Sustainable Groundwater in Westlands Water District

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Westlands Water District

- Westlands Water District is the largest agricultural water delivery agency in the United States. It covers 942 square miles of land between the California Coast Range Mountains and the trough of the San Joaquin Valley in western Fresno and Kings counties.
- Predominantly servicing agricultural operations with surface irrigation water.
- Water is delivered through 1,034 miles of underground pipe and 3,300 metered delivery outlets
- The District consist of 615,000 acres which 580,000 are irrigable.
- Water rates for users are based upon supply, operational expenses, and debt service for construction of water delivery system.

Westlands Water District

History of Westlands Area

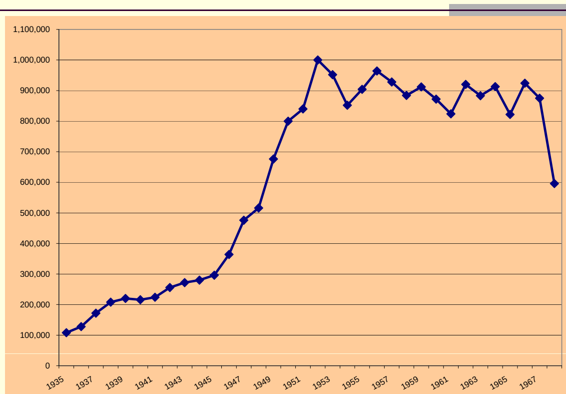
- First deep groundwater well was drilled in 1909 by G. T. Willis just west of the present-day Lemoore Naval Air Station.
- By 1951, the number of wells had increased to about 1,000 and groundwater pumping increased to about one million acre-feet annually.
- 1955-56, pumping depth had increased to a range of about 350-700 feet and groundwater levels within the District dropped 225 feet over the previous 15 years – overdraft stood at about one-half to one million acre-feet annually.
- On December 30, 1961, the federal government signed with the State of California for federal construction of the San Luis Unit of the Central Valley Project.


Early Groundwater Well Construction

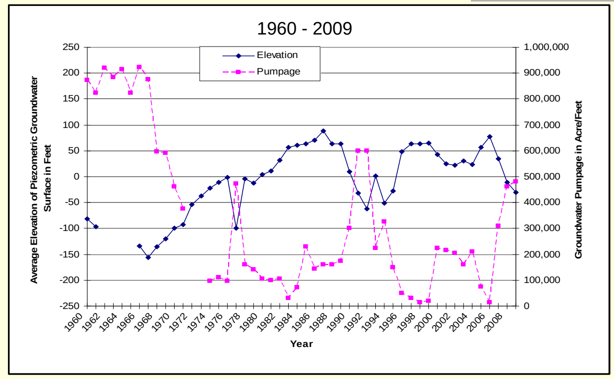
Westlands Water District Formed

- Westlands entered into a long-term water service contract with the federal government on June 5, 1963.
- Westlands took first water deliveries from the Mendota Pool in 1964 through temporary facilities.
- Major deliveries began in 1968 from the San Luis Aqueduct and groundwater pump dropped as more of the delivery system was completed.
- In 1974, the District took delivery of over 1,000,000 acre-feet of surface water with groundwater pumpage at 96,000 acre-feet.

1935-1968 Groundwater Pumpage



Groundwater Pumpage vs. Sub-Corcoran Water Surface Elevation

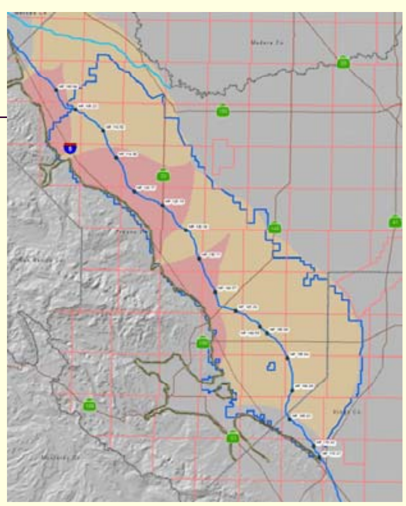


Subsidence from Groundwater Pumping

- The USGS characterizes deep subsidence as the largest human alteration of the earth's surface and occurs almost entirely below the Corcoran Clay
- Deep subsidence in the SJV is caused by accelerated groundwater pumping and water level declines in the lower aquifer
- Falling water levels reduce sub-Corcoran clay layer pressure levels, squeezing the interbedded clays and causing subsidence
- A one time mining of the water

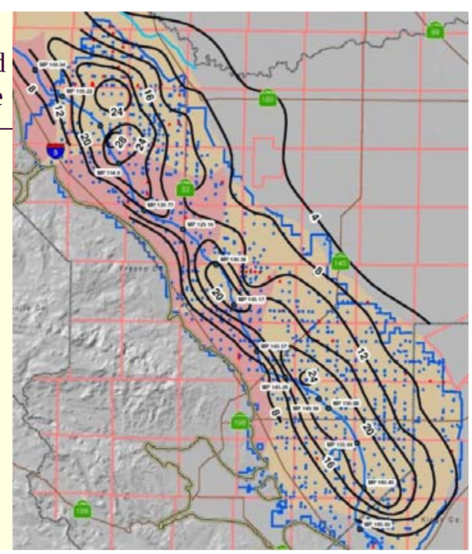
Alluvial Fans

- Subsidence is the story of three alluvial fans (tan shade), Panoche Creek, Cantua Creek and Los Gatos Creek.
- Interfan areas prone to shallow subsidence (area in pink).
- During periodic Coast Range uplift, the alluvial fans grew, dumping large amounts of sediments into the valley. These sediments carried types of clays prone to producing deep subsidence.



Alluvial Fans and Deep Subsidence

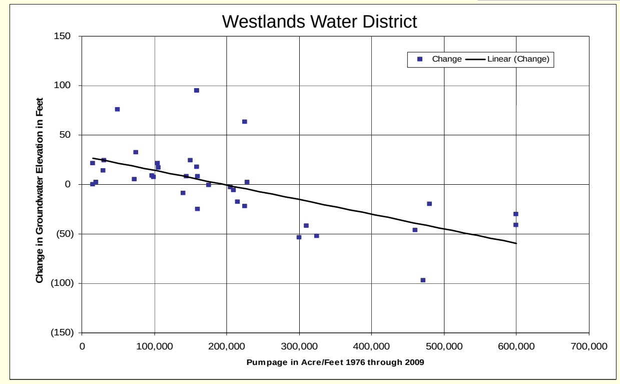
- Subsidence in feet 1926 to 1972.



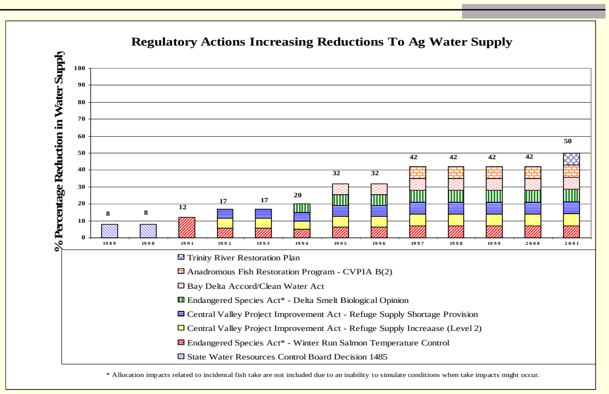
Cross-Section A-A'

Cross-Section A-A'. Southwest/Northeast Geologic Section near Panoche Creek

Estimated Groundwater Pumpage Safe Yield



Water Supply Restrictions



Groundwater Monitoring Program

- Groundwater monitoring is an essential part of managing any conjunctive use program.
- This information is vital for determining the affect of groundwater pumping on the aquifer, aquifer water quality, pumping costs and subsidence.
- Groundwater measurements and quality testing prove useful to water users in helping manage water supplies, facilitate accurate irrigation-scheduling and monitor pump efficiency.
- The District has surveyed shallow and deep groundwater conditions annually each December, beginning in 1977.
- In December 2009, the District had 589 operational wells with 93% having meters.

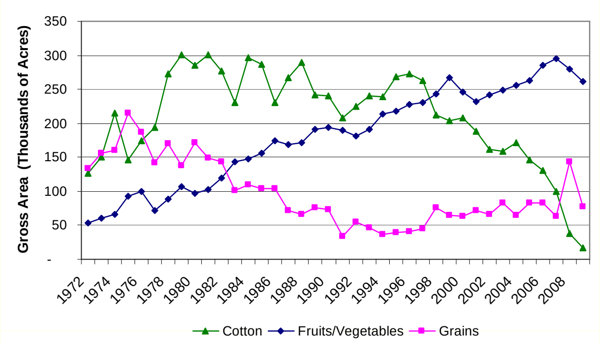
The Groundwater Management Plan (AB 3030)

- AB 3030 became law on January 1, 1993 permits local agencies to adopt programs to manage groundwater.
- The District adopted a Groundwater Management Plan on September 8, 1996.
- Groundwater Management Plan Primary Goals:
  - Preserve and enhance the reliability of groundwater resources of the District.
  - Ensure the long-term availability of high quality groundwater .
  - Maintain local monitoring of groundwater resources within the District .
  - Minimize the cost and impacts of groundwater use.

The Groundwater Management Plan (AB 3030)

- Proposed changes to The District's 2010 Ground Management Plan:
  - Installation of meters on all groundwater wells within the District.
  - Reading the meters monthly.
  - Placing the meters on a maintenance and flow testing schedule.

Crop Acreage Trends



Irrigation Systems

- District water users are continuing to increase the use of Drip/Trickle irrigation systems.

On-Farm Irrigation Systems

	Percent of Land Irrigated															
Type of System	1985	1990	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Surface																
Furrow	60	38	34	32	31	29	28	26	22	22	23	20	19	18	11	9
Border Strip	3	5	2	2	2	2	2	1	2	2	2	3	2	2	5	4
Combination Sprinkler/Furrow	15	38	43	44	43	45	44	45	45	42	39	34	28	24	19	10
Pressurized																
Sprinkler	21	16	15	14	15	13	14	13	12	13	11	10	10	9	13	15
Drip/Trickle	1	3	6	8	9	11	13	15	18	22	25	33	41	46	51	62
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Water Conservation Program

- The Irrigation Guide – provides farmers with water requirements for various crops based on actual weather and computer modeling.
  - A separate Guide is produced for the Districts three climate regions.
- Satellite Imagery – has been available, via the internet, to all District water users our website using GIS.
  - Images are available every two week during the growing season.
- Enhanced Irrigation Improvement Program (EISP) – offers low interest rates to water users for the lease-purchase of irrigation system equipment, funded by a Revolving Fund.
- AWEP partnership with USDA/NRCS – will pay up to $600/acre of the purchase price for installed water conservation equipment. The District has committed to match up to $2,000,000 per year in matching funds under its Enhanced Irrigation System Improvement Program (EISIP) in the form of low-interest leases.

Sustainable Groundwater in Westlands

- The District believes the following is needed to sustain groundwater use within Westlands Water District:
  - Foremost, a reliable, timely and adequate surface water supply.
  - Groundwater pumping near the safe yield of 200,000 acre-feet per year.
  - Continuing Water Conservation methods.
    - Increase use of drip were applicable.
    - Increase seasonable application efficiency.