of Wells	16	15.0	1.0	0.0
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	0.8	-0.1	0.8	NA
Maximum Decrease in GWE (ft)	-2.4	-2.4	-0.8	NA
Average GWL Change (ft)	-0.6	-1.3	0.1	NA
Average Well Depth (ft)	292.1	160.6	423.6	NA
Number of Wells	10	5.0	5.0	0.0
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	10.8	9.6	2.0	10.8
Maximum Decrease in GWE (ft)	-10.4	-10.4	-8.0	-6.6
Average GWL Change (ft)	-1.5	-1.6	-1.9	0.5
Average Well Depth (ft)	281.4	135.6	435.9	824.1
Number of Wells	66	43.0	16.0	7.0
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	9.8	9.8	2.9	1.3
Maximum Decrease in GWE (ft)	-13.9	-4.7	-3.0	-13.9
Average GWL Change (ft)	0.4	1.0	-0.7	-3.5
Average Well Depth (ft)	257.6	145.1	487.4	893.5
Number of Wells	57	43.0	10.0	4.0
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	9.5	4.4	9.5	-0.2
Maximum Decrease in GWE (ft)	-37.2	-37.2	-23.1	-35.8
Average GWL Change (ft)	-5.4	-4.0	-4.4	-18.8
Average Well Depth (ft)	273.6	128.1	409.8	928.4
Number of Wells	83	53.0	23.0	7.0
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	3.3	2.3	3.3	-10.9
Maximum Decrease in GWE (ft)	-18.9	-13.1	-18.9	-12.5
Average GWL Change (ft)	-4.6	-2.6	-6.7	-11.7
Average Well Depth (ft)	284.1	144.9	415.6	806.5
Number of Wells	27	16.0	9.0	2.0
TOTAL				
Maximum Increase in GWE (ft)	16.1	16.1	9.5	10.8
Maximum Decrease in GWE (ft)	-37.2	-37.2	-23.1	-35.8
Average GWL Change (ft)	-2.5	-1.6	-3.1	-8.3
Average Well Depth (ft)	266.9	137.8	430.6	872.8
Number of Wells	259	175	64	20

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH SUMMER 2004 to SUMMER 2012				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		16.1	0.3	NA
Maximum Decrease in GWE (ft)		-12.9	NA	NA
Average GWL Change (ft)		-1.3	0.3	NA
Average Well Depth (ft)		138	425	NA
Number of Wells	17	16	1	0
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		NA	NA	NA
Maximum Decrease in GWE (ft)		-1.7	-9.8	NA
Average GWL Change (ft)		-2.5	-3.0	NA
Average Well Depth (ft)		132	424	NA
Number of Wells	10	5	5	0
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		15.0	3.6	12.2
Maximum Decrease in GWE (ft)		-18.8	-17.4	-14.3
Average GWL Change (ft)		-6.1	-6.2	-3.0
Average Well Depth (ft)		134	405	804
Number of Wells	69	40	20	9
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		5.3	NA	NA
Maximum Decrease in GWE (ft)		-33.2	-18.7	-6.1
Average GWL Change (ft)		-5.7	-5.9	-5.6
Average Well Depth (ft)		161	436	892
Number of Wells	50	36	10	4
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		2.3	6.9	NA
Maximum Decrease in GWE (ft)		-42.2	-35.2	-54.4
Average GWL Change (ft)		-8.6	-11.7	-22.3
Average Well Depth (ft)		121	405	917
Number of Wells	81	50	23	8
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		7.5	1.8	NA
Maximum Decrease in GWE (ft)		-20.6	-23.8	-34.1
Average GWL Change (ft)		-3.6	-7.0	-13.9
Average Well Depth (ft)		141	402	713
Number of Wells	33	15	13	5
TOTAL				
Maximum Increase in GWE (ft)		16.1	6.9	1.2
Maximum Decrease in GWE (ft)		-6.0	-35.2	-54.4
Average GWL Change (ft)		137.0	-7.8	-11.4
Average Well Depth (ft)		162	410	835
Number of Wells	260	162	72	26

Fall GWL Change - Intermediate Annual

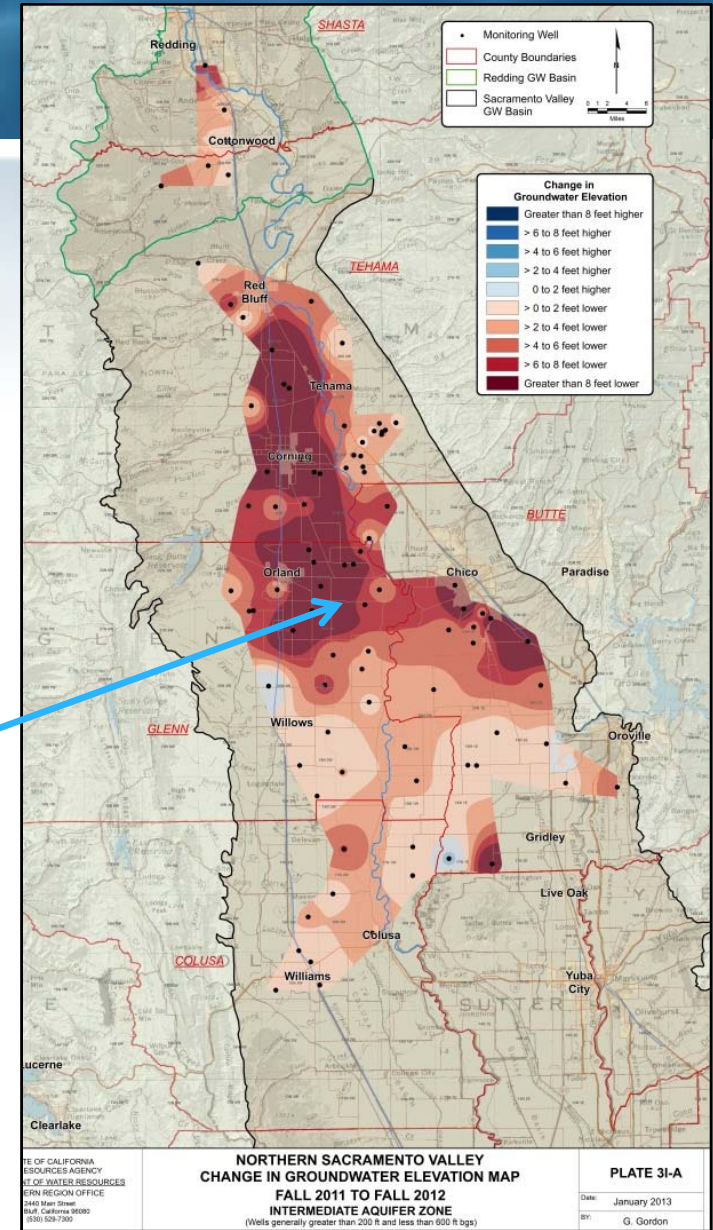
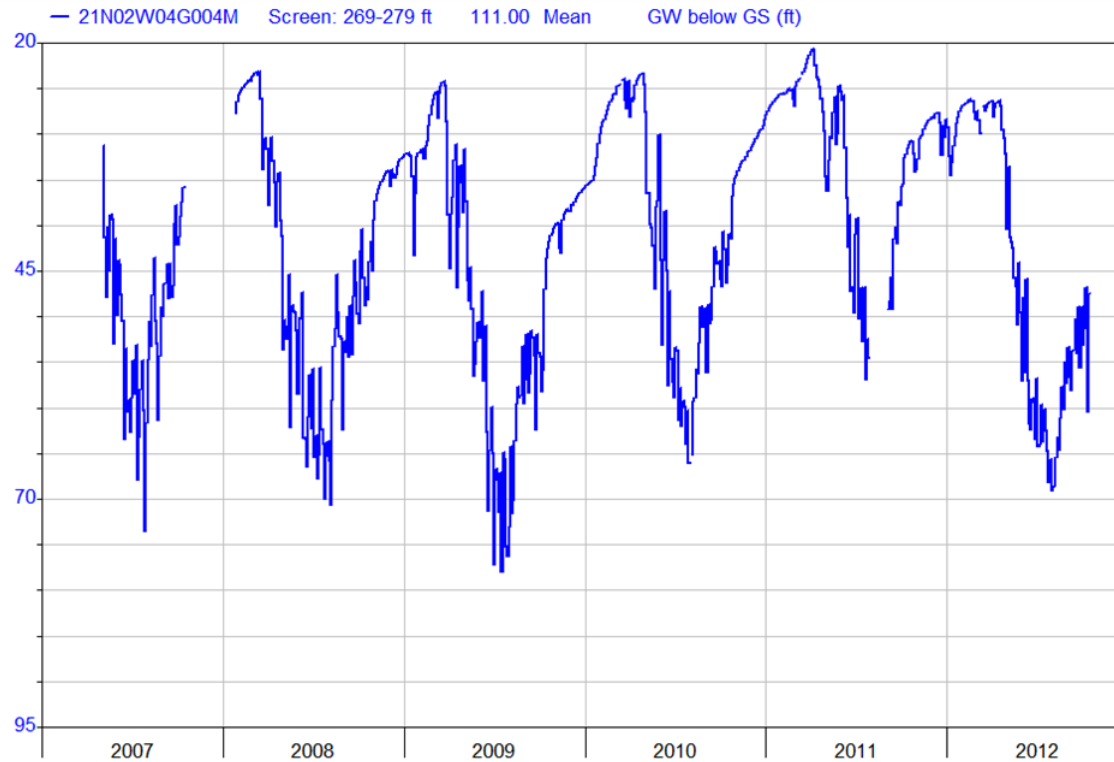


2011



2012

Fall GWL Change - Intermediate Annual



2012

Change in GW Elevation Table

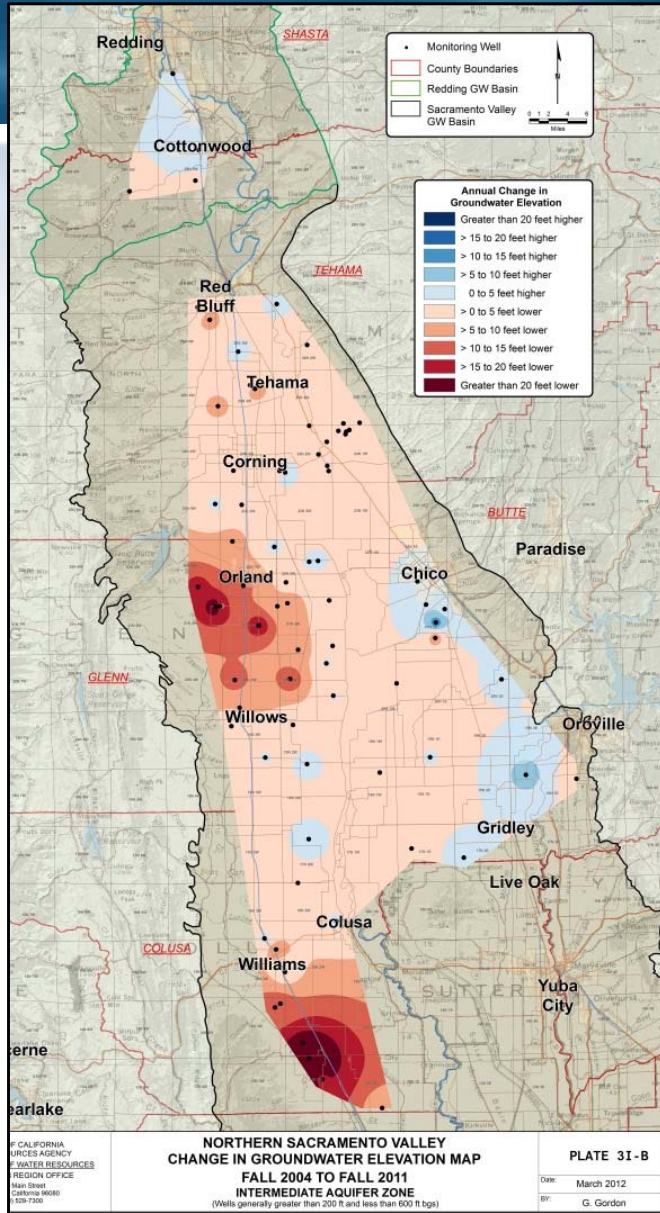
Fall Annual

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH FALL 2010 to FALL 2011				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	5.5	5.5	1.9	2.2
Maximum Decrease in GWE (ft)	0.0	0.0	1.3	2.1
Average GWL Change (ft)	2.0	2.0	1.7	2.2
Average Well Depth (ft)	238	141	408	790
Number of Wells	27	20	5	2
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	3.6	3.6	2.8	1.3
Maximum Decrease in GWE (ft)	-3.0	-3.0	0.1	1.3
Average GWL Change (ft)	1.0	0.8	1.2	1.3
Average Well Depth (ft)	323	152	456	865
Number of Wells	13	7	5	1
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	9.7	9.2	9.7	5.9
Maximum Decrease in GWE (ft)	-3.3	-1.6	-3.3	-0.9
Average GWL Change (ft)	1.8	1.7	2.3	1.2
Average Well Depth (ft)	304	125	389	845
Number of Wells	102	57	31	14
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	13.0	13.0	9.4	8.2
Maximum Decrease in GWE (ft)	-8.0	-4.8	-5.3	-8.0
Average GWL Change (ft)	2.2	2.2	2.2	2.1
Average Well Depth (ft)	348	175	502	857
Number of Wells	93	59	20	14
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	10.9	10.9	9.3	2.3
Maximum Decrease in GWE (ft)	-41.6	-18.6	-3.5	-41.6
Average GWL Change (ft)	0.4	1.8	2.8	-7.2
Average Well Depth (ft)	348	127	418	924
Number of Wells	136	76	35	25
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	13.0	13.0	5.7	4.1
Maximum Decrease in GWE (ft)	-4.9	-2.3	-4.9	-4.1
Average GWL Change (ft)	0.9	1.4	0.7	0.3
Average Well Depth (ft)	373	134	400	905
Number of Wells	60	27	22	11
TOTAL				
Maximum Increase in GWE (ft)	13.0	13.0	9.7	8.2
Maximum Decrease in GWE (ft)	-41.6	-18.6	-5.3	-41.6
Average GWL Change (ft)	1.3	1.8	2.1	-1.9
Average Well Depth (ft)	334	141	422	885
Number of Wells	431	246	118	67

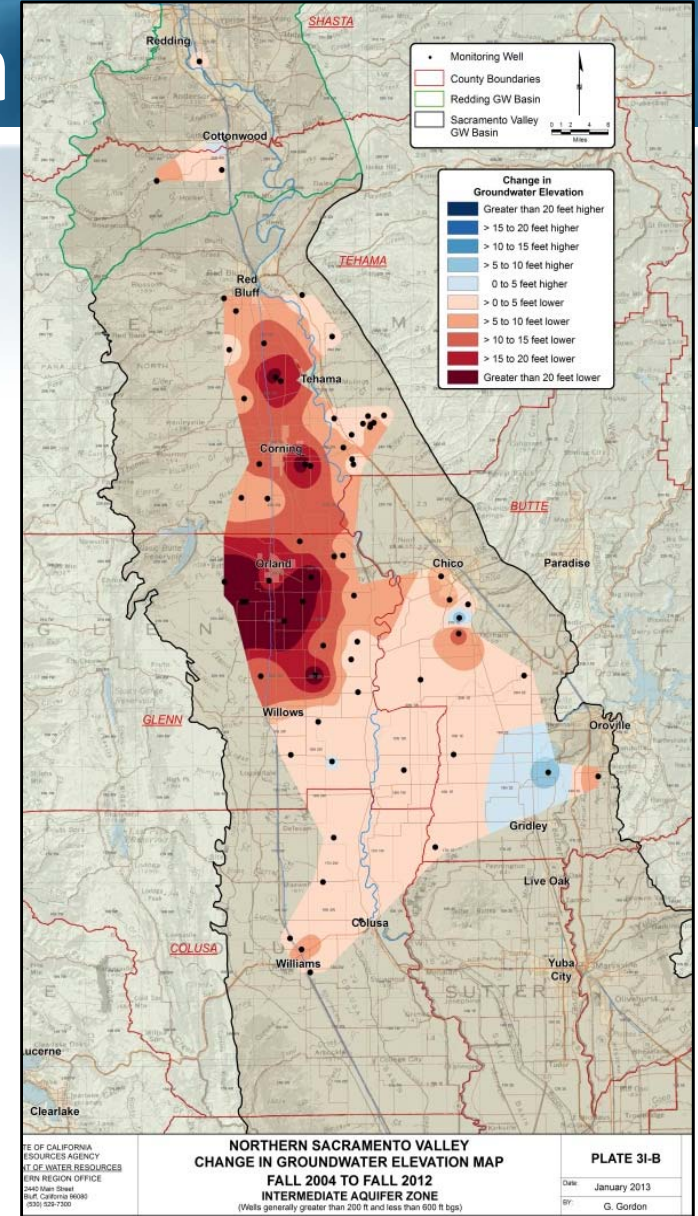
CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH FALL 2011 to FALL 2012				
	Total	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		0.1	NA	NA
Maximum Decrease in GWE (ft)		-6.4	-7.8	-2.6
Average GWL Change (ft)		-2.3	-3.9	-2.6
Average Well Depth (ft)		145	408	790
Number of Wells	26	19	5	2
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		NA	NA	NA
Maximum Decrease in GWE (ft)		-5.0	-11.3	-4.7
Average GWL Change (ft)		-3.4	-4.0	-4.7
Average Well Depth (ft)		153	456	865
Number of Wells	13	7	5	1
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		2.4	NA	NA
Maximum Decrease in GWE (ft)		-13.8	-21.3	-26.1
Average GWL Change (ft)		-3.9	-6.6	-5.9
Average Well Depth (ft)		126	388	838
Number of Wells	98	53	31	14
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		2.0	2.5	3.7
Maximum Decrease in GWE (ft)		-17.2	-16.3	-13.7
Average GWL Change (ft)		-3.7	-5.4	-4.2
Average Well Depth (ft)		154	478	896
Number of Wells	96	57	25	14
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		3.2	1.9	38.1
Maximum Decrease in GWE (ft)		-21.6	-22.1	-19.2
Average GWL Change (ft)		-4.3	-6.6	1.9
Average Well Depth (ft)		125	408	918
Number of Wells	130	72	32	26
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		0.4	0.1	NA
Maximum Decrease in GWE (ft)		-8.3	-6.5	-6.4
Average GWL Change (ft)		-1.5	-2.3	-2.7
Average Well Depth (ft)		126	382	868
Number of Wells	37	17	13	7
TOTAL				
Maximum Increase in GWE (ft)		3.2	2.5	38.1
Maximum Decrease in GWE (ft)		-21.6	-22.1	-26.1
Average GWL Change (ft)		-3.6	-5.6	-1.9
Average Well Depth (ft)		135	417	885
Number of Wells	400	225	111	64

Fall GWL Change - Intermediate

Long Term



2011



2012

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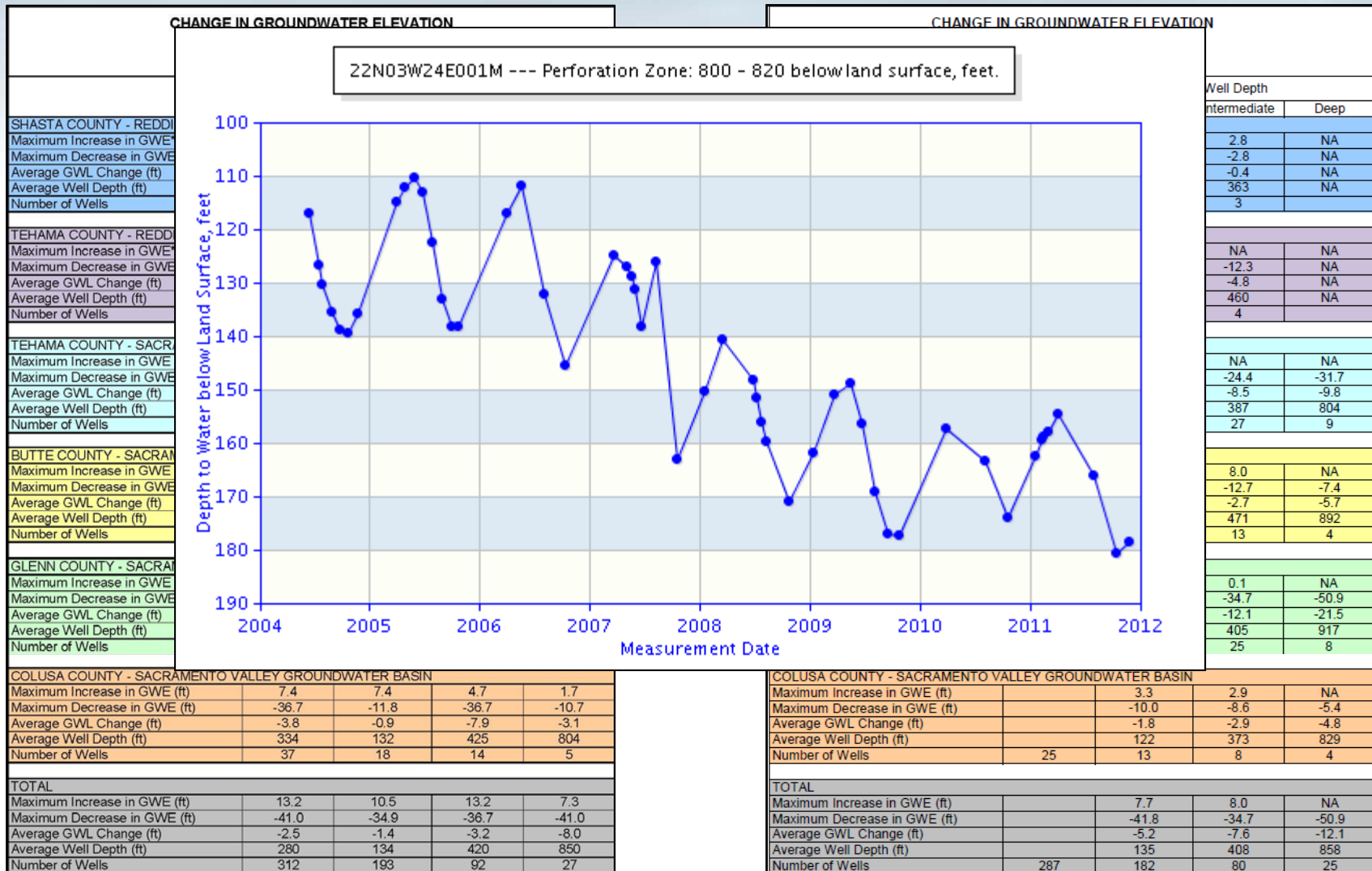
Change in GW Elevation Table

Fall Long-term

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH FALL 2004 to FALL 2011				
	All Well Depths	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	10.5	10.5	5.0	NA
Maximum Decrease in GWE (ft)	-4.9	-4.9	NA	NA
Average GWL Change (ft)	2.9	2.4	4.4	NA
Average Well Depth (ft)	208	150	363	NA
Number of Wells	11	8	3	NA
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)	1.6	1.6	0.1	NA
Maximum Decrease in GWE (ft)	-2.2	-2.2	-1.0	NA
Average GWL Change (ft)	-0.5	-0.4	-0.6	NA
Average Well Depth (ft)	293	161	460	NA
Number of Wells	9	5	4	NA
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	8.1	8.1	5.5	0.4
Maximum Decrease in GWE (ft)	-8.2	-6.9	-8.2	-6.4
Average GWL Change (ft)	-1.5	-1.1	-1.9	-2.6
Average Well Depth (ft)	279	126	394	807
Number of Wells	87	51	27	9
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	13.2	6.2	13.2	7.3
Maximum Decrease in GWE (ft)	-11.3	-11.3	-7.9	-3.9
Average GWL Change (ft)	0.8	0.5	1.4	2.4
Average Well Depth (ft)	282	155	464	847
Number of Wells	61	42	14	5
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	4.0	4.0	3.6	NA
Maximum Decrease in GWE (ft)	-41.0	-34.9	-29.9	-41.0
Average GWL Change (ft)	-5.4	-3.3	-5.5	-23.5
Average Well Depth (ft)	268	125	421	929
Number of Wells	107	69	30	8
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)	7.4	7.4	4.7	1.7
Maximum Decrease in GWE (ft)	-36.7	-11.8	-36.7	-10.7
Average GWL Change (ft)	-3.8	-0.9	-7.9	-3.1
Average Well Depth (ft)	334	132	425	804
Number of Wells	37	18	14	5
TOTAL				
Maximum Increase in GWE (ft)	13.2	10.5	13.2	7.3
Maximum Decrease in GWE (ft)	-41.0	-34.9	-36.7	-41.0
Average GWL Change (ft)	-2.5	-1.4	-3.2	-8.0
Average Well Depth (ft)	280	134	420	850
Number of Wells	312	193	92	27

CHANGE IN GROUNDWATER ELEVATION BY WELL DEPTH FALL 2004 to FALL 2012				
	Total	Well Depth		
		Shallow	Intermediate	Deep
SHASTA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		7.0	2.8	NA
Maximum Decrease in GWE (ft)		-4.8	-2.8	NA
Average GWL Change (ft)		0.3	-0.4	NA
Average Well Depth (ft)		162	363	NA
Number of Wells	11	8	3	
TEHAMA COUNTY - REDDING GROUNDWATER BASIN				
Maximum Increase in GWE** (ft)		NA	NA	NA
Maximum Decrease in GWE (ft)		-5.0	-12.3	NA
Average GWL Change (ft)		-3.3	-4.8	NA
Average Well Depth (ft)		149	460	NA
Number of Wells	10	6	4	
TEHAMA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		7.7	NA	NA
Maximum Decrease in GWE (ft)		-11.9	-24.4	-31.7
Average GWL Change (ft)		-5.0	-8.5	-9.8
Average Well Depth (ft)		125	387	804
Number of Wells	90	54	27	9
BUTTE COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		3.3	8.0	NA
Maximum Decrease in GWE (ft)		-18.3	-12.7	-7.4
Average GWL Change (ft)		-3.9	-2.7	-5.7
Average Well Depth (ft)		154	471	892
Number of Wells	55	38	13	4
GLENN COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		3.9	0.1	NA
Maximum Decrease in GWE (ft)		-41.8	-34.7	-50.9
Average GWL Change (ft)		-6.9	-12.1	-21.5
Average Well Depth (ft)		128	405	917
Number of Wells	96	63	25	8
COLUSA COUNTY - SACRAMENTO VALLEY GROUNDWATER BASIN				
Maximum Increase in GWE (ft)		3.3	2.9	NA
Maximum Decrease in GWE (ft)		-10.0	-8.6	-5.4
Average GWL Change (ft)		-1.8	-2.9	-4.8
Average Well Depth (ft)		122	373	829
Number of Wells	25	13	8	4
TOTAL				
Maximum Increase in GWE (ft)		7.7	8.0	NA
Maximum Decrease in GWE (ft)		-41.8	-34.7	-50.9
Average GWL Change (ft)		-5.2	-7.6	-12.1
Average Well Depth (ft)		135	408	858
Number of Wells	287	182	80	25

Change in GW Elevation Table Fall Long-term



Agenda for Glenn County WAC

- Glenn County Geology
- Precipitation
- Land use
 - Crop type, irrigation type, and water use (2003-2009)
- Review 2011 and 2012 GW elevation change maps
 - Brief map introduction
 - Spring and fall
 - Intermediate aquifer
 - The county numbers
 - Select hydrographs
- Closing and questions

Closing

- Geology
 - Fixed
 - Location, storage, movement, WQ, recharge, and recovery of GW
- Precipitation
 - GW recharge, timing, surface water availability, and possible WQ
- More analysis
 - Geologic influences
 - Precipitation variability
 - Land use variability (crop, irrigation methods, and water source)

Thank you

Questions?