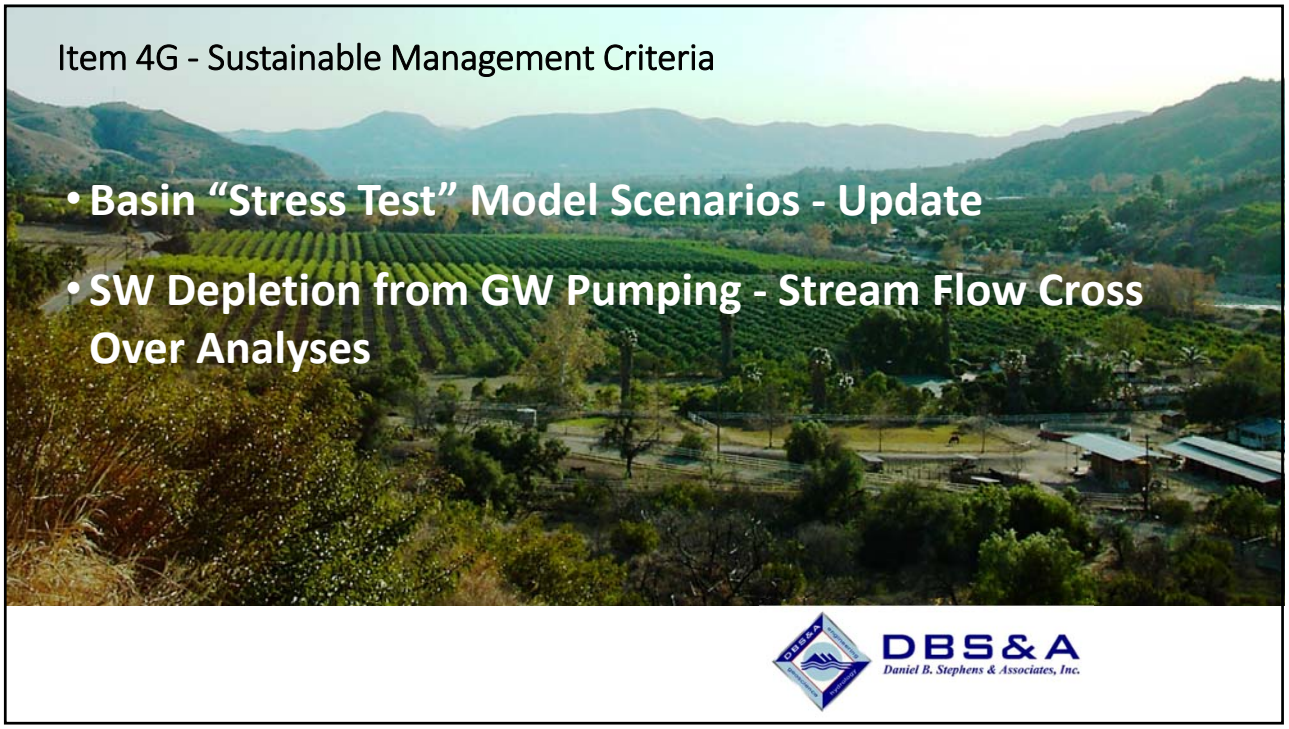


Basin "Stress Test"

Preliminary Draft - For Internal Discussion Purposes Only

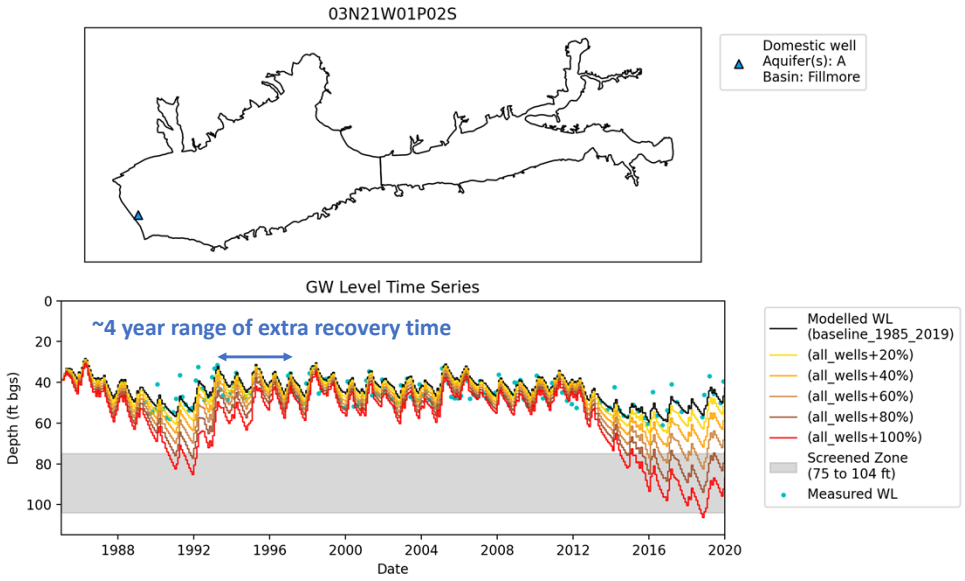
- GW pumping increased for all well categories by 20%, 40%, 60%, 80%, & 100%

Pumping , AFY	Fillmore basin	Piru basin	Total for both basins
Baseline	46,760	11,390	58,150
Baseline + 20%	56,120	13,670	69,780
Baseline + 40%	65,470	15,950	81,420
Baseline + 60%	74,820	18,220	93,050
Baseline + 80%	84,180	20,500	104,680
Baseline + 100%	93,530	22,780	116,310

(Values rounded to nearest 10 AFY)

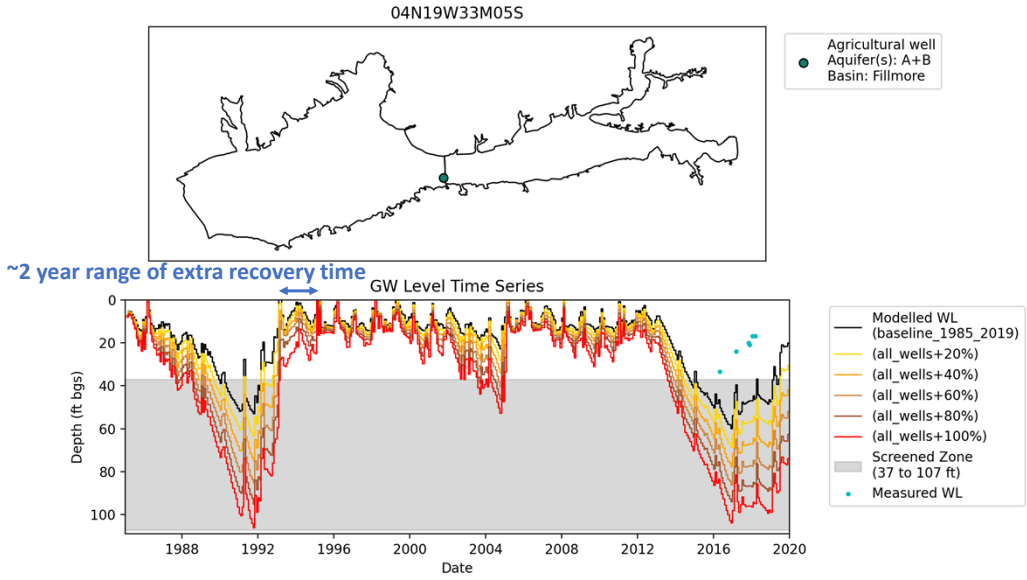
Basin "Stress Test"

Preliminary Draft - For Internal Discussion Purposes Only



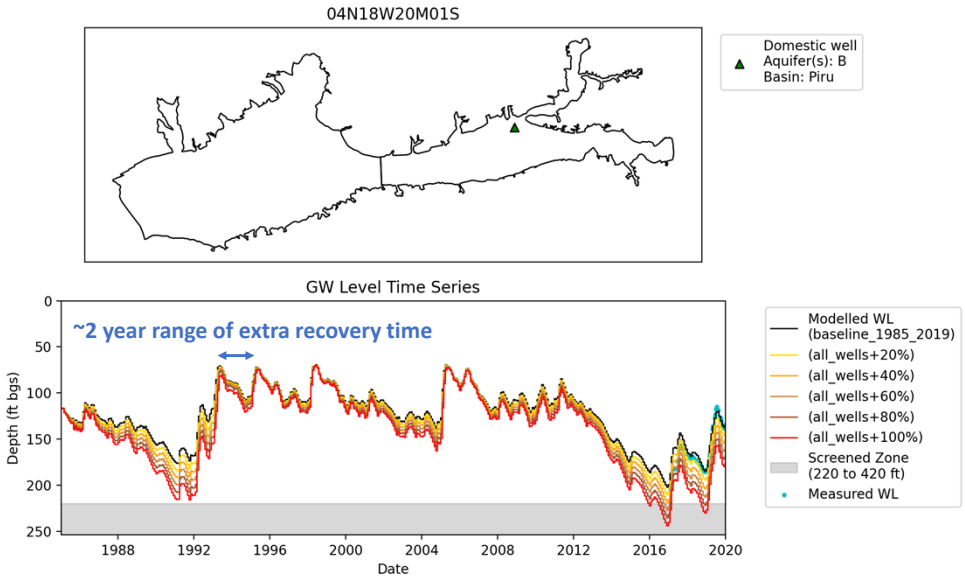
Basin "Stress Test"

Preliminary Draft - For Internal Discussion Purposes Only



Basin "Stress Test"

Preliminary Draft - For Internal Discussion Purposes Only



Basin "Stress Test" - Summary *(based on limited # of wells)*

In general...

Pumping Scenario	Extra Recovery Time Needed
Baseline + 20%	0 to 0.5 year
Baseline + 40%	0.5 to 1 year
Baseline + 60%	1 to 2 years
Baseline + 80%	2 to 3 years
Baseline + 100%	2 to 4 years

Preliminary Draft - For Internal Discussion Purposes Only

Basin "Stress Test" - Summary

	No. of Wells with GW Level below Bottom of Screen							
	Fillmore				Piru			
Pumping Scenario	Agricultural	Domestic	Municipal	Industrial	Agricultural	Domestic	Municipal	Industrial
Baseline	0	0	0	0	0	0	0	0
Baseline + 20%	1	0	0	0	0	0	0	0
Baseline + 40%	2	4	0	0	0	1	0	1
Baseline + 60%	4	7	0	0	1	1	0	1
Baseline + 80%	6	10	0	0	5	1	0	1
Baseline + 100%	14	17	0	0	5	1	0	1

* No. reflects number of wells (with known screen construction information) predicted to go dry at any time.

Preliminary Draft - For Internal Discussion Purposes Only

Item 4A - Sustainable Management Criteria

Water Level - Stream Flow Cross Over Analyses

- Expand relationship(s) between WLs in wells near rising GW areas and measured SW flow
- Impact of pumping on SW flows

DBS&A
Daniel B. Stephens & Associates, Inc.

Water Level - Stream Flow Cross Over Analyses

Results of the analyses done by United:

- cross over relationship between WLs and SW flow; and
- impact of pumping on SW flow

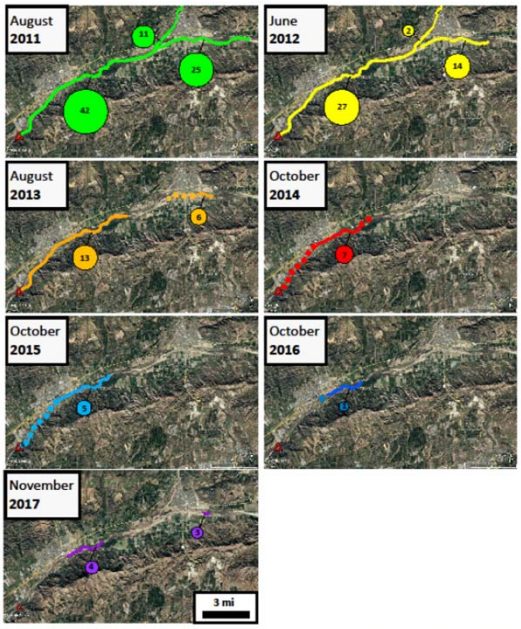
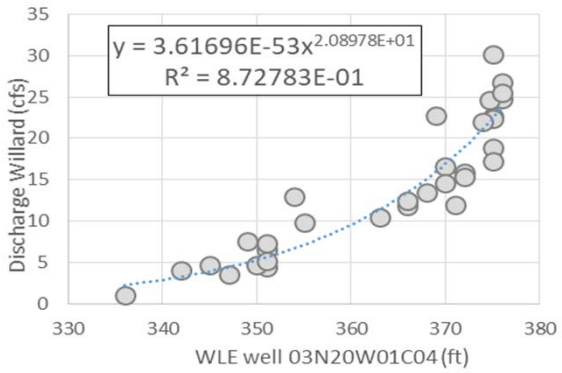


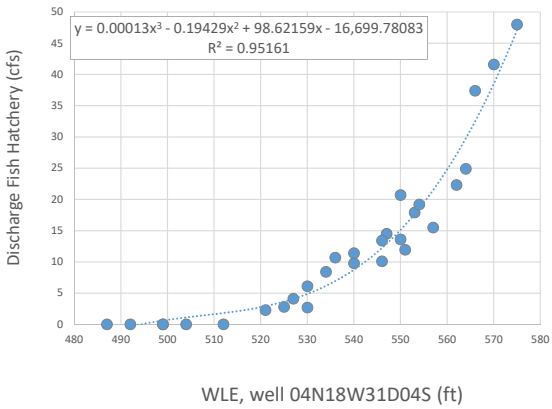
Figure 5.2-2. Length of wetted areas (colored lines) in the lower Santa Clara River, upstream of the Freeman Diversion (indicated by red triangle). Reaches where the end of the wetted area is uncertain are indicated by dotted lines. Flow rates (cfs) are indicated in circles, scaled according to magnitude.

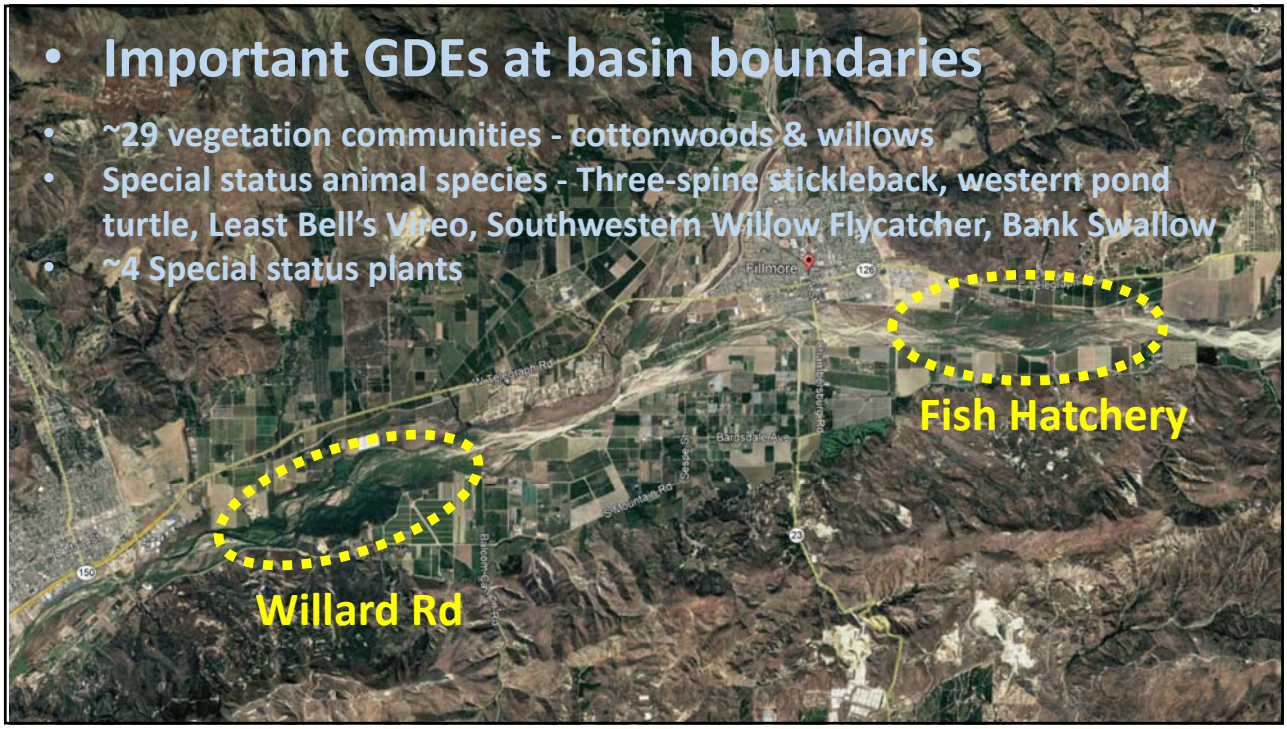
Water Level - Stream Flow Cross Over Analyses

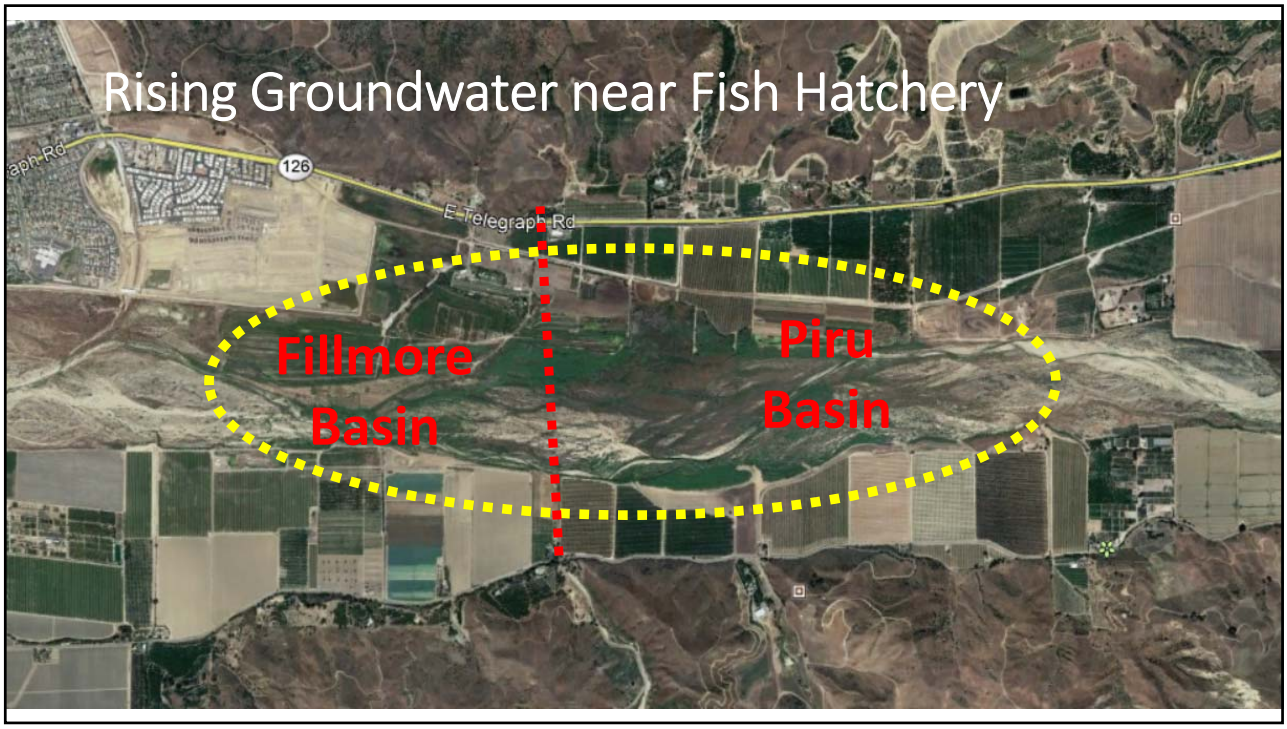
Willard Road

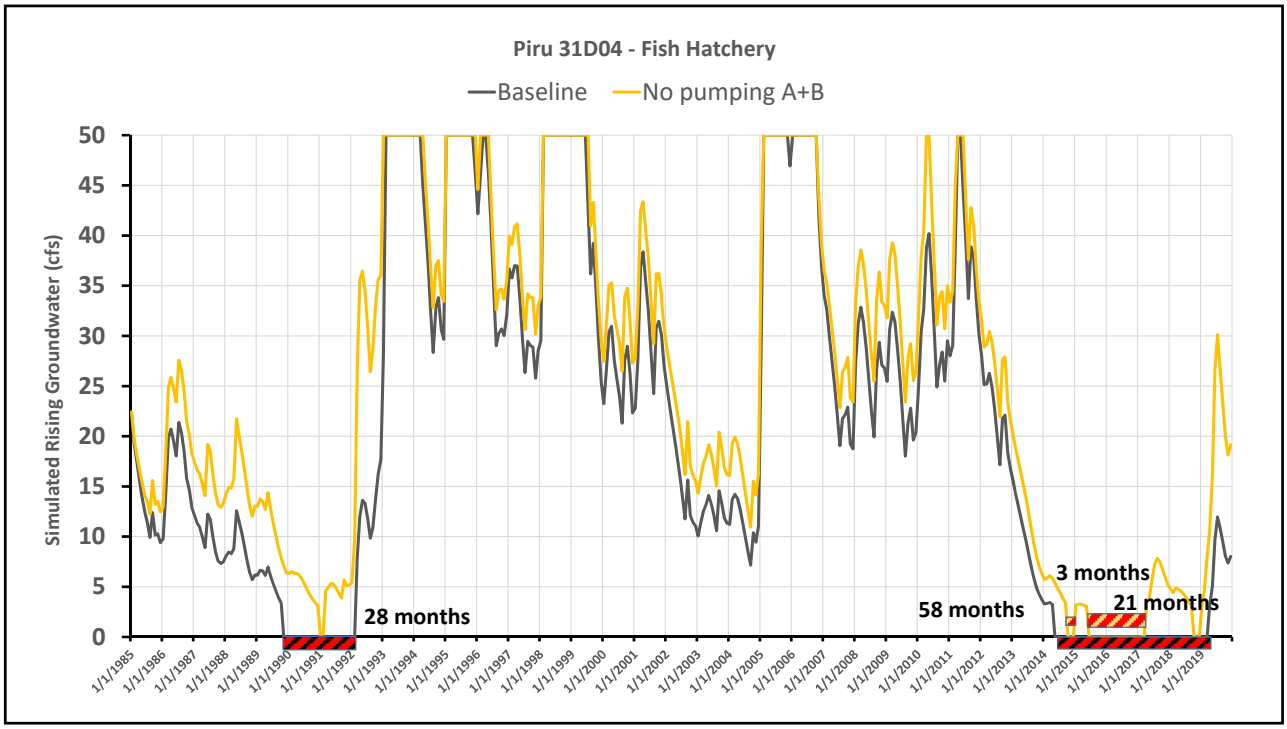


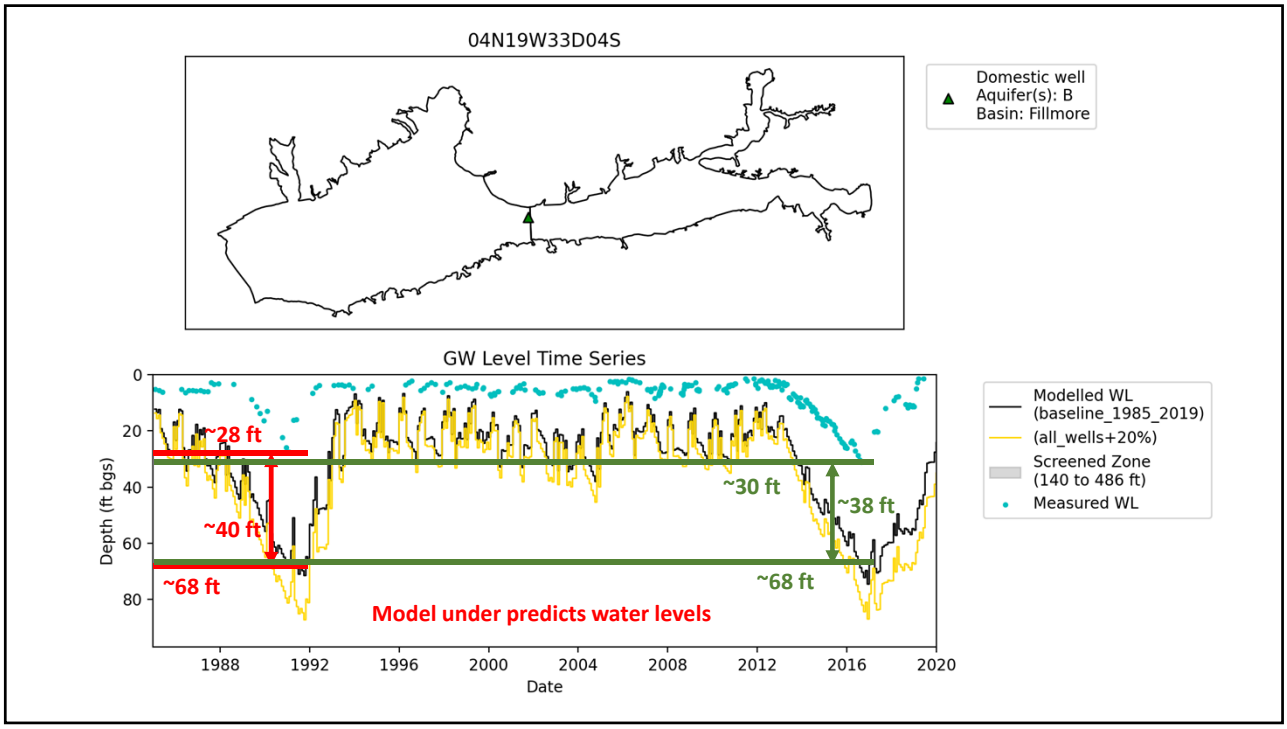
Fish Hatchery

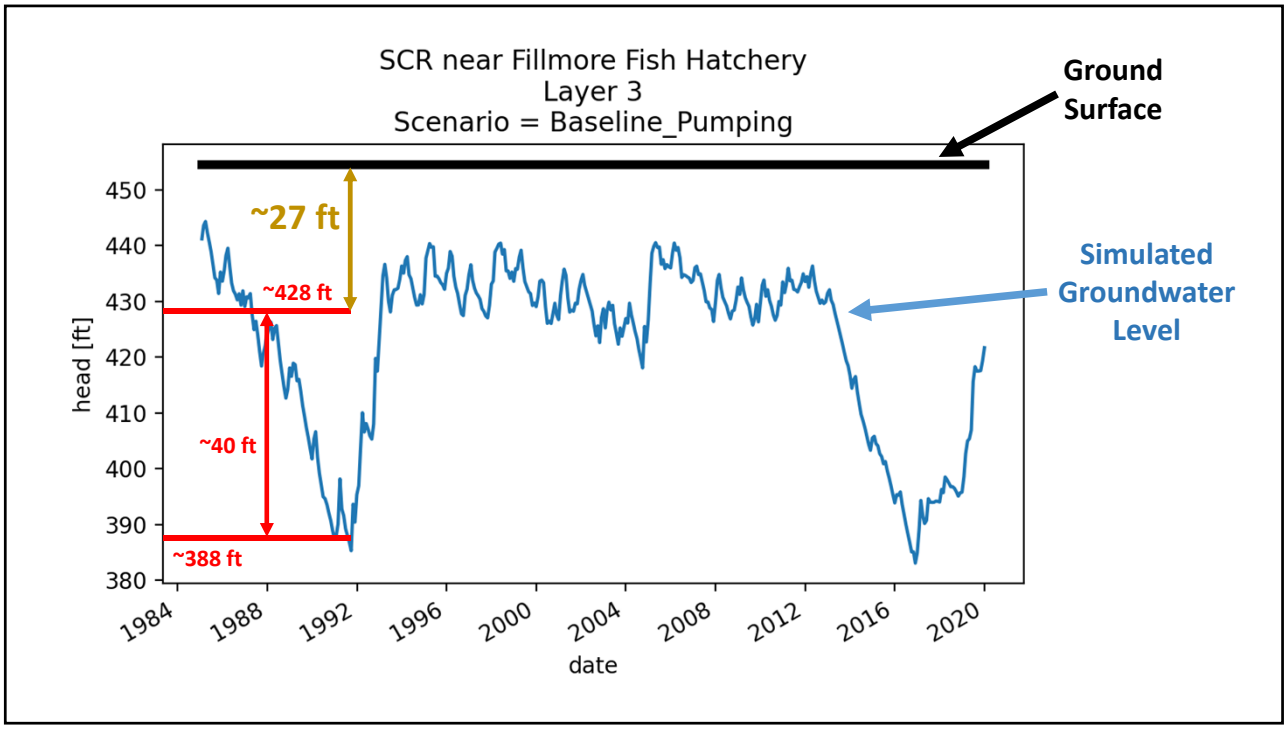


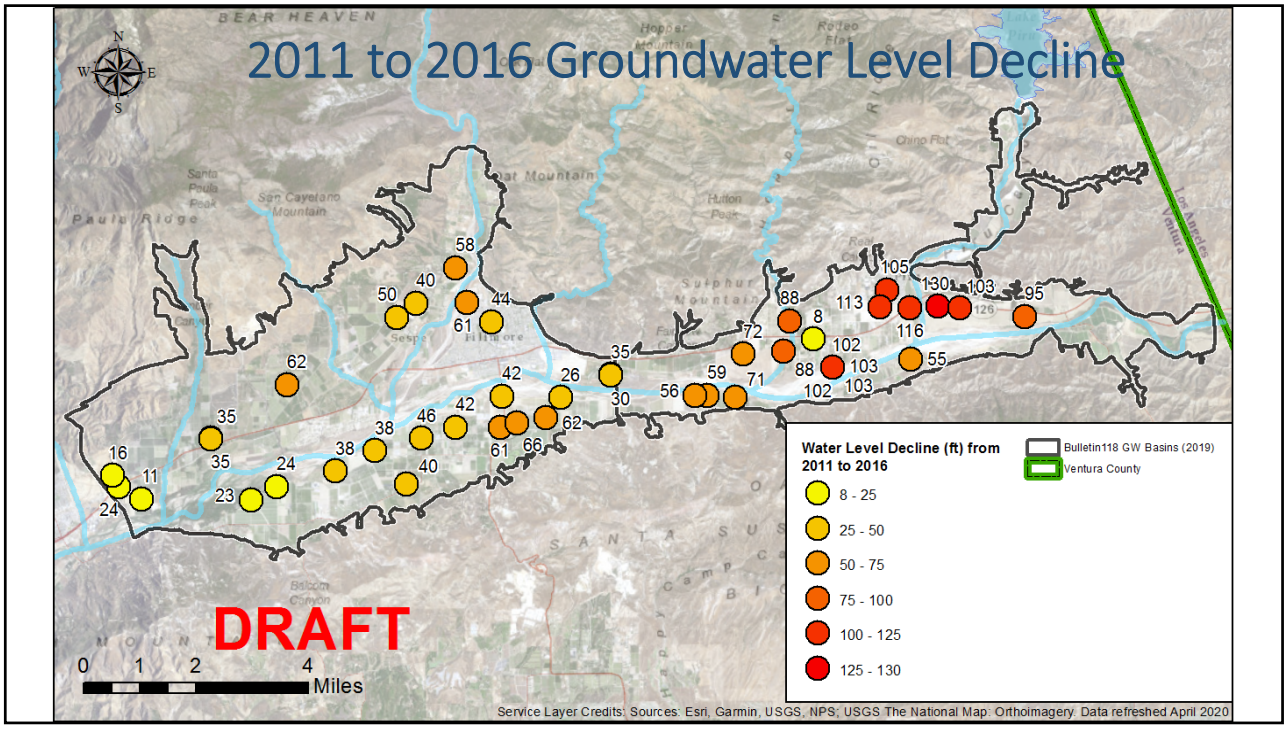

Important GDEs at basin boundaries
~29 vegetation communities - cottonwoods & willows
Special status animal species - Three-spine stickleback, western pond turtle, Least Bell's Vireo, Southwestern Willow Flycatcher, Bank Swallow
~4 Special status plants
Fish Hatchery
Willard Rd


Rising Groundwater near Fish Hatchery
E Telegraph Rd
126
Fillmore Basin
Piru Basin


Piru 31D04 - Fish Hatchery
Baseline
No pumping A+B
Simulated Rising Groundwater (cfs)
50
45
40
35
30
25
20
15
10
5
0
28 months
58 months
3 months
21 months
1/1/1985
1/1/1986
1/1/1987
1/1/1988
1/1/1989
1/1/1990
1/1/1991
1/1/1992
1/1/1993
1/1/1994
1/1/1995
1/1/1996
1/1/1997
1/1/1998
1/1/1999
1/1/2000
1/1/2001
1/1/2002
1/1/2003
1/1/2004
1/1/2005
1/1/2006
1/1/2007
1/1/2008
1/1/2009
1/1/2010
1/1/2011
1/1/2012
1/1/2013
1/1/2014
1/1/2015
1/1/2016
1/1/2017
1/1/2018
1/1/2019


04N19W33D04S
Domestic well
Aquifer(s): B
Basin: Fillmore
GW Level Time Series
Depth (ft bgs)
0
20
40
60
80
~28 ft
~40 ft
~68 ft
~30 ft
~38 ft
~68 ft
Model under predicts water levels
1988
1992
1996
2000
2004
2008
2012
2016
2020
Date
Modelled WL
(baseline_1985_2019)
(all_wells+20%)
Screened Zone
(140 to 486 ft)
Measured WL


SCR near Fillmore Fish Hatchery
Layer 3
Scenario = Baseline_Pumping
Ground Surface
~27 ft
~428 ft
~40 ft
~388 ft
Simulated Groundwater Level
head [ft]
450
440
430
420
410
400
390
380
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
date


2011 to 2016 Groundwater Level Decline
DRAFT
Water Level Decline (ft) from 2011 to 2016
8 - 25
25 - 50
50 - 75
75 - 100
100 - 125
125 - 130
Bulletin118 GW Basins (2019)
Ventura County
0 1 2 4 Miles
Service Layer Credits: Sources: Esri, Garmin, USGS, NPS; USGS The National Map: Orthoimagery. Data refreshed April 2020

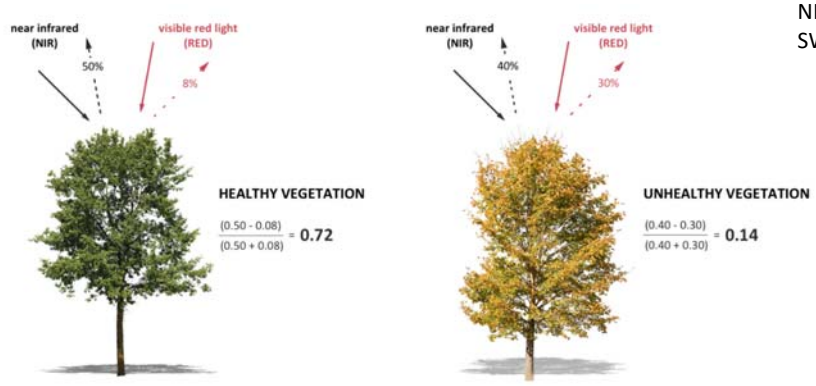
Satellite-Derived Vegetation Data

Normalized Derived Vegetation Index (NDVI)
measures "greenness"

Normalized Derived Moisture Index (NDMI)
estimates vegetation moisture

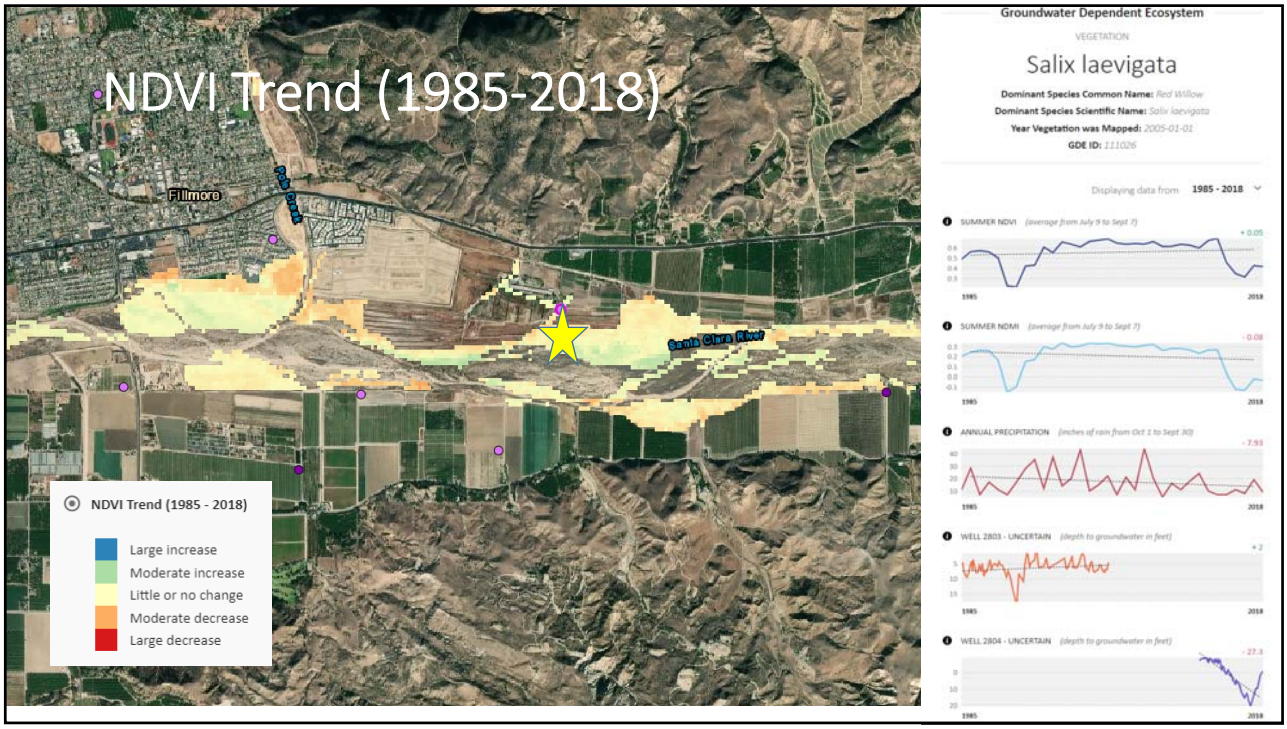
TABLE 1 Vegetation Metrics in GDE Pulse

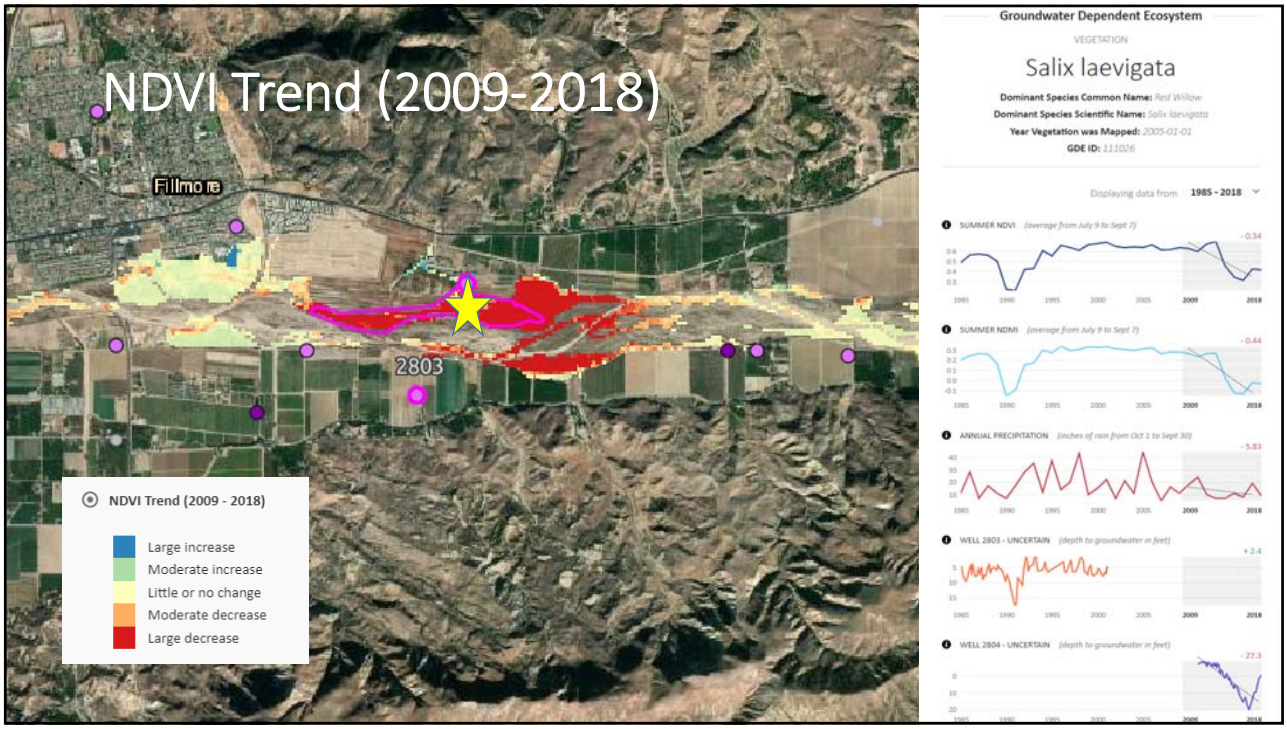
Spectral Index	Equation	Source
NDVI	NDVI = (NIR – red)/(NIR + red)	(Rouse et al. 1974)
NDMI	NDMI = (NIR – SWIR)/(NIR + SWIR1)	(Wilson and Sader 2002)

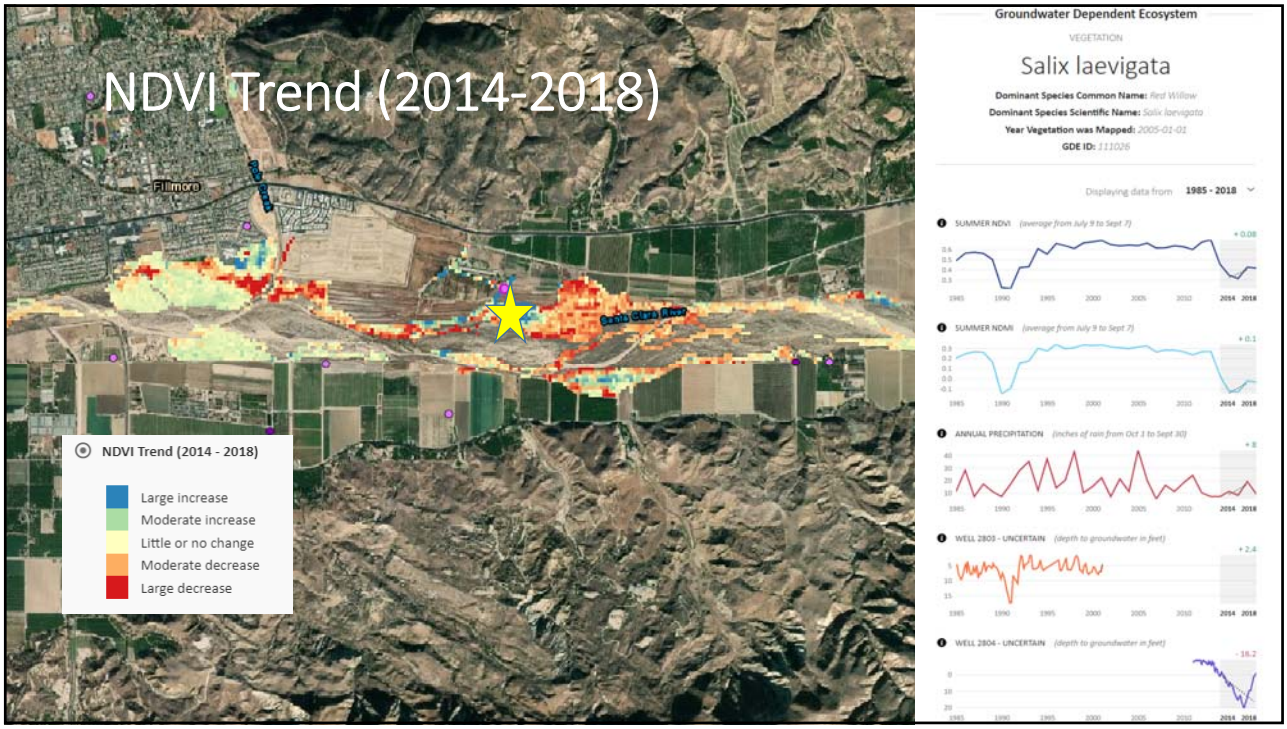


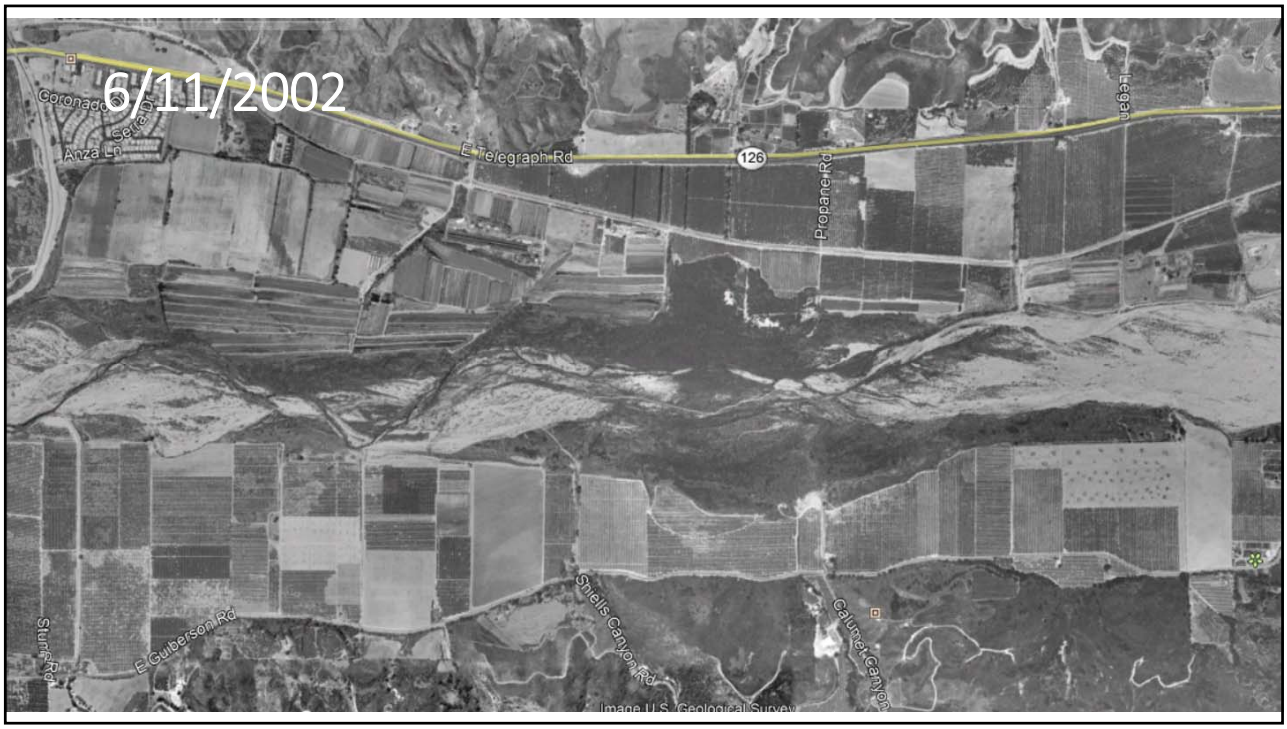
NIR = near infrared
SWIR = short wave infrared

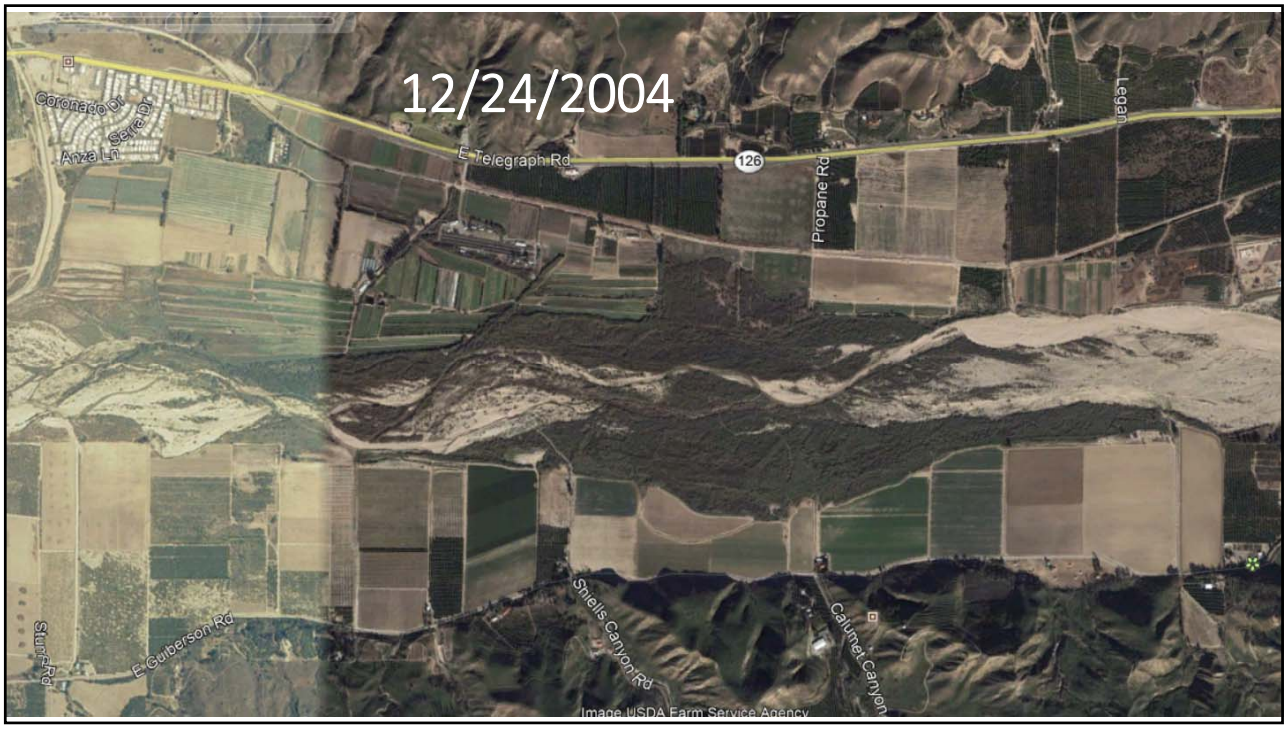
https://groundwaterresourcehub.org/sgma-tools/gde-pulse/

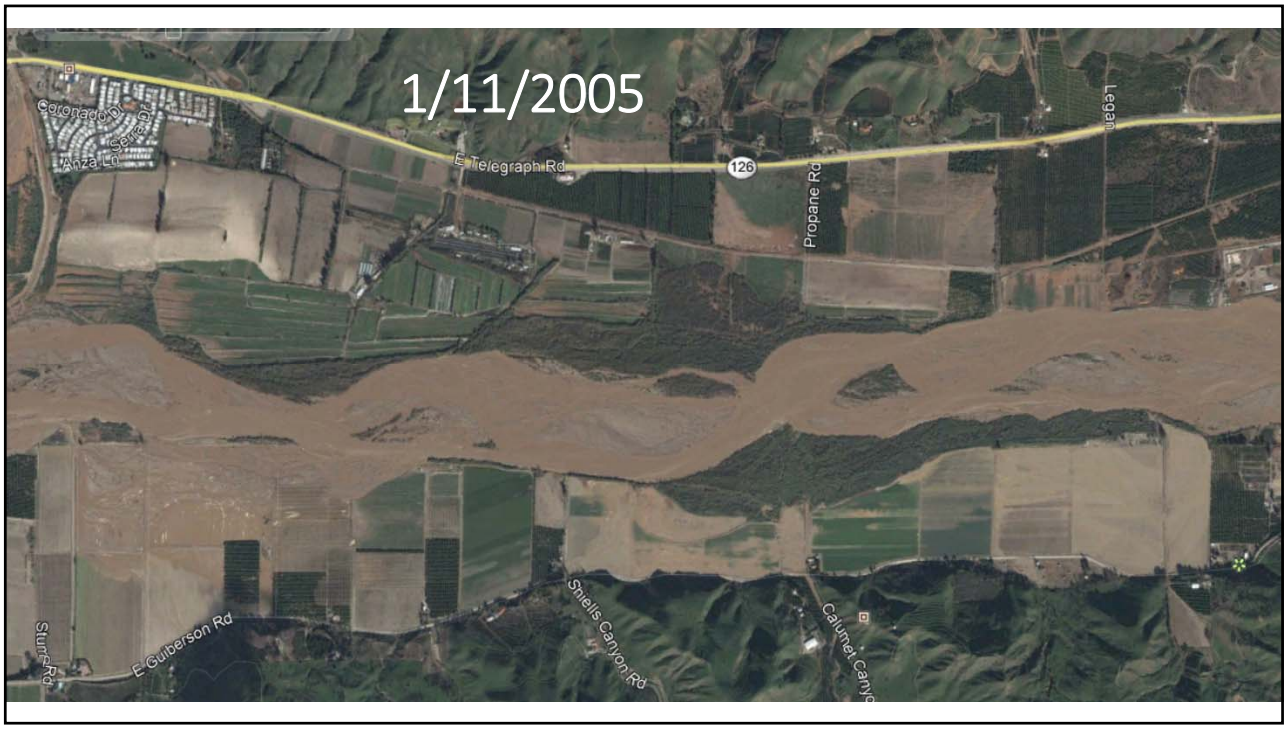



NDVI Trend (2009-2018)
Fillmore
2803
NDVI Trend (2009 - 2018)
Large increase
Moderate increase
Little or no change
Moderate decrease
Large decrease
Groundwater Dependent Ecosystem
VEGETATION
Salix laevigata
Dominant Species Common Name: Red Willow
Dominant Species Scientific Name: Salix laevigata
Year Vegetation was Mapped: 2005-01-01
GDE ID: 111026
Displaying data from 1985 - 2018
SUMMER NDVI (average from July 9 to Sept 7)
SUMMER NDMI (average from July 9 to Sept 7)
ANNUAL PRECIPITATION (inches of rain from Oct 1 to Sept 30)
WELL 2803 - UNCERTAIN (depth to groundwater in feet)
WELL 2804 - UNCERTAIN (depth to groundwater in feet)


NDVI Trend (2014-2018)
Fillmore
Santa Clara River
NDVI Trend (2014 - 2018)
Large increase
Moderate increase
Little or no change
Moderate decrease
Large decrease
Groundwater Dependent Ecosystem
VEGETATION
Salix laevigata
Dominant Species Common Name: Red Willow
Dominant Species Scientific Name: Salix laevigata
Year Vegetation was Mapped: 2005-01-01
GDE ID: 111026
Displaying data from 1985 - 2018
SUMMER NDVI (average from July 9 to Sept 7)
SUMMER NDMI (average from July 9 to Sept 7)
ANNUAL PRECIPITATION (inches of rain from Oct 1 to Sept 30)
WELL 2803 - UNCERTAIN (depth to groundwater in feet)
WELL 2804 - UNCERTAIN (depth to groundwater in feet)

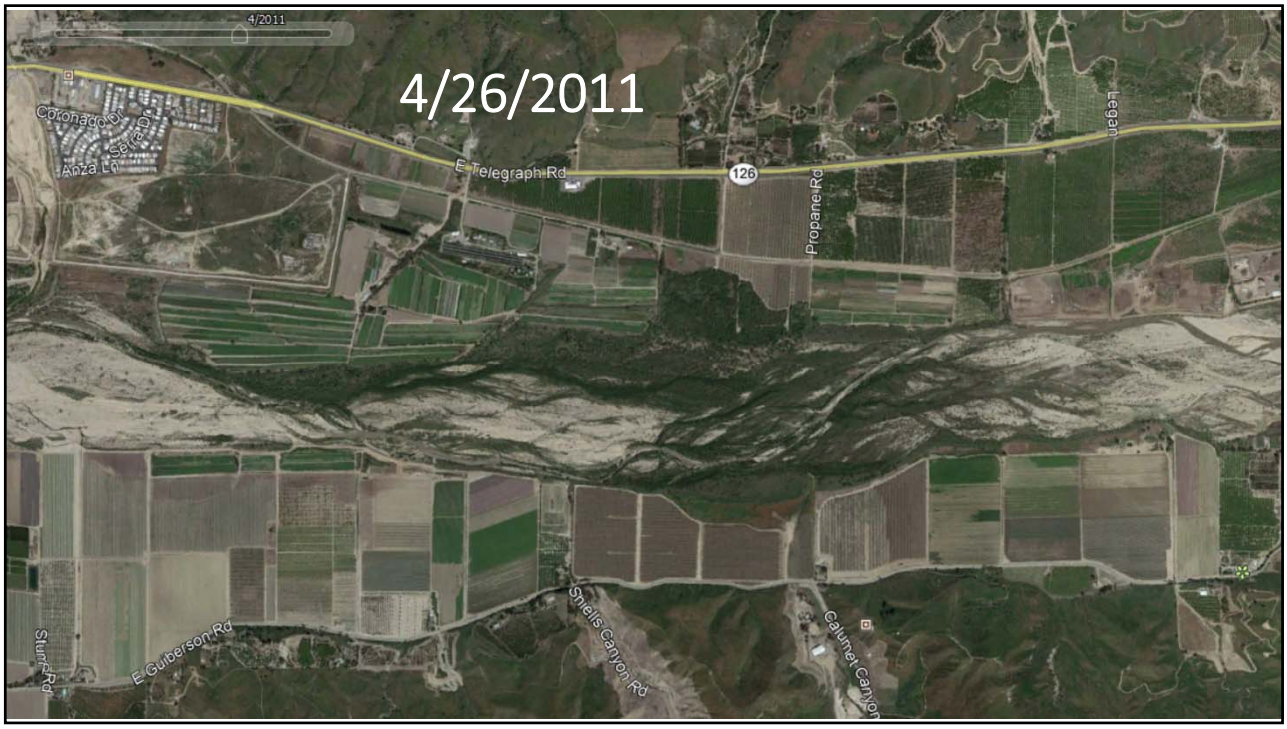

6/11/2002
Coronado Dr
Serra Dr
Anza Ln
E Telegraph Rd
126
Propane Rd
Legan
Sturie Rd
E Guiberson Rd
Shiells Canyon Rd
Calumet Canyon
Image U.S. Geological Survey

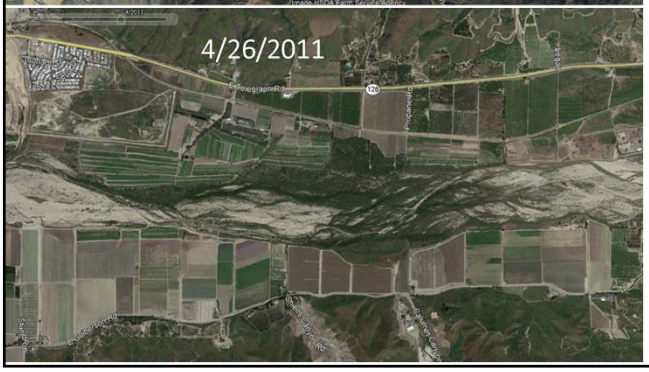

12/24/2004
Coronado Dr
Serra Dr
Anza Ln
E Telegraph Rd
126
Propane Rd
Legan
Sturie Rd
E Guiberson Rd
Shiells Canyon Rd
Calumet Canyon
Image USDA Farm Service Agency


1/11/2005
Coronado Dr
Serra Dr
Anza Ln
E Telegraph Rd
126
Propane Rd
Legan
Sturre Rd
E Guiberson Rd
Shells Canyon Rd
Calumet Canyo


12/31/2005
Coronado Dr
Serra Dr
Anza Ln
E Telegraph Rd
126
Propane Rd
Legan
Sturre Rd
E Guiberson Rd
Shells Canyon Rd
Calumet Canyon

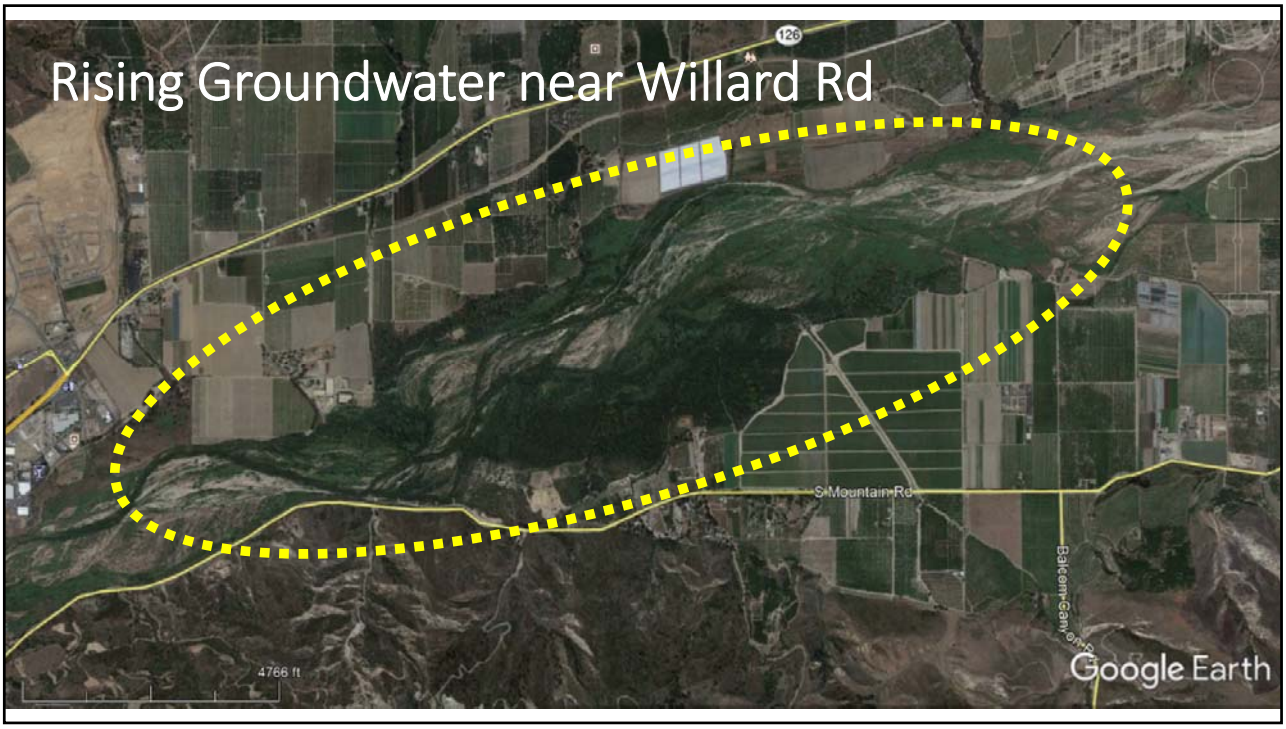

8/31/2007
Coronado Dr
Serrano
Anza Ln
E Telegraph Rd
126
Propane Rd
Legan
Stunt Rd
E Guiberson Rd
Shiells Canyon Rd
Calumet Canyon

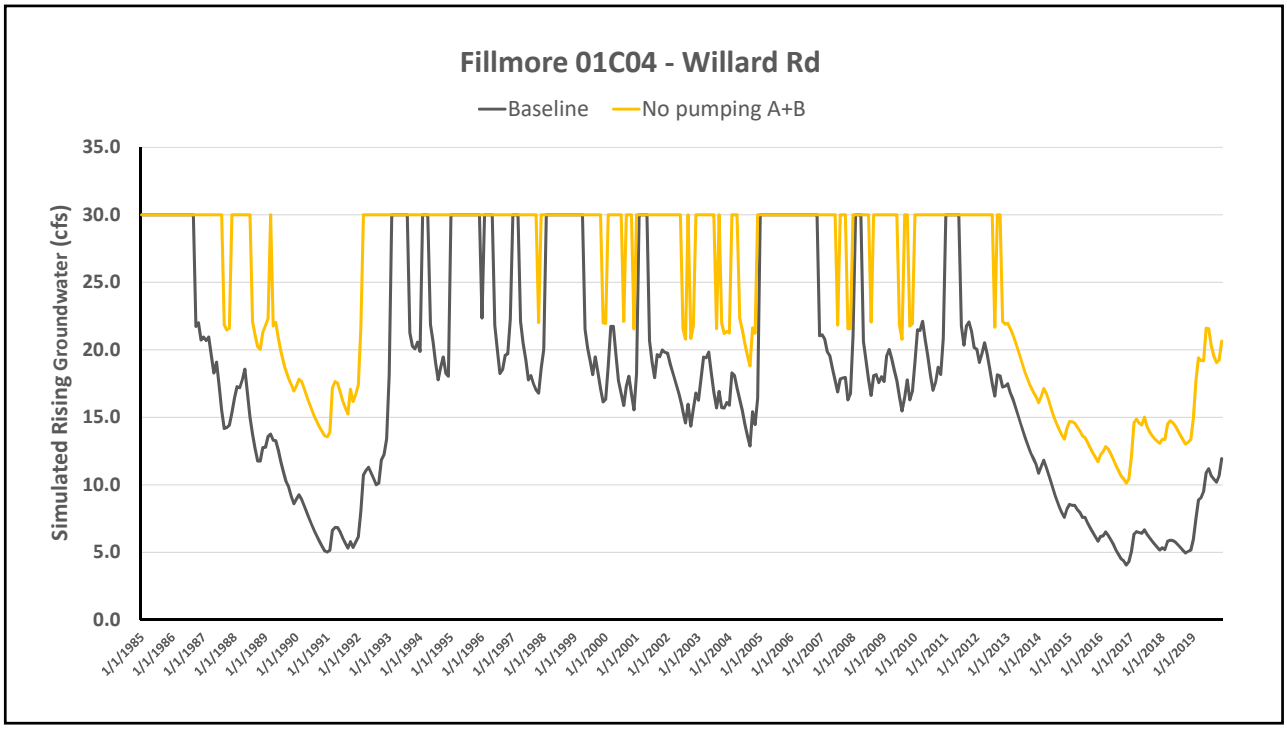

4/2011
4/26/2011
Coronado Dr
Serrano
Anza Ln
E Telegraph Rd
126
Propane Rd
Legan
Stunt Rd
E Guiberson Rd
Shiells Canyon Rd
Calumet Canyon



Observations

- ✓ Significant recovery from scour associated with storm flows
- ✓ Drought periods stress vegetation (NDVI)
- ✓ Vegetation recovers from drought stress (NDVI)
- ✓ GW model suggests rising groundwater is partially depleted due to GW extractions
- ✓ Rising GW is depleted during major drought events - WLs estimated to be ~30 ft bgs




Fillmore 01C04 - Willard Rd
Baseline
No pumping A+B
Simulated Rising Groundwater (cfs)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1/1/1985
1/1/1986
1/1/1987
1/1/1988
1/1/1989
1/1/1990
1/1/1991
1/1/1992
1/1/1993
1/1/1994
1/1/1995
1/1/1996
1/1/1997
1/1/1998
1/1/1999
1/1/2000
1/1/2001
1/1/2002
1/1/2003
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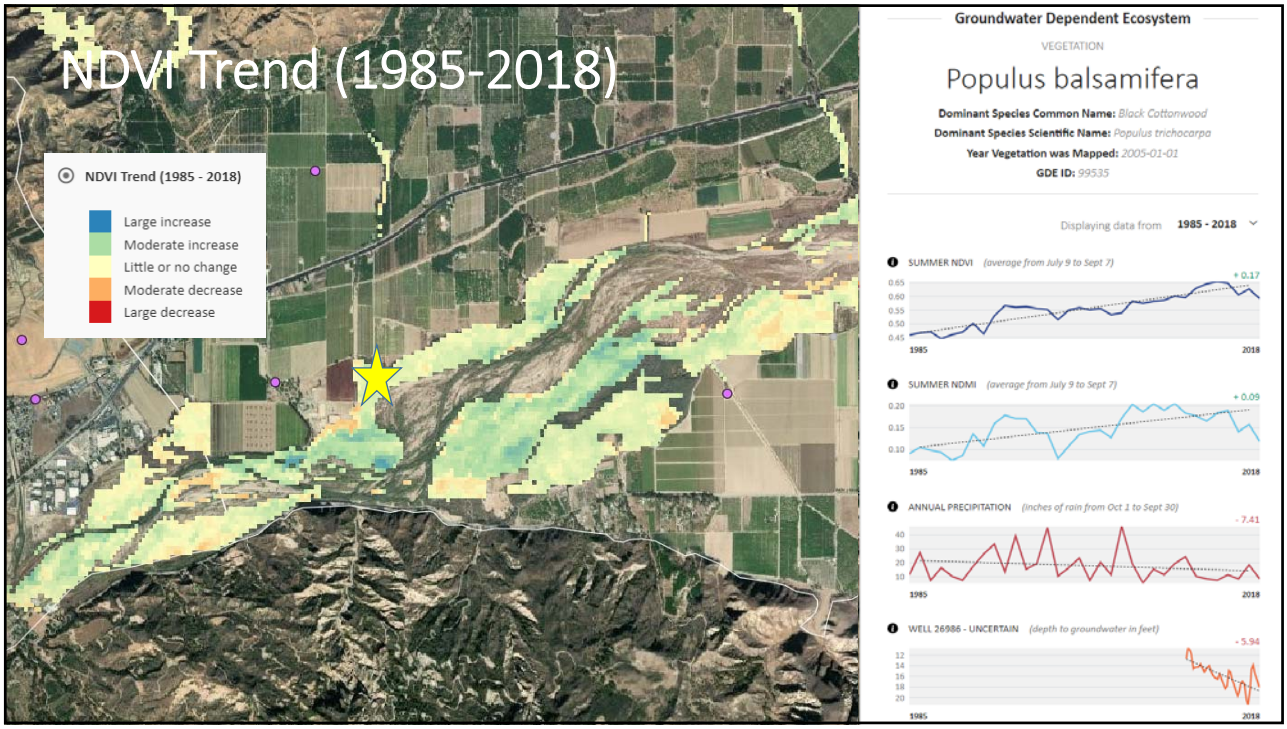
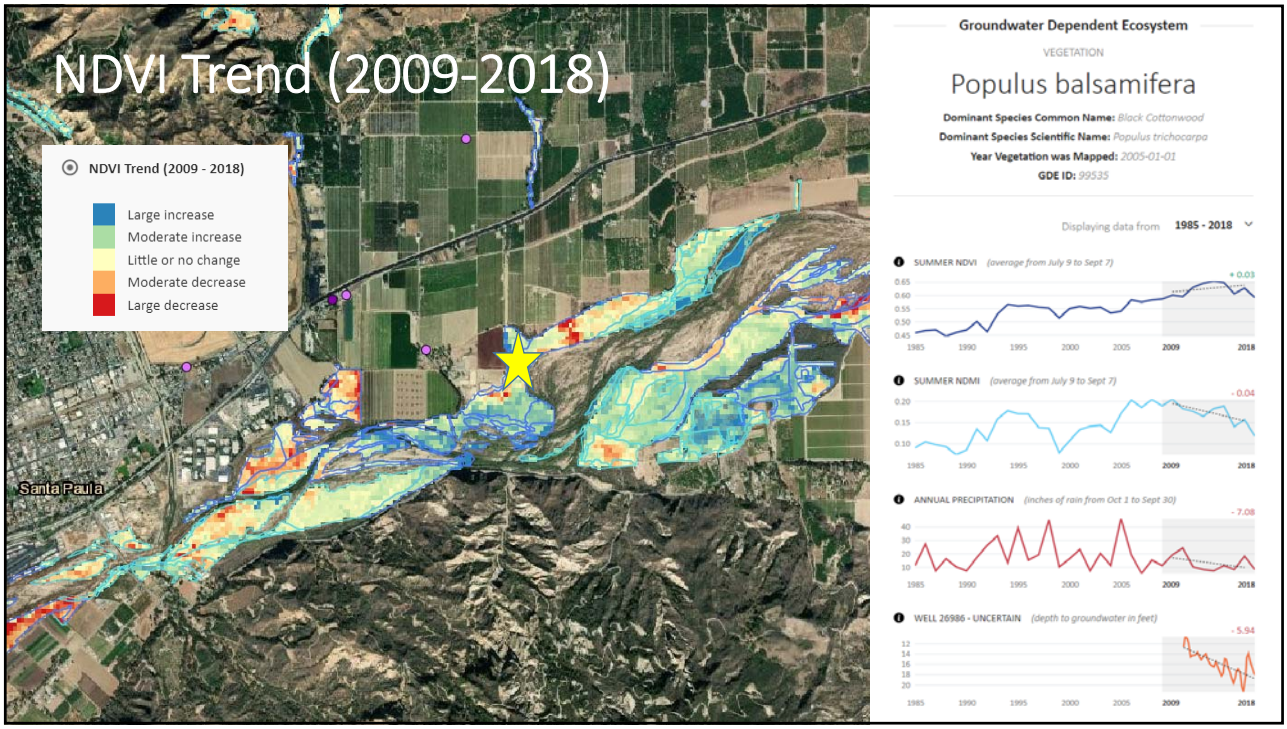
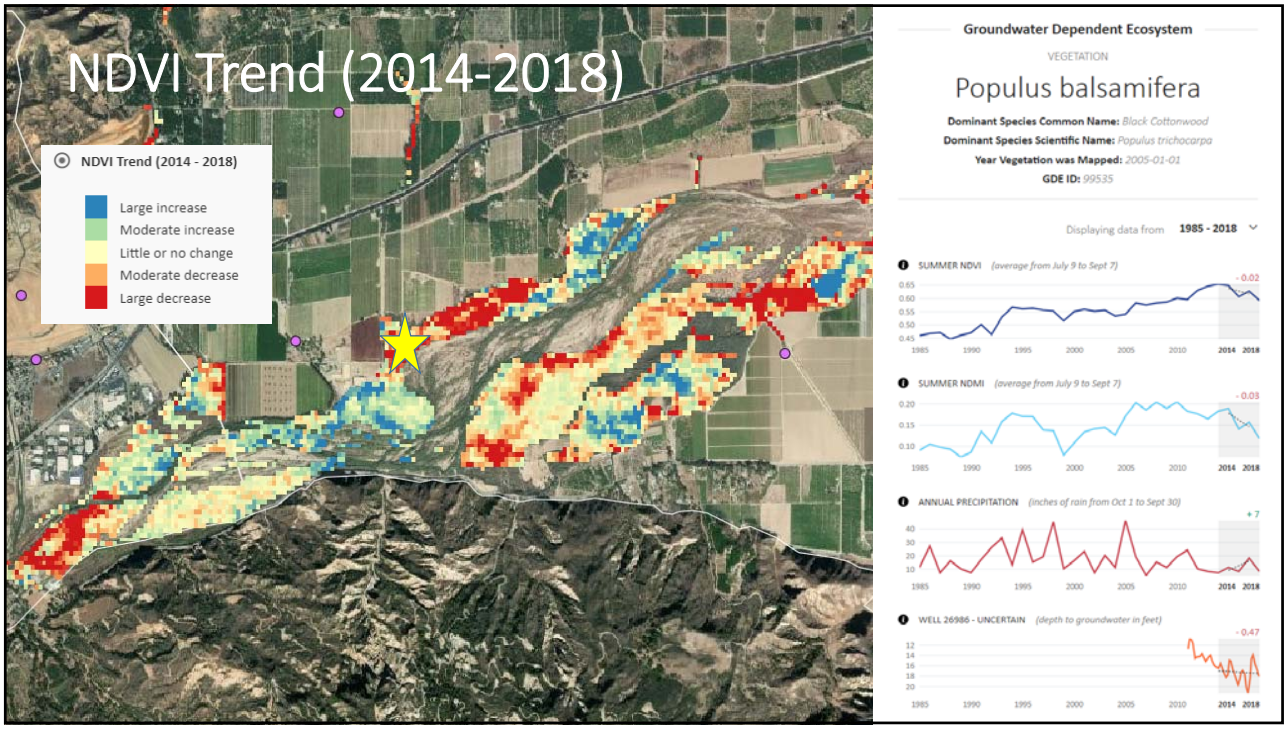
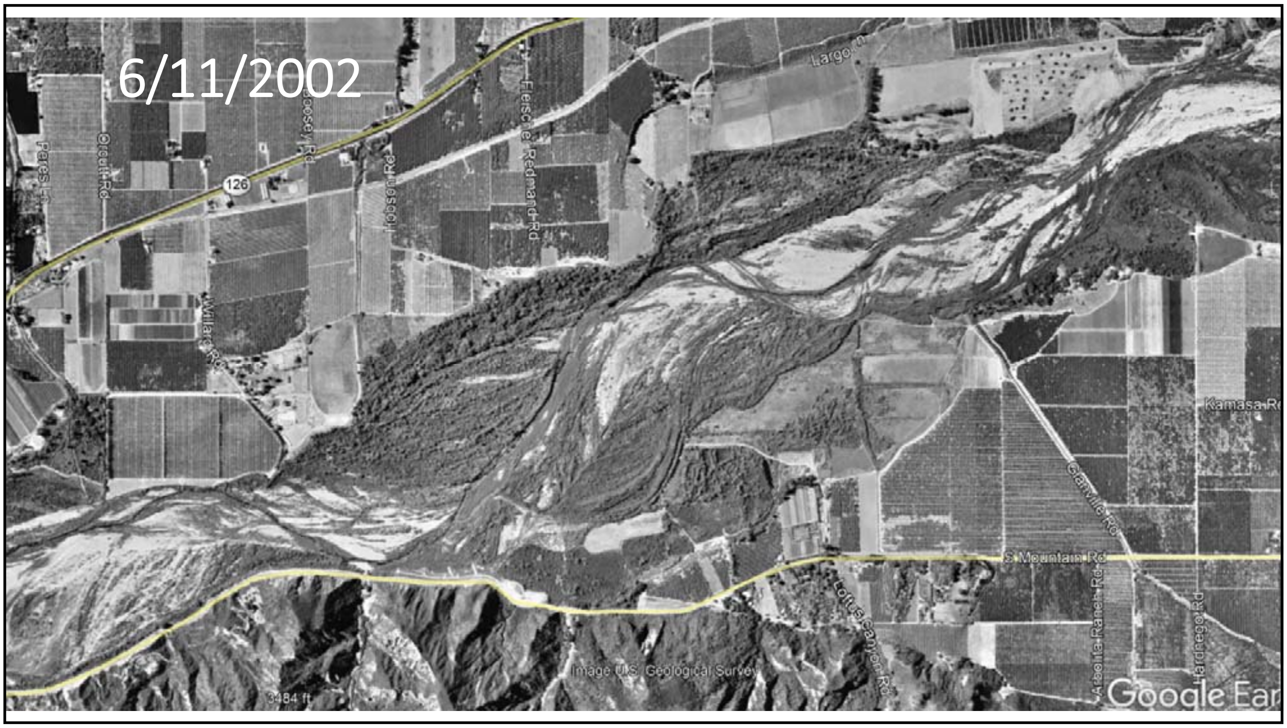
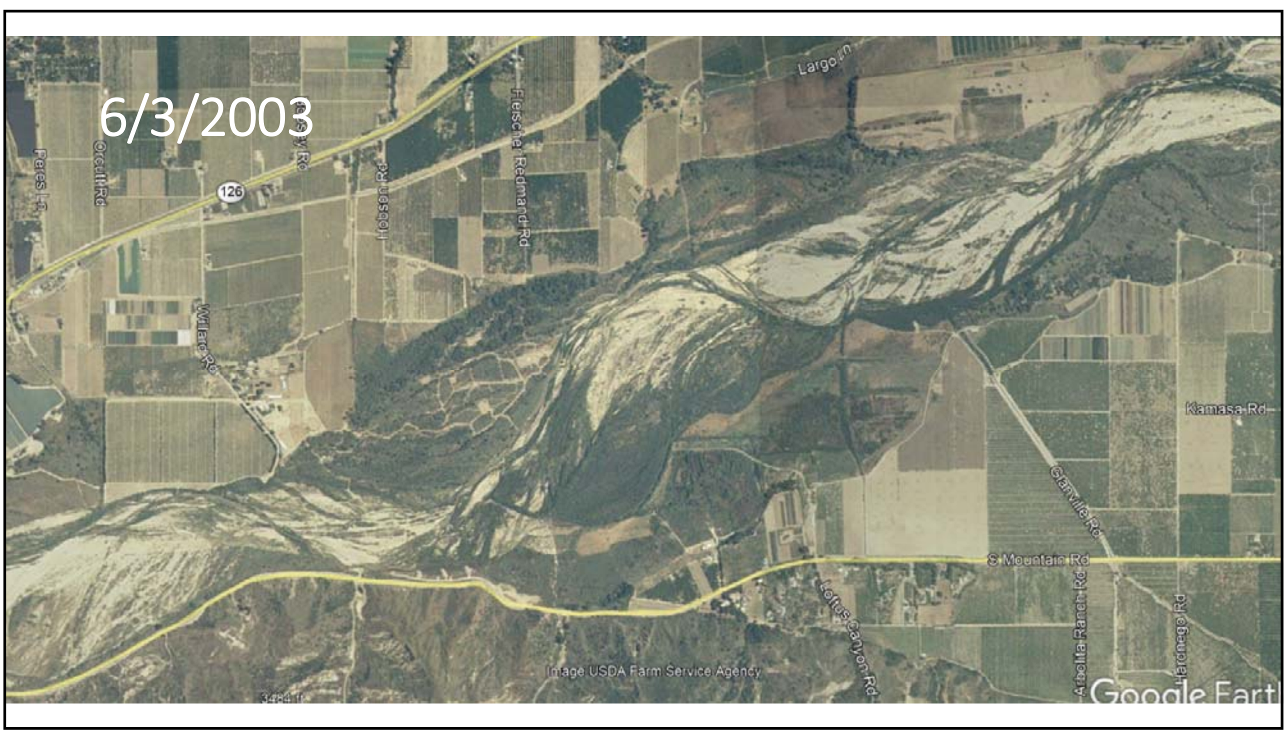
1/1/2007
1/1/2008
1/1/2009
1/1/2010
1/1/2011
1/1/2012
1/1/2013
1/1/2014
1/1/2015
1/1/2016
1/1/2017
1/1/2018
1/1/2019

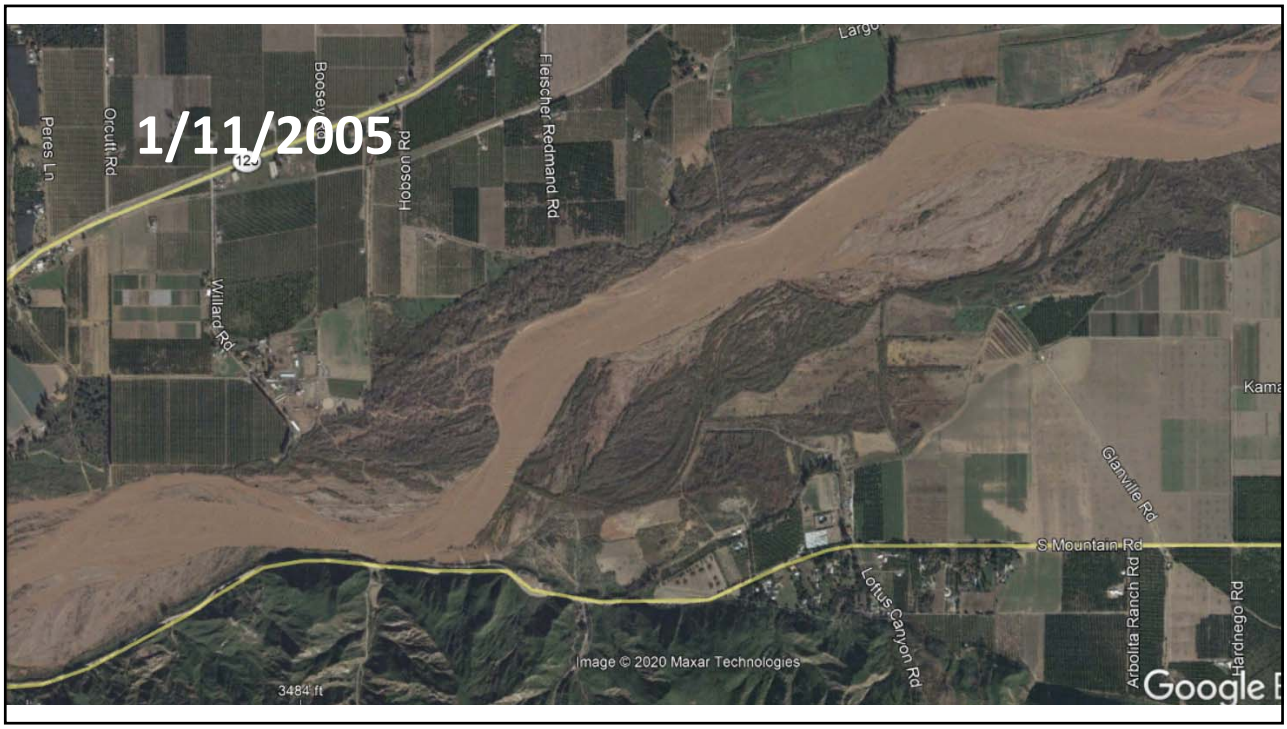

NDVI Trend (1985-2018)
NDVI Trend (1985 - 2018)
Large increase
Moderate increase
Little or no change
Moderate decrease
Large decrease
Groundwater Dependent Ecosystem
VEGETATION
Populus balsamifera
Dominant Species Common Name: Black Cottonwood
Dominant Species Scientific Name: Populus trichocarpa
Year Vegetation was Mapped: 2005-01-01
GDE ID: 99535
Displaying data from 1985 - 2018
SUMMER NDVI (average from July 9 to Sept 7)
+ 0.17
SUMMER NDMI (average from July 9 to Sept 7)
+ 0.09
ANNUAL PRECIPITATION (inches of rain from Oct 1 to Sept 30)
- 7.41
WELL 26986 - UNCERTAIN (depth to groundwater in feet)
- 5.94

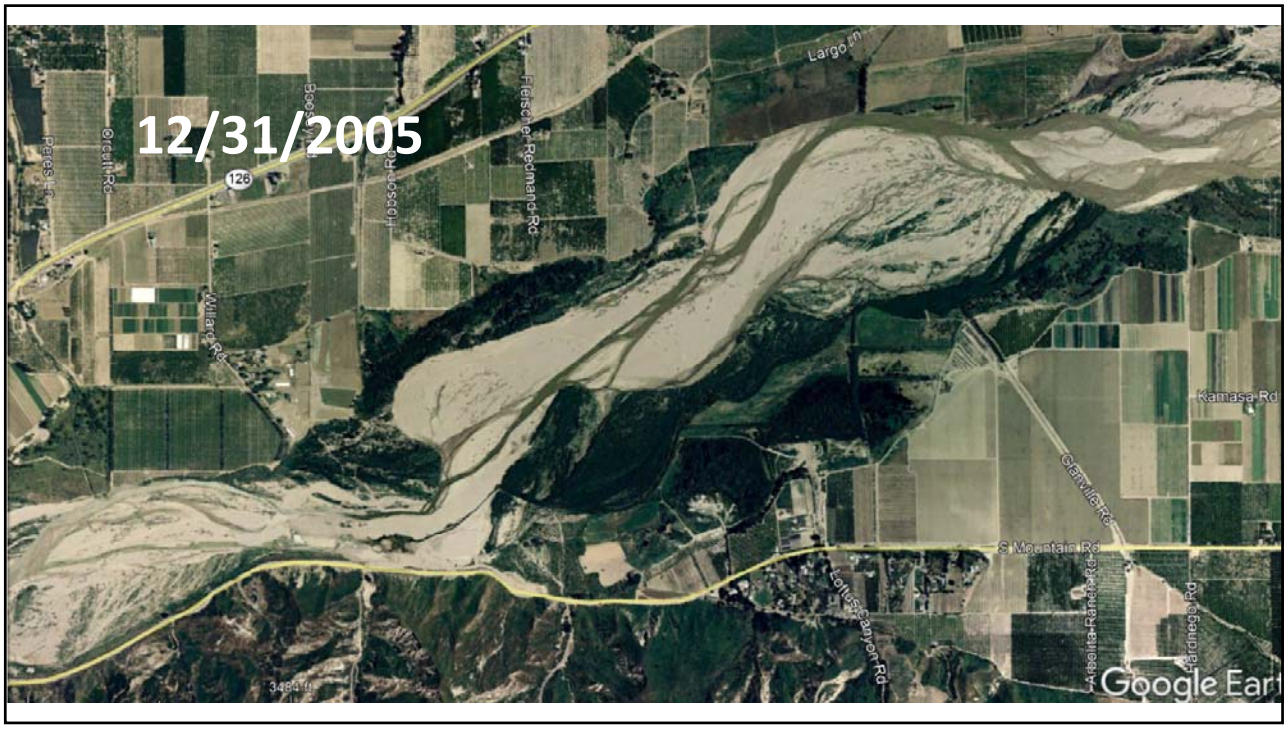

NDVI Trend (2009-2018)
NDVI Trend (2009 - 2018)
Large increase
Moderate increase
Little or no change
Moderate decrease
Large decrease
Santa Paula
Groundwater Dependent Ecosystem
VEGETATION
Populus balsamifera
Dominant Species Common Name: Black Cottonwood
Dominant Species Scientific Name: Populus trichocarpa
Year Vegetation was Mapped: 2005-01-01
GDE ID: 99535
Displaying data from 1985 - 2018
SUMMER NDVI (average from July 9 to Sept 7)
SUMMER NDMI (average from July 9 to Sept 7)
ANNUAL PRECIPITATION (inches of rain from Oct 1 to Sept 30)
WELL 26986 - UNCERTAIN (depth to groundwater in feet)

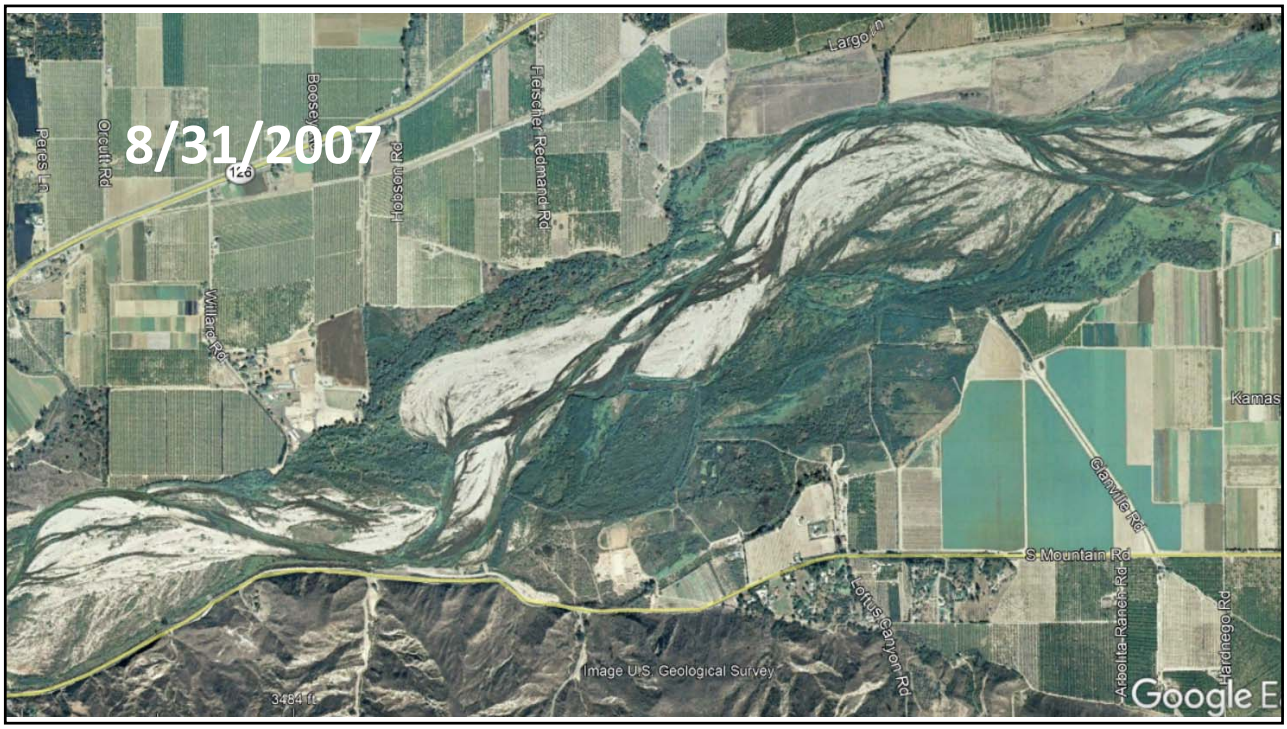

NDVI Trend (2014-2018)
NDVI Trend (2014 - 2018)
Large increase
Moderate increase
Little or no change
Moderate decrease
Large decrease
Groundwater Dependent Ecosystem
VEGETATION
Populus balsamifera
Dominant Species Common Name: Black Cottonwood
Dominant Species Scientific Name: Populus trichocarpa
Year Vegetation was Mapped: 2005-01-01
GDE ID: 99535
Displaying data from 1985 - 2018
SUMMER NDVI (average from July 9 to Sept 7)
SUMMER NDMI (average from July 9 to Sept 7)
ANNUAL PRECIPITATION (inches of rain from Oct 1 to Sept 30)
WELL 26986 - UNCERTAIN (depth to groundwater in feet)

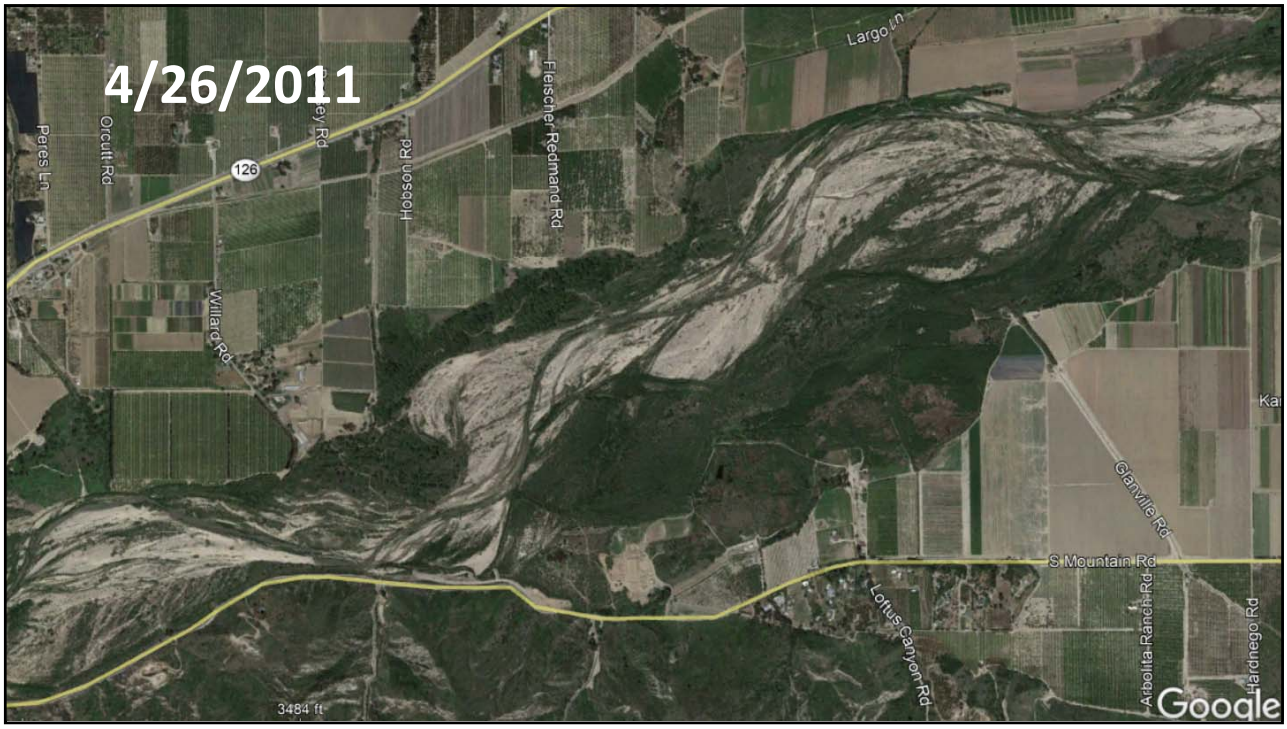

6/11/2002
Largo Ln
Peres Ln
Orcell Rd
Hoosey Rd
Hosselt Rd
Fleischer Redmand Rd
126
Willard Rd
Kamasa Rd
Clarville Rd
S Mountain Rd
Loftus Canyon Rd
Arbolita Ranch Rd
Image U.S. Geological Survey
Google Earth


6/3/2003
Largo Ln
Peres Ln
Orcell Rd
Hosselt Rd
Fleischer Redmand Rd
126
Willard Rd
Kamasa Rd
Clarville Rd
S Mountain Rd
Loftus Canyon Rd
Arbolita Ranch Rd
Image USDA Farm Service Agency
Google Earth


1/11/2005
Peres Ln
Orcutt Rd
Boosey
Hopson Rd
Fleischer Redmand Rd
Willard Rd
Largo
Ganville Rd
S Mountain Rd
Lotus Canyon Rd
Arbolita Ranch Rd
Hardnego Rd
Image © 2020 Maxar Technologies
3484 ft
Google


12/31/2005
Peres Ln
Orcutt Rd
126
Hopson Rd
Fleischer Redmand Rd
Willard Rd
Largo Ln
Kamasa Rd
Ganville Rd
S Mountain Rd
Lotus Canyon Rd
Arbolita Ranch Rd
Hardnego Rd
3484 ft
Google Earth


8/31/2007
Largo Ln
Peres Ln
Orcutt Rd
126
Boosey Rd
Hobson Rd
Fleischer Redmand Rd
Willard Rd
Kamas
Granville Rd
S Mountain Rd
Lotus Canyon Rd
Arbolita Ranch Rd
Hardnego Rd
Image U.S. Geological Survey
3484 ft
Google E


4/26/2011
Largo Ln
Peres Ln
Orcutt Rd
126
Hobson Rd
Fleischer Redmand Rd
Willard Rd
Granville Rd
S Mountain Rd
Lotus Canyon Rd
Arbolita Ranch Rd
Hardnego Rd
3484 ft
Google

Observations

- ✓ Significant recovery from scour associated with storm flows
- ✓ Drought periods stress vegetation (NDVI)
- ✓ Vegetation recovers from drought stress (NDVI)
- ✓ GW model suggests rising groundwater is partially depleted due to GW extractions
- ✓ Rising GW persists throughout major drought events

Questions?