PV Water Update

Aromas Water District
Board of Directors

October 28, 2014

Presented by:
Brian Lockwood, CHg, Senior Hydrologist

Pajaro Valley
Water Management Agency

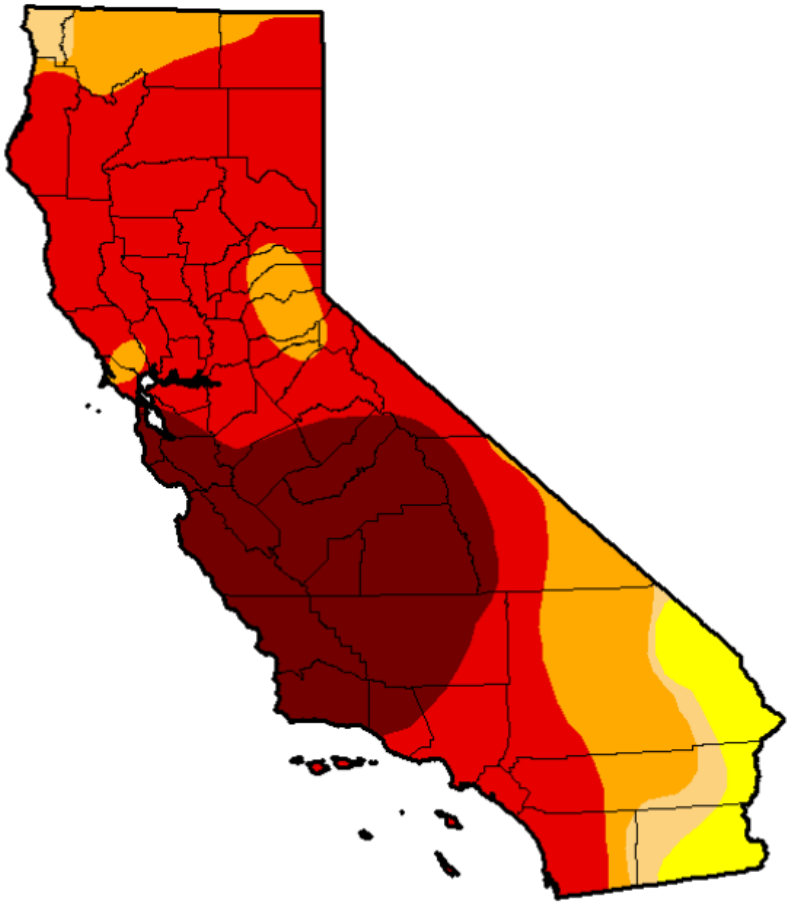
Presentation Overview

- State of the Basin
- Water Supply Facilities Overview
- Basin Management Planning & Funding
- Next Steps

February 25, 2014

(Released Thursday, Feb. 27, 2014)

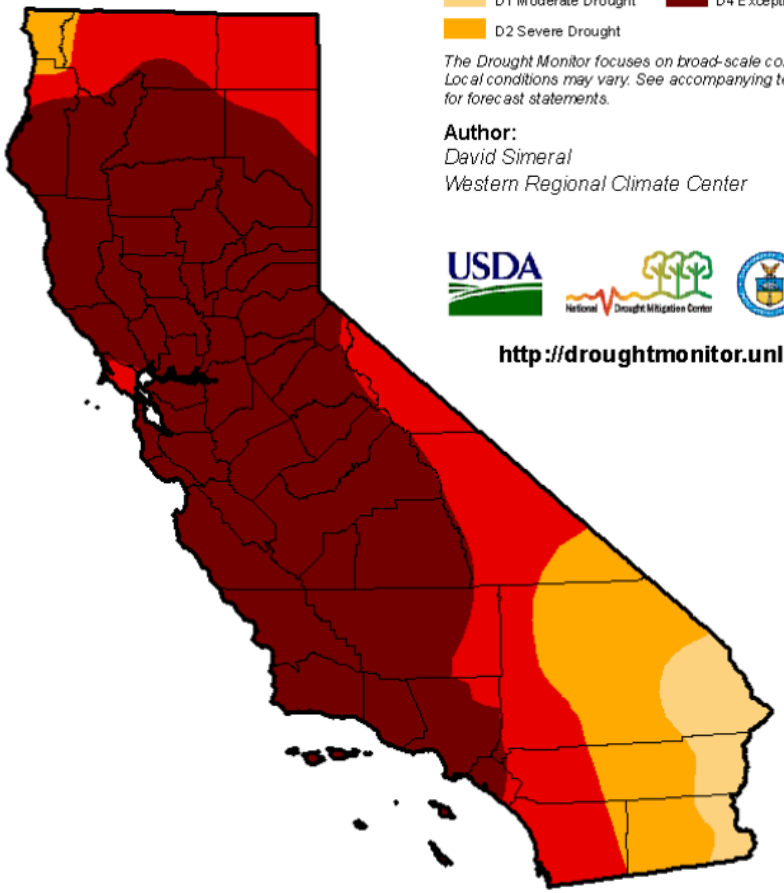
Valid 7 a.m. EST



October 21, 2014

(Released Thursday October 23, 2014)

Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

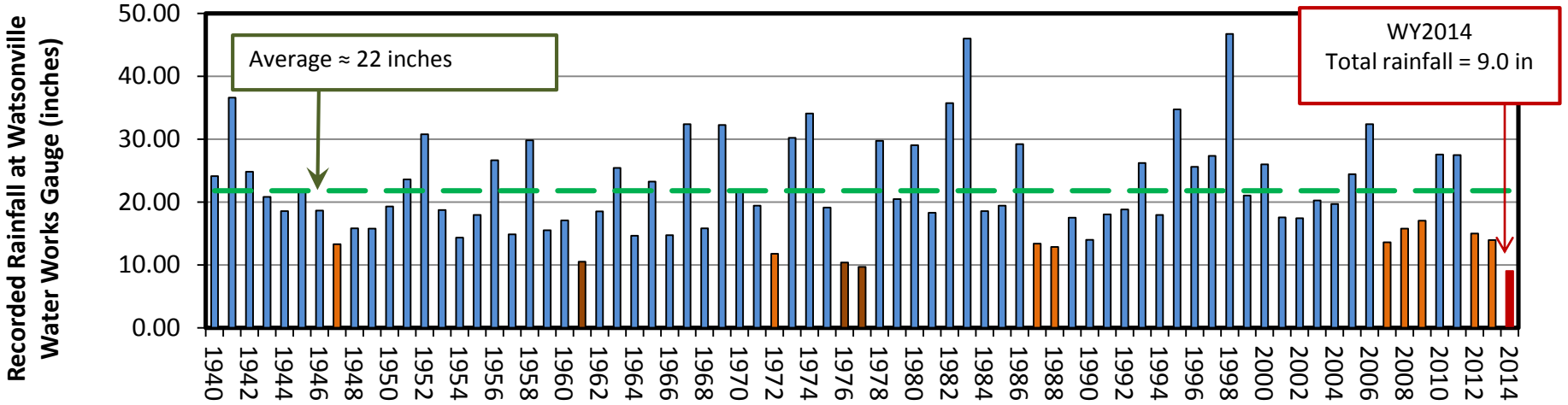
Author:

David Simeral

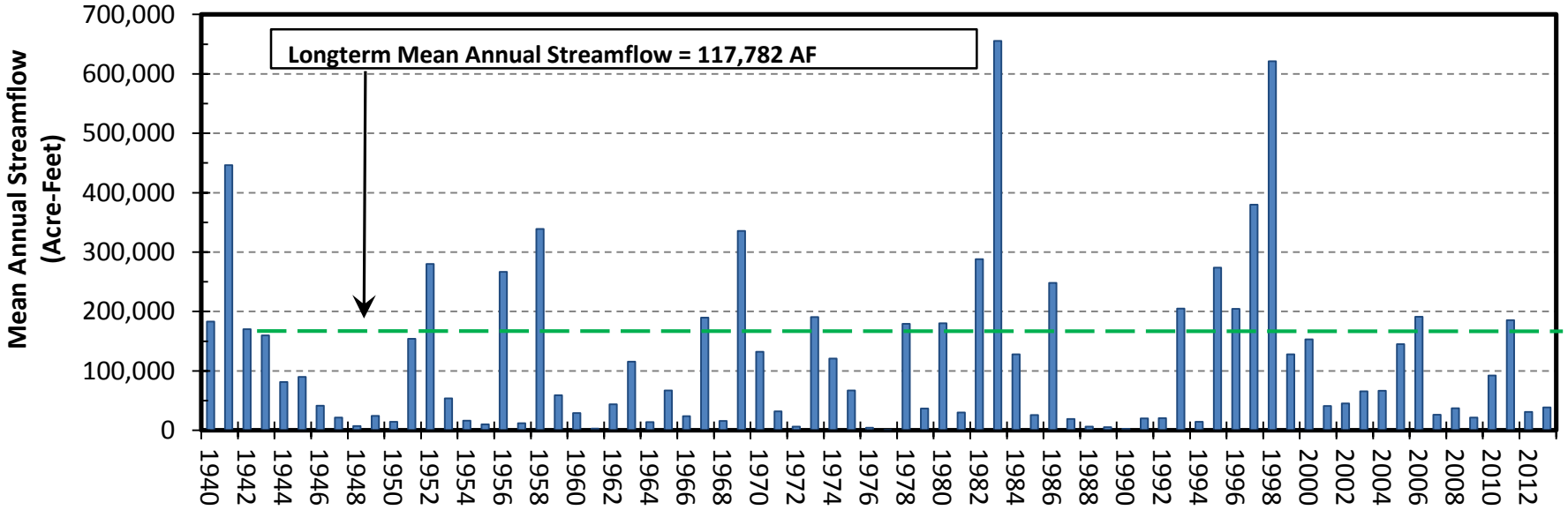
Western Regional Climate Center

http://droughtmonitor.unl.edu/

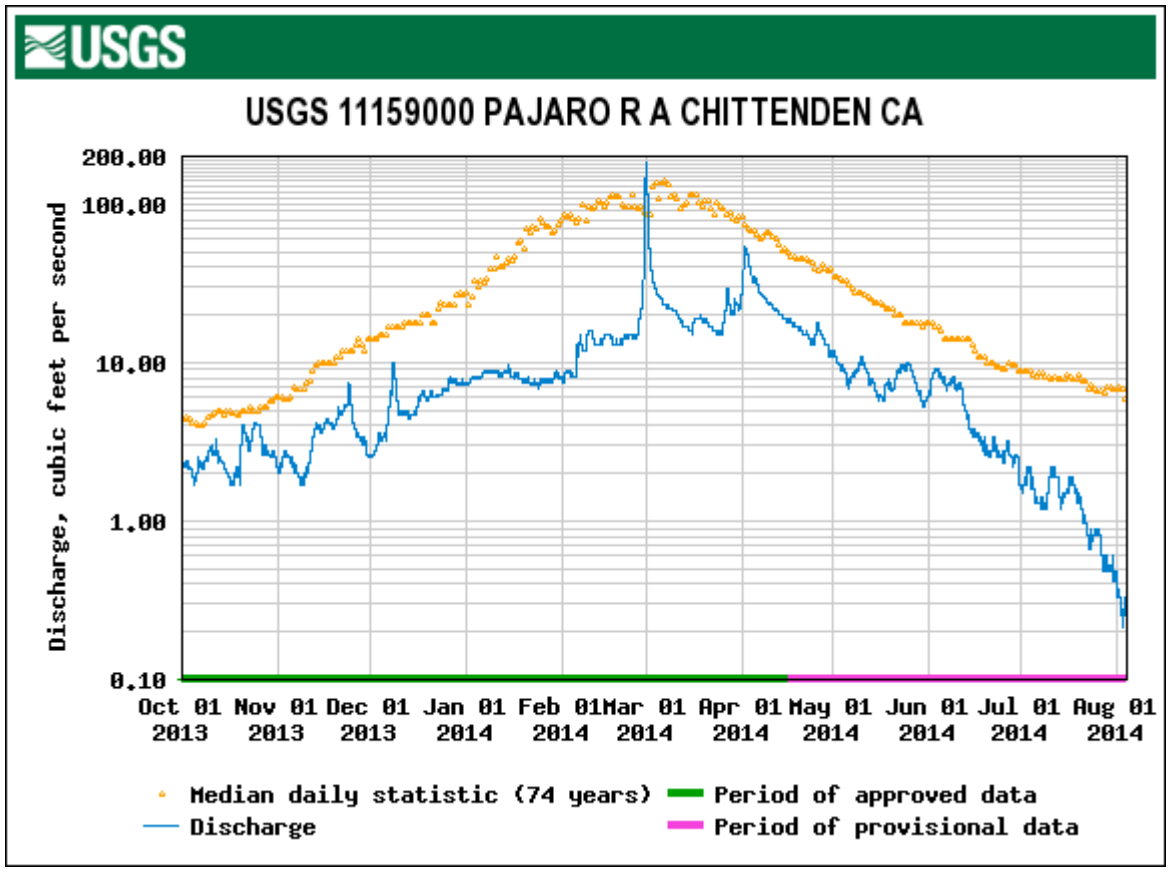
Rainfall Accumulation at Watsonville Water Works
by Water Year (beginning Oct. 1)

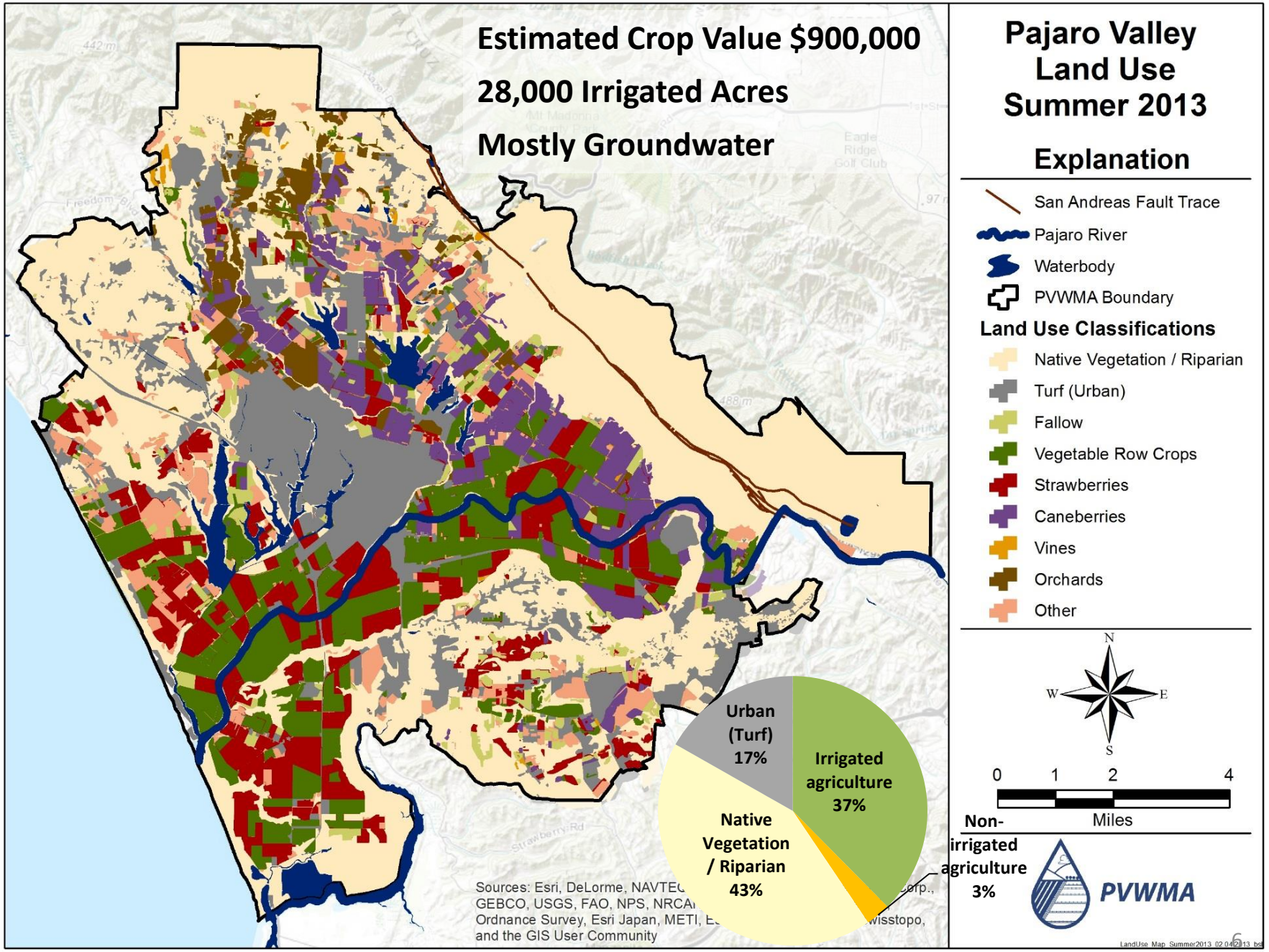


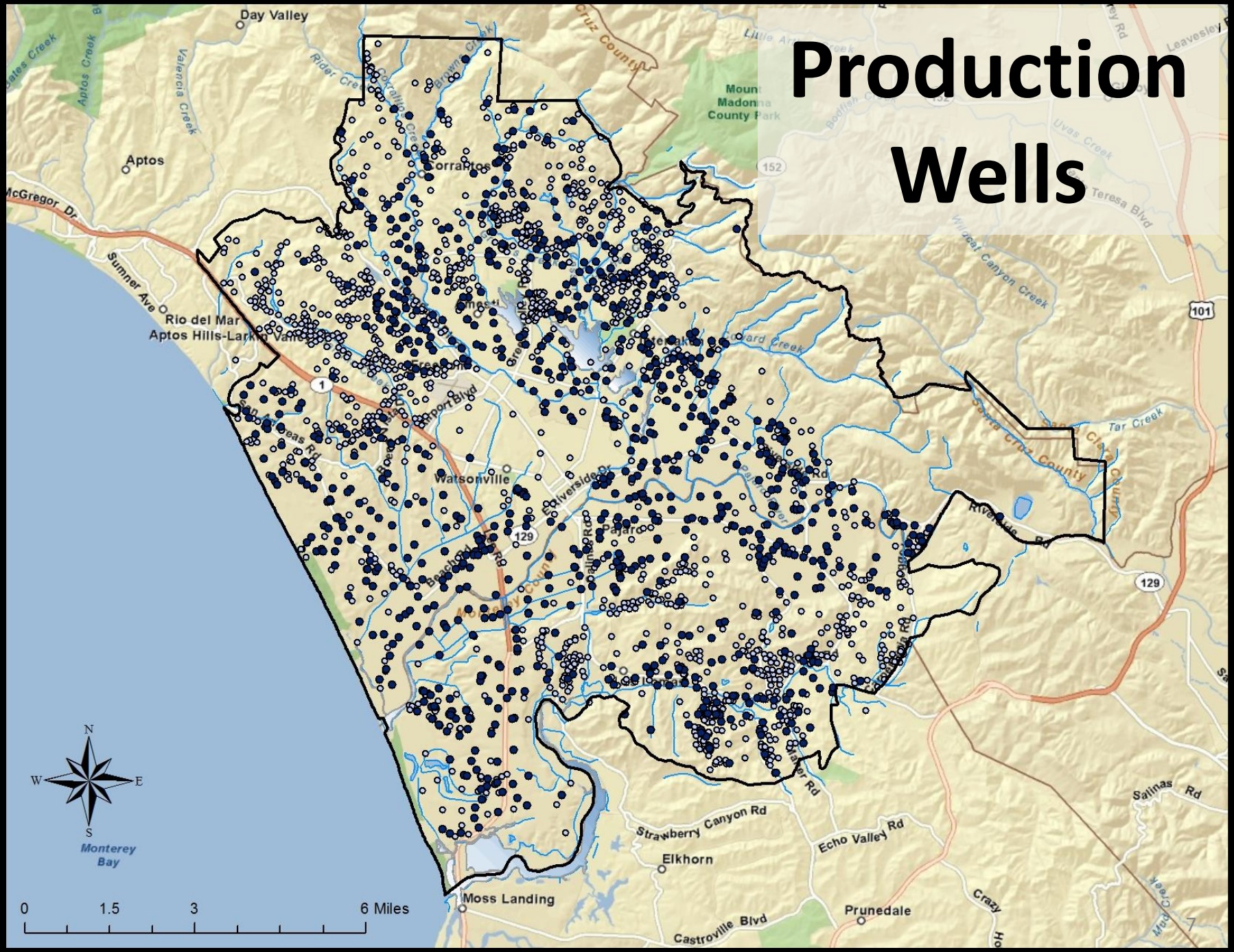
Pajaro River Annual Streamflow
Recorded at Chittenden Gap, Water Years 1940 - 2013



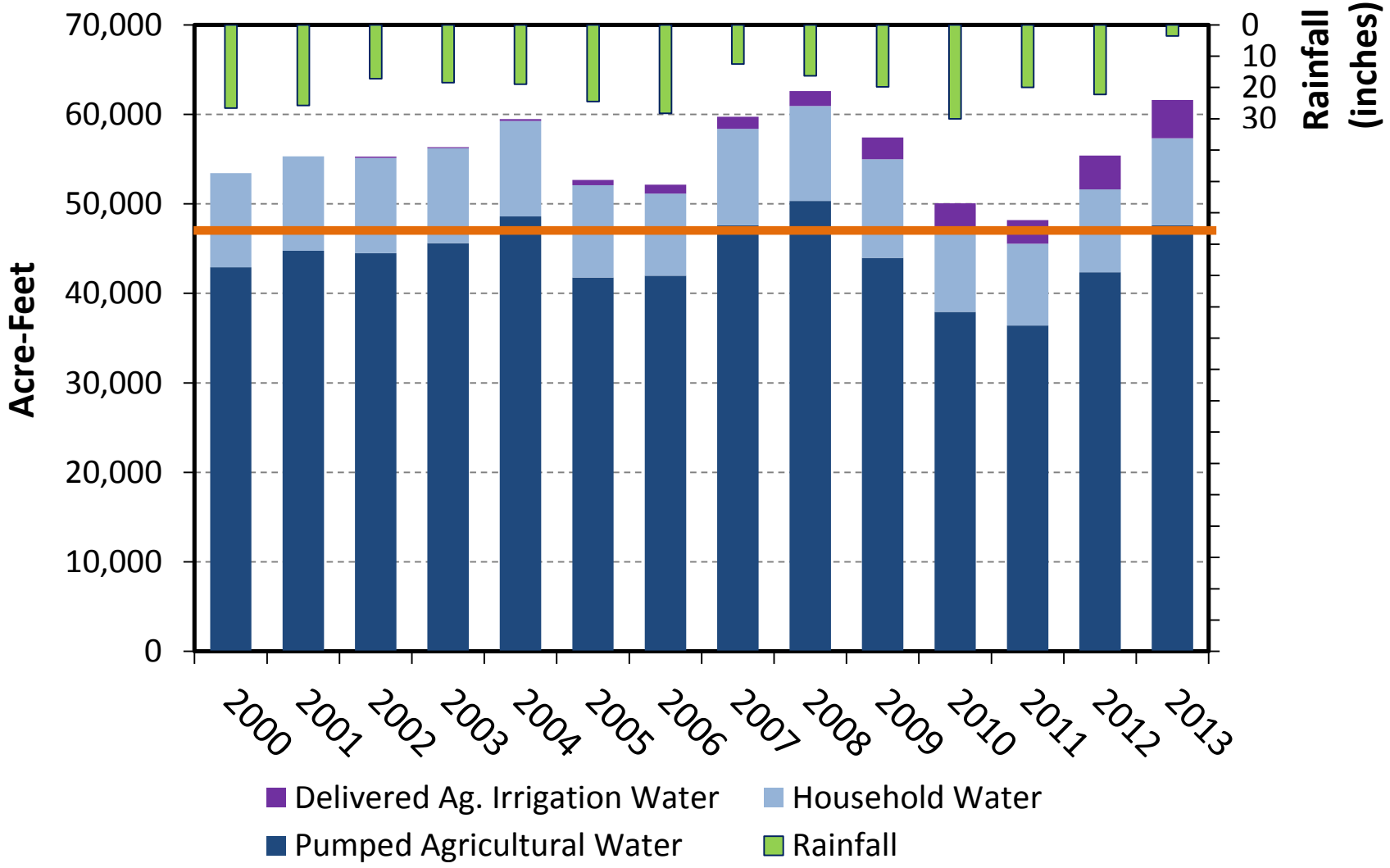
Pajaro River Streamflow



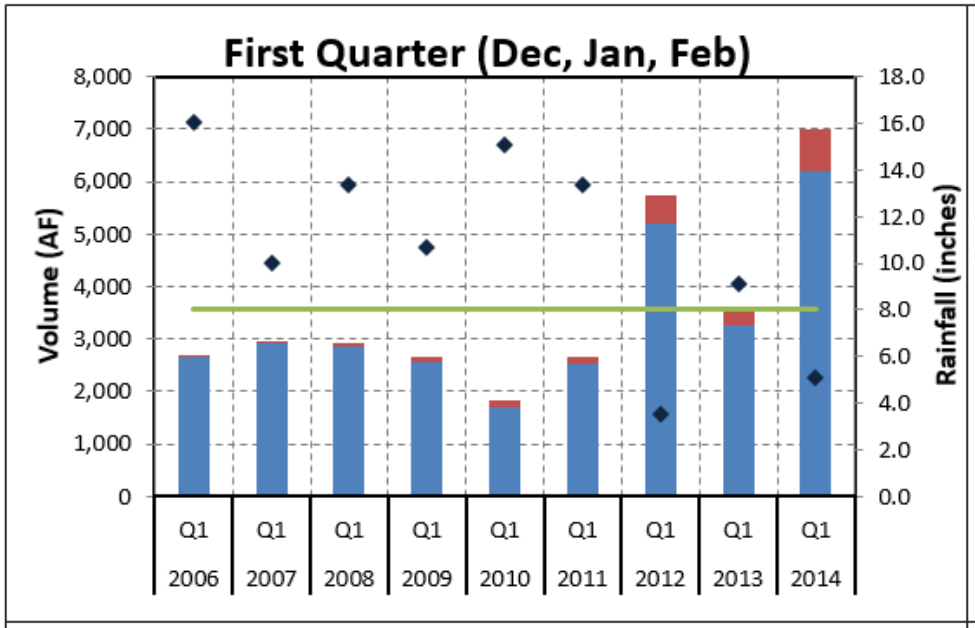

Estimated Crop Value $900,000
28,000 Irrigated Acres
Mostly Groundwater
Pajaro Valley
Land Use
Summer 2013
Explanation
San Andreas Fault Trace
Pajaro River
Waterbody
PVWMA Boundary
Land Use Classifications
Native Vegetation / Riparian
Turf (Urban)
Fallow
Vegetable Row Crops
Strawberries
Caneberries
Vines
Orchards
Other
N
W
E
S
0
1
2
4
Miles
Urban (Turf) 17%
Irrigated agriculture 37%
Native Vegetation / Riparian 43%
Non-irrigated agriculture 3%
PVWMA
Sources: Esri, DeLorme, NAVTEC
GEBCO, USGS, FAO, NPS, NRCA
Ordnance Survey, Esri Japan, METI,
and the GIS User Community
Corp.,
Wisstopo,
LandUse_Map_Summer2013_02.04.2013_bs

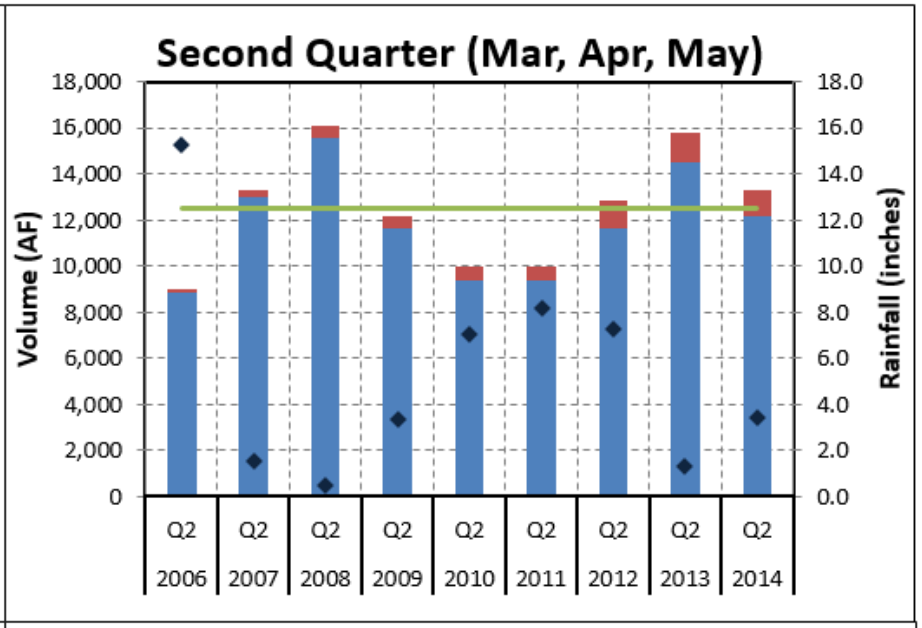

Production Wells
Day Valley
Aptos
Rio del Mar
Aptos Hills-Larkin Valley
Watsonville
Pajaro
Moss Landing
Elkhorn
Prunedale
Strawberry Canyon Rd
Echo Valley Rd
Castroville Blvd
Salinas Rd
Monterey Bay
N
W
E
S
0
1.5
3
6 Miles

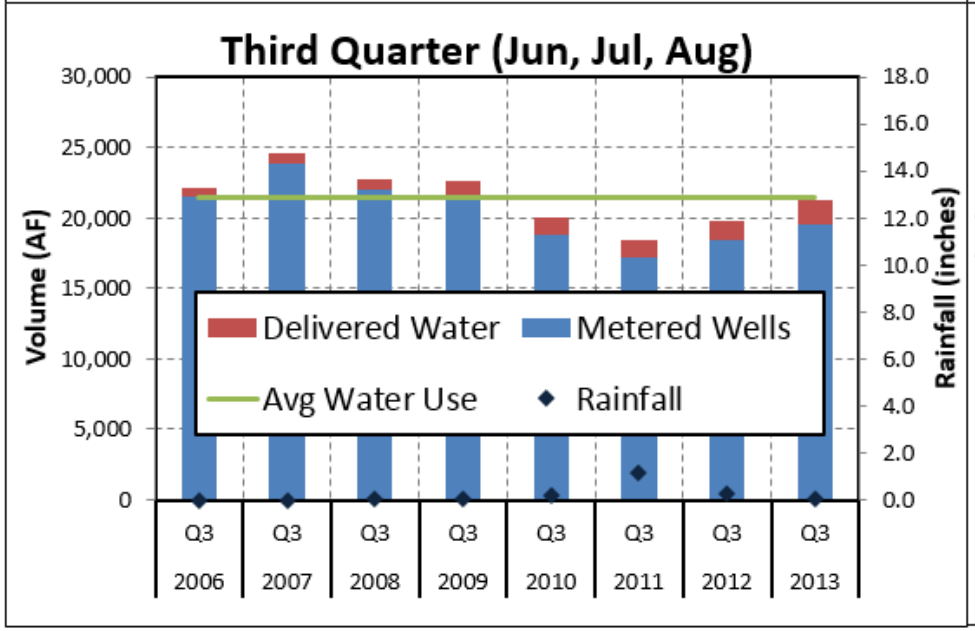
Water Use and Precipitation Trends
Pajaro Valley 2000 - 2013

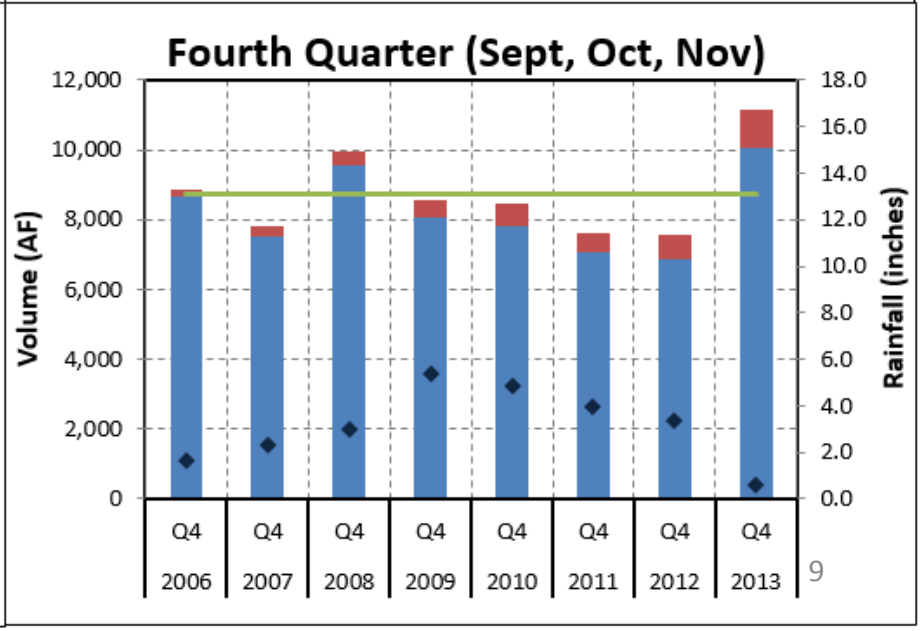


Quarterly Agricultural Water Use



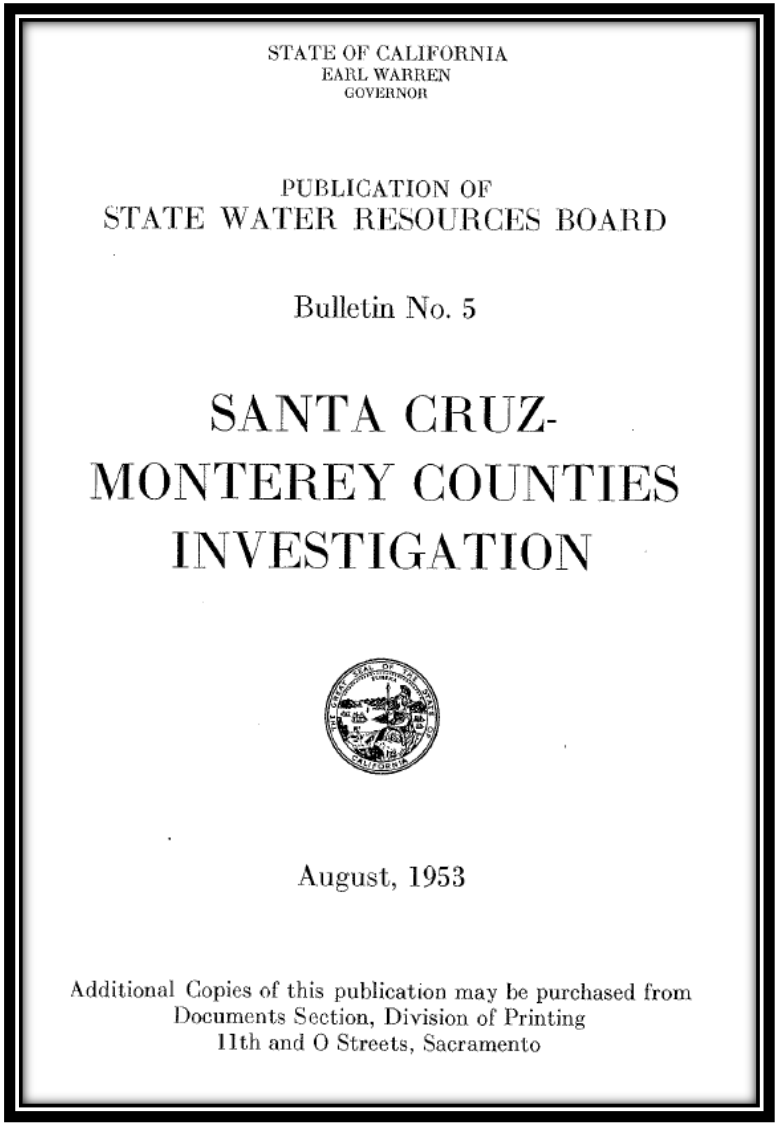






Pajaro Valley Water History

- **1953**
  - Seawater Intrusion in the Pajaro Valley is first documented, Bulletin No. 5, State Water Resources Board
- **1984**
  - PVWMA formed by California Legislature
- **1993**
  - First Basin Management Plan & EIR
  - Well Metering Begins
- **2002**
  - Revised BMP
  - Harkins Slough MAR project commences operation and a portion of the Coastal Distribution System is completed



STATE OF CALIFORNIA
EARL WARREN
GOVERNOR

PUBLICATION OF
STATE WATER RESOURCES BOARD

Bulletin No. 5

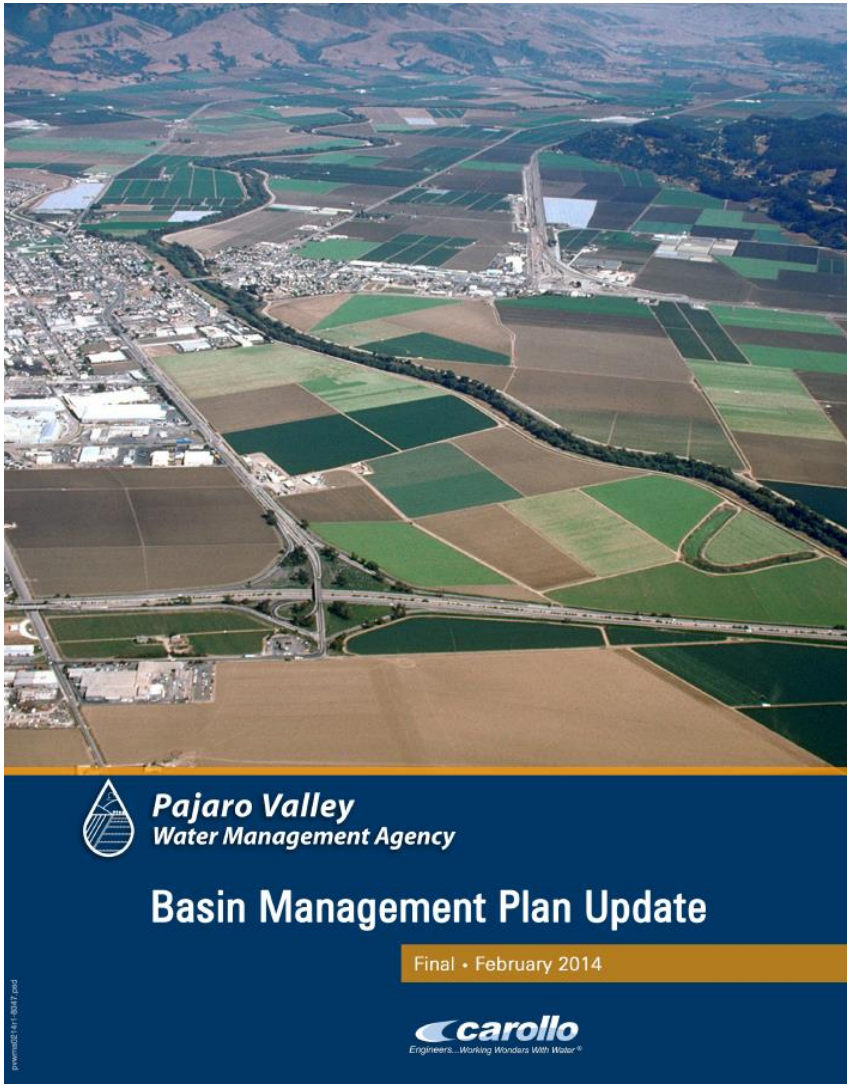
SANTA CRUZ-
MONTEREY COUNTIES
INVESTIGATION

August, 1953

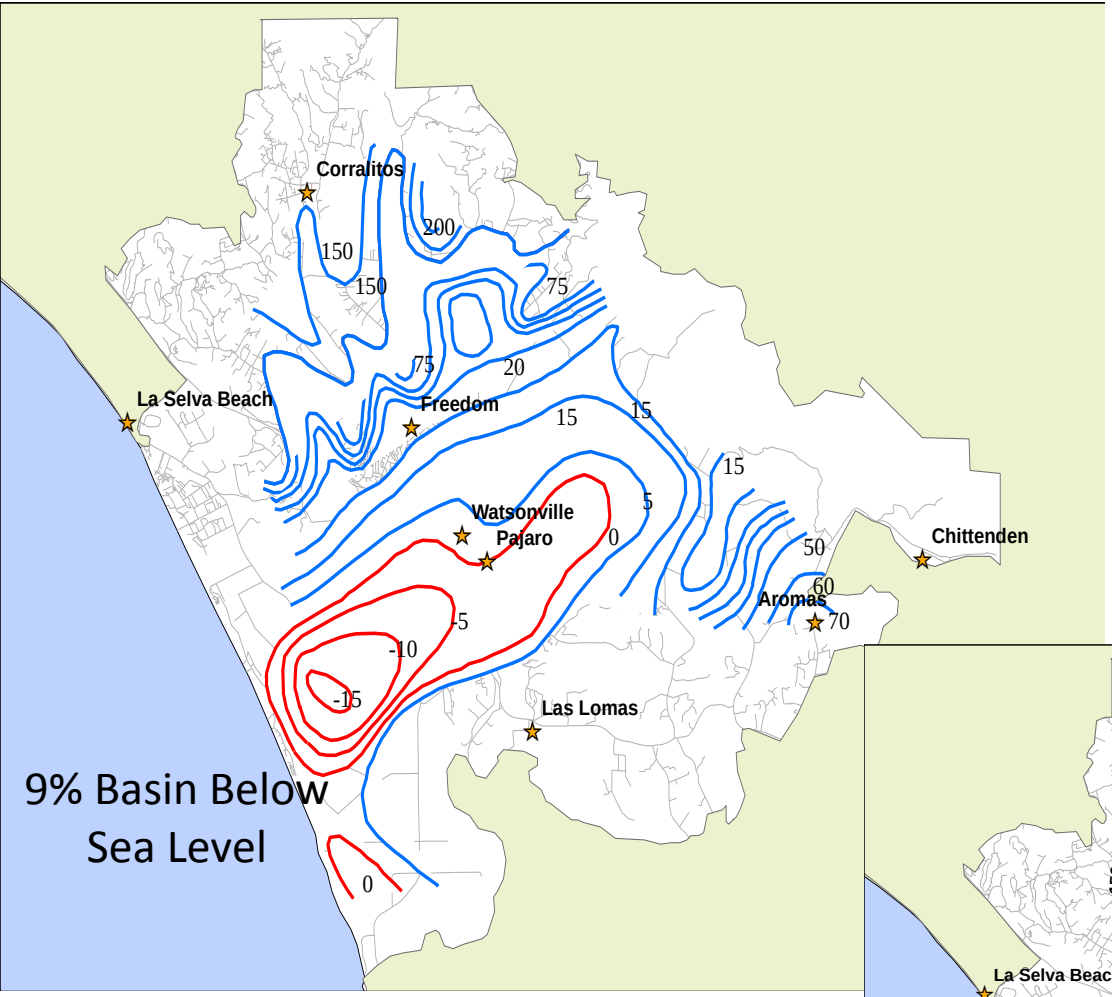
Additional Copies of this publication may be purchased from
Documents Section, Division of Printing
11th and O Streets, Sacramento

Pajaro Valley Water History (cont.)

- **2009**
  - Recycled Water Facility and 20 miles of conveyance pipeline (CDS) completed & operational.
- **2010**
  - New Hydrologic Model (PVHM)
  - Successful Prop. 218 Vote
- **2012**
  - Community based development of Basin Management Plan (BMP) Update
- **2014**
  - Certified BMP Environmental Impact Report
  - Adopted Updated Basin Management Plan

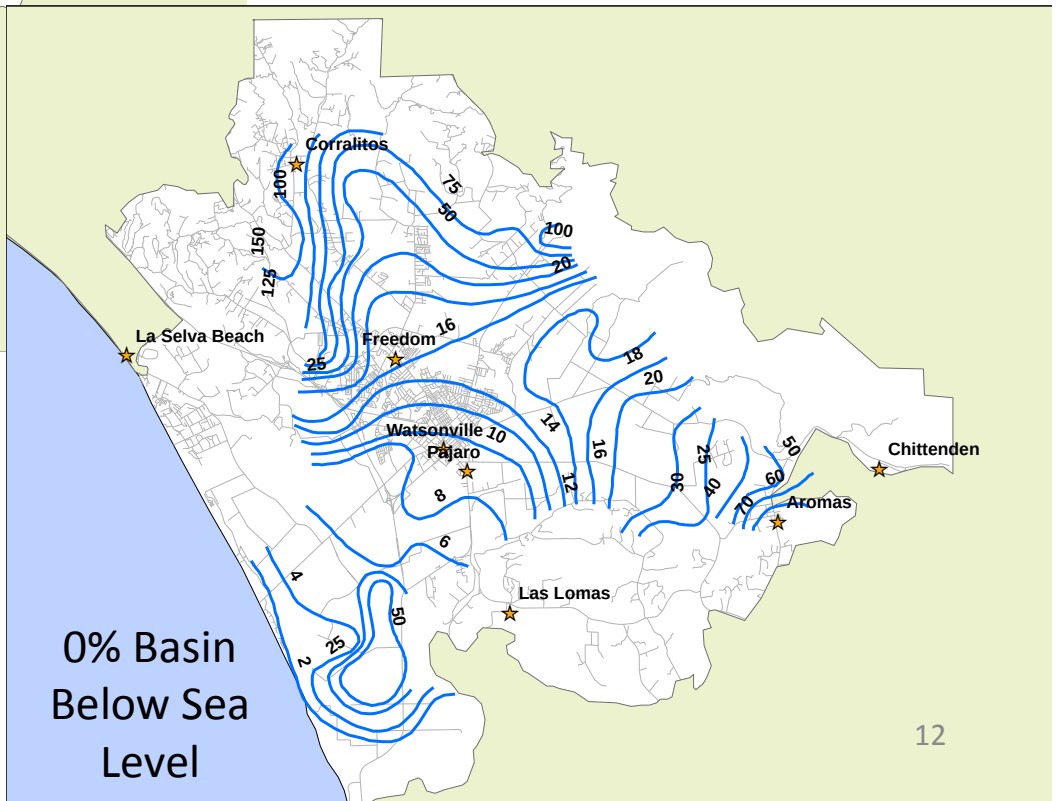


1947: Following 10-year Drought



9% Basin Below Sea Level

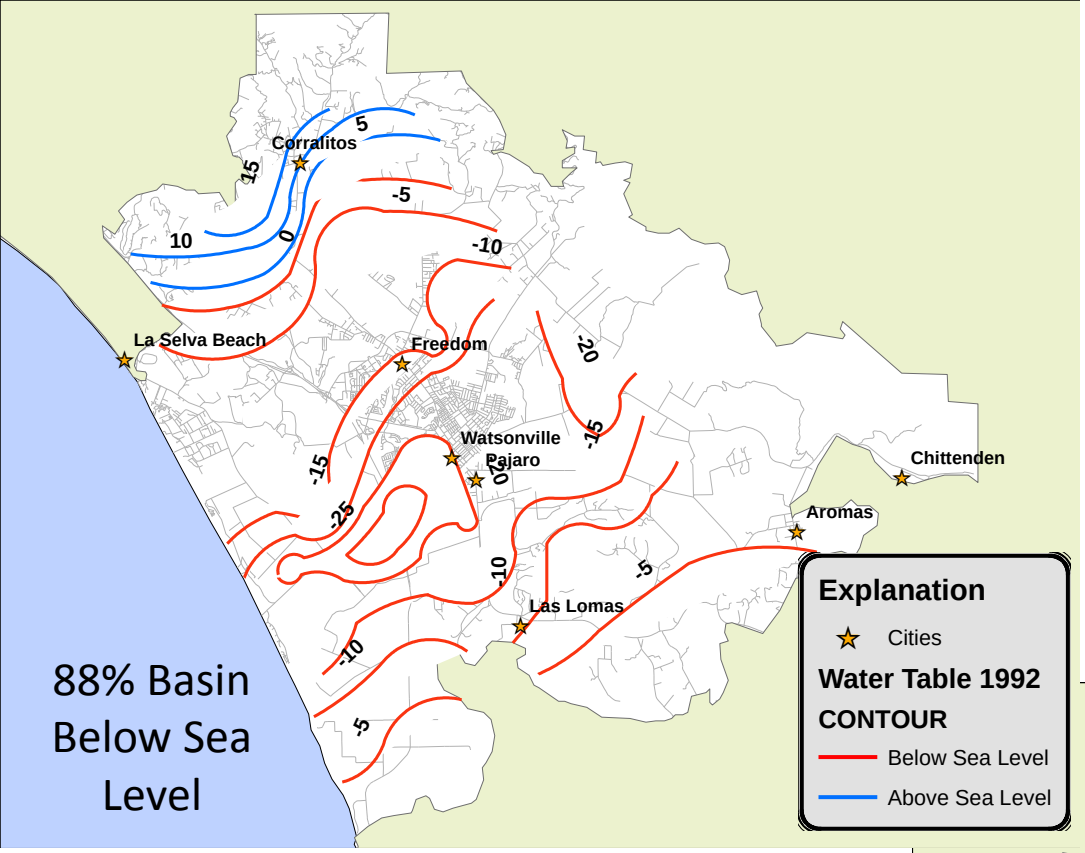
1951: Recovery after wet cycle



0% Basin Below Sea Level

Contours from Bulletin No. 5, 1953

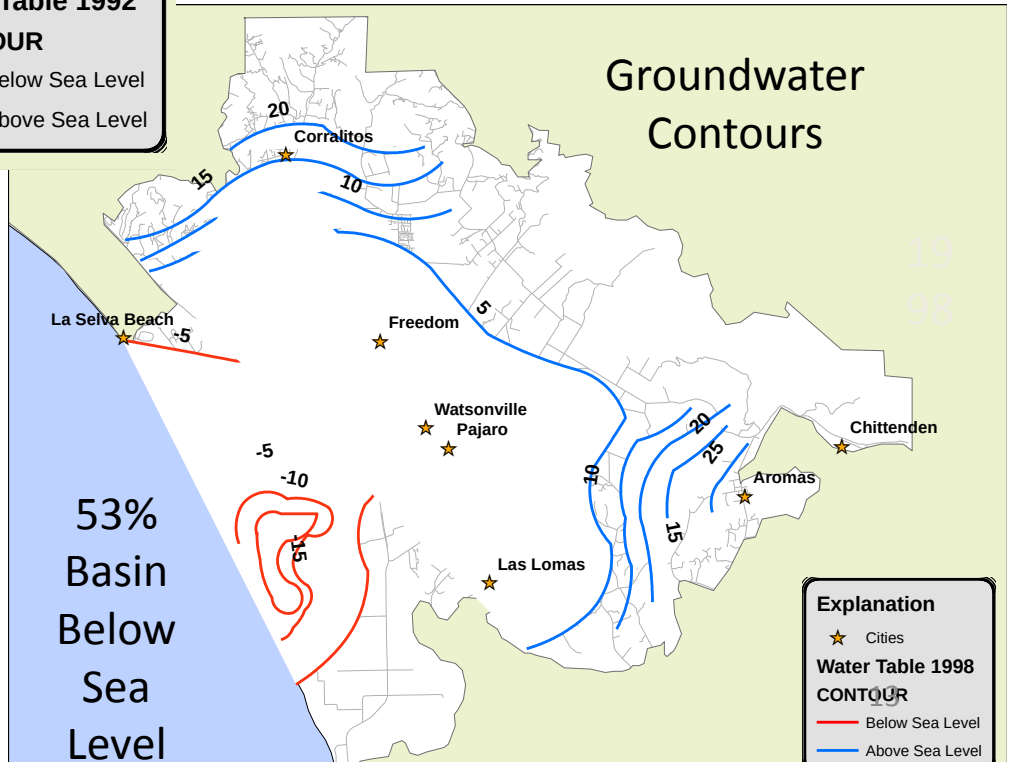
1992: Following drought of the late 1980s



88% Basin Below Sea Level

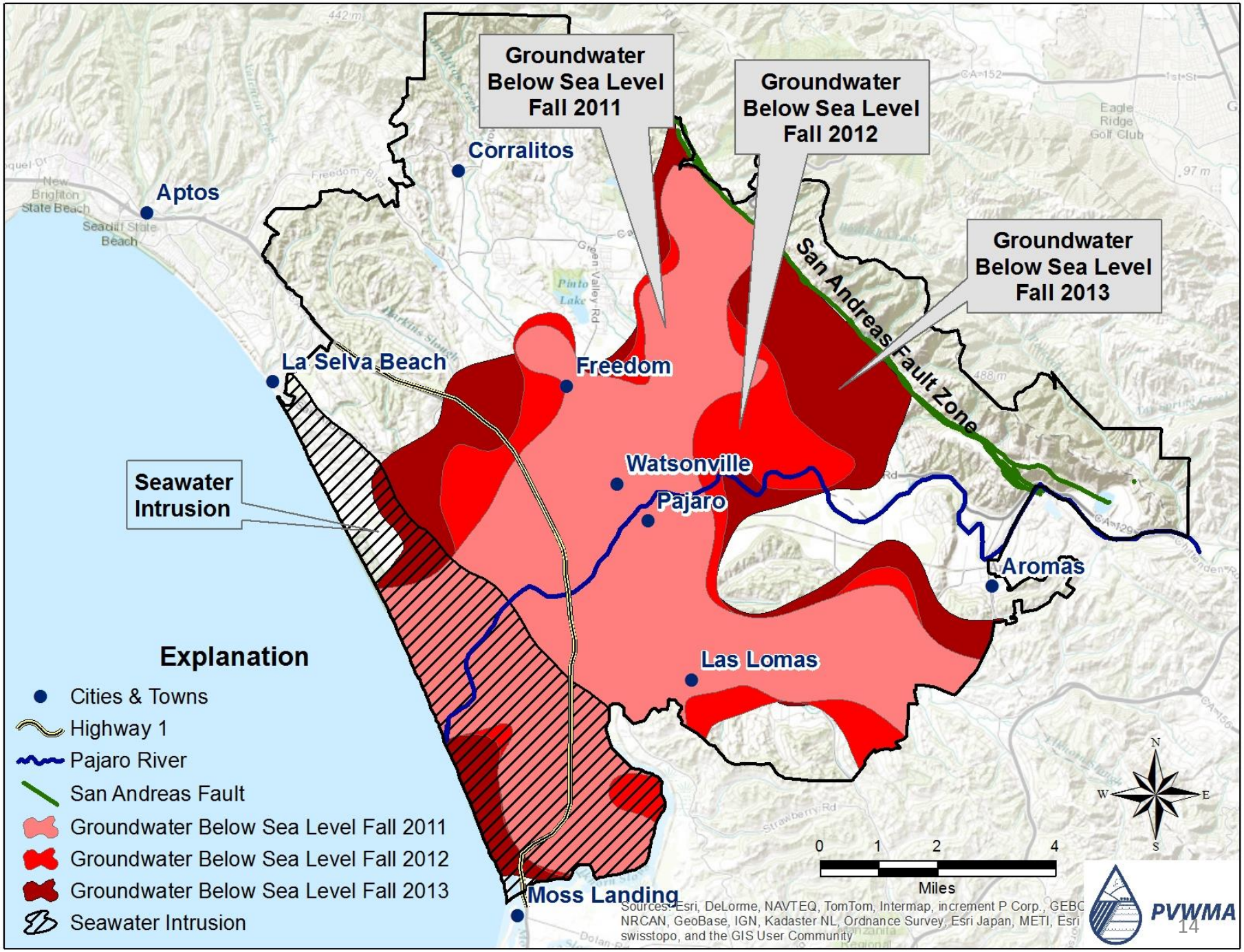
Groundwater Contours

1998: Following wet cycle → Partial Recovery



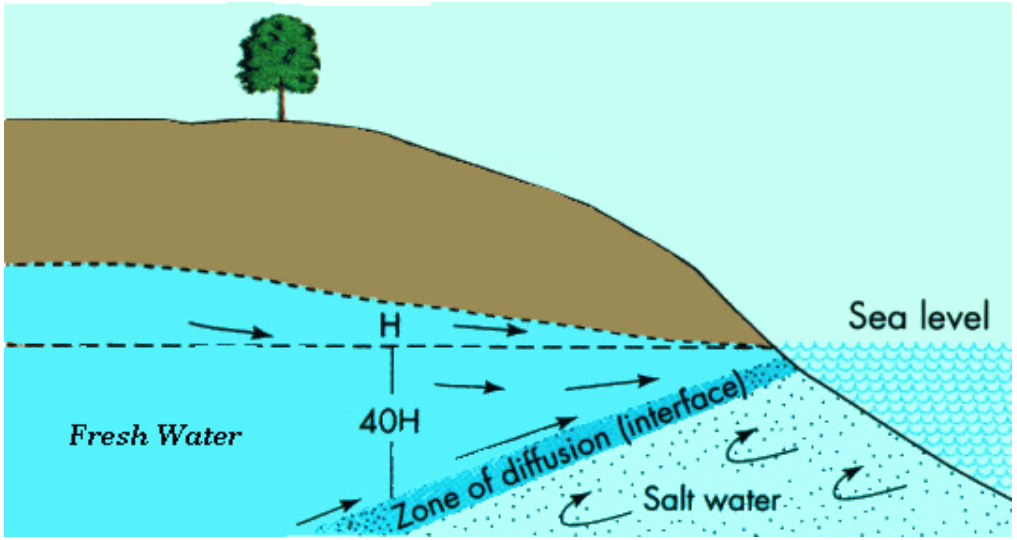
53% Basin Below Sea Level

Contours from Rev BMP, 2002

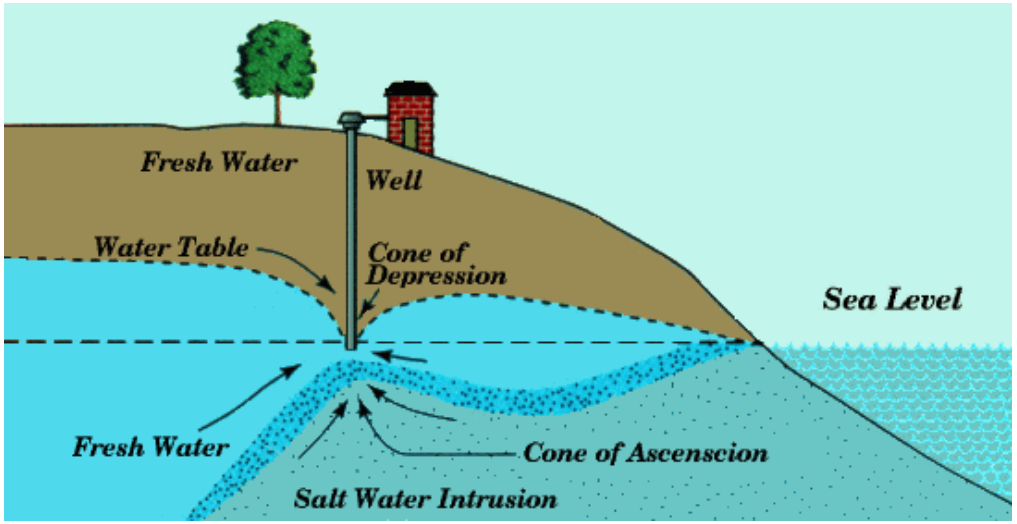

Groundwater Below Sea Level Fall 2011
Groundwater Below Sea Level Fall 2012
Groundwater Below Sea Level Fall 2013
Corralitos
Aptos
La Selva Beach
Freedom
Watsonville
Pajaro
Aromas
Las Lomas
Moss Landing
San Andreas Fault Zone
Seawater Intrusion
Explanation
Cities & Towns
Highway 1
Pajaro River
San Andreas Fault
Groundwater Below Sea Level Fall 2011
Groundwater Below Sea Level Fall 2012
Groundwater Below Sea Level Fall 2013
Seawater Intrusion
0 1 2 4
Miles
N
W
E
S
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBC
NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri
swisstopo, and the GIS User Community
PVWMA

Ground water levels do not have to be below sea level for "intrusion" to occur

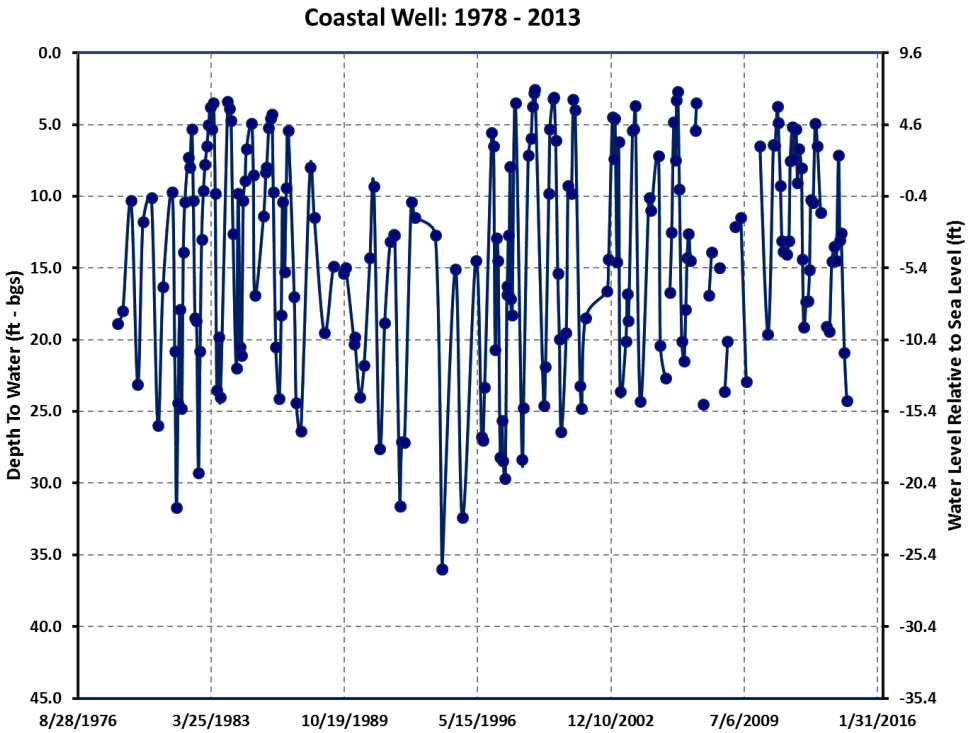
Initial conditions

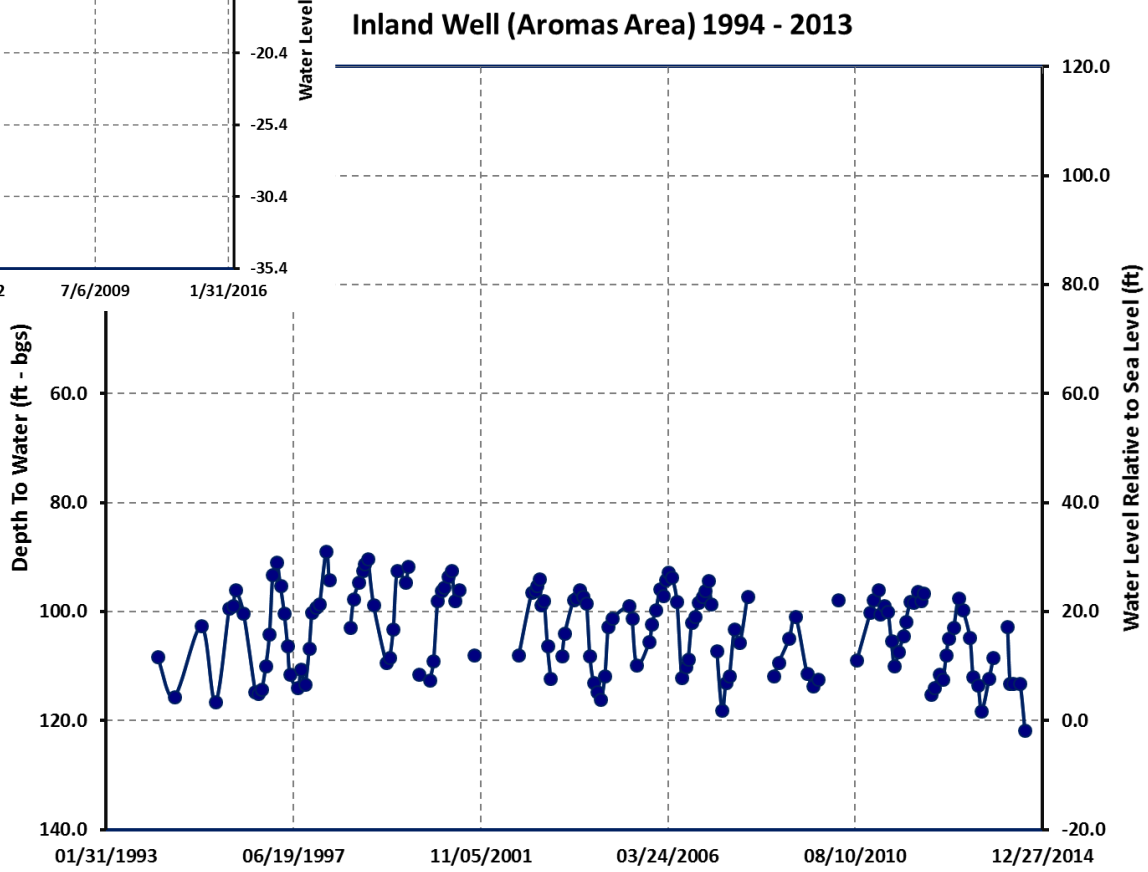


Modified conditions

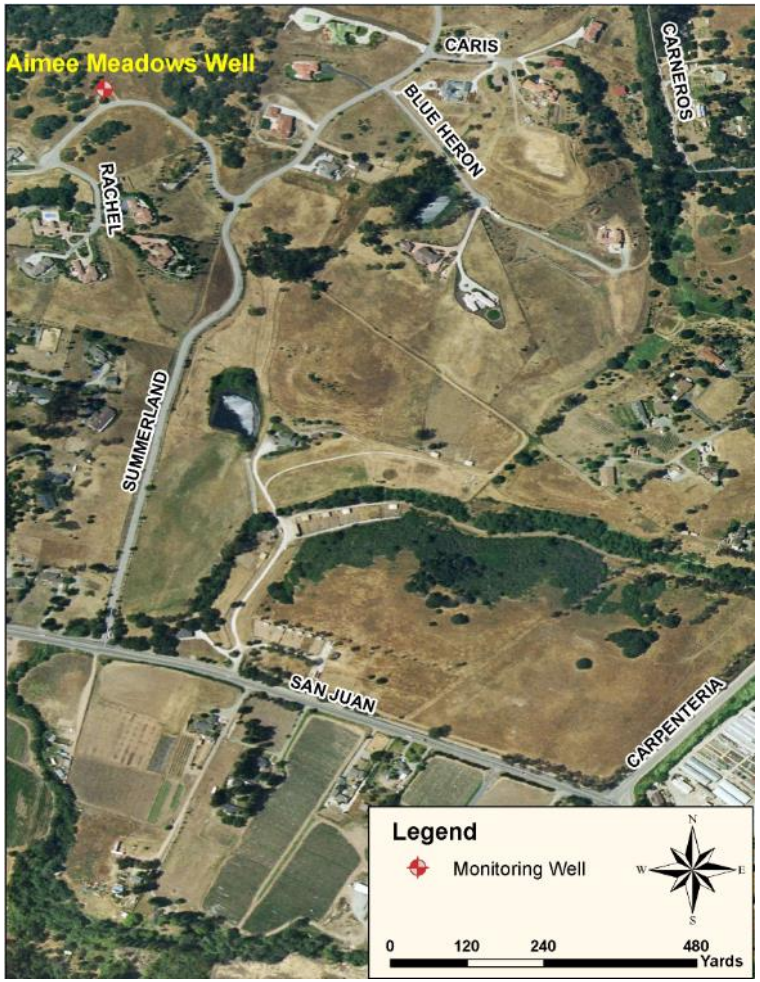


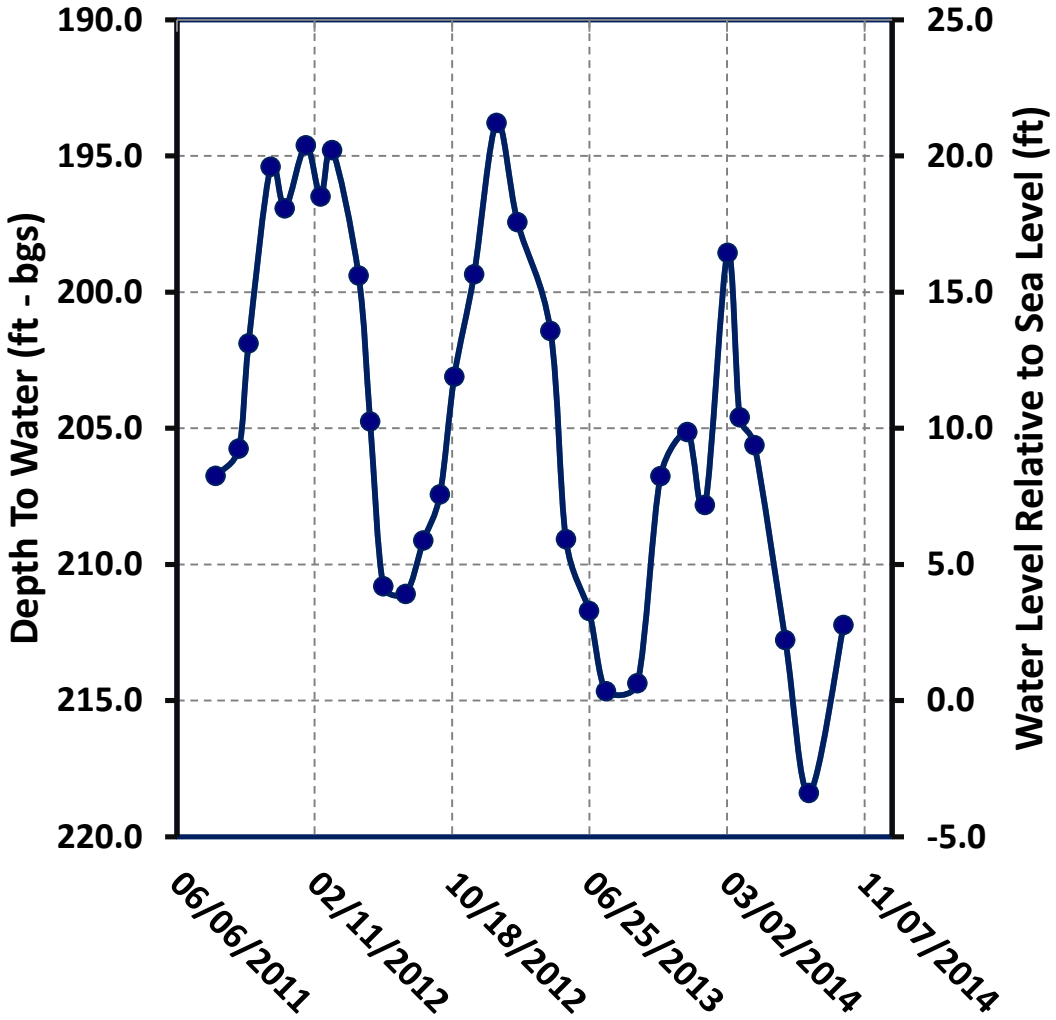
Idealized Concept of "Wedge of Seawater Intrusion" and related upconing from coastal wells.


Coastal Well: 1978 - 2013
Depth To Water (ft - bgs)
Water Level Relative to Sea Level (ft)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
9.6
4.6
-0.4
-5.4
-10.4
-15.4
-20.4
-25.4
-30.4
-35.4
8/28/1976
3/25/1983
10/19/1989
5/15/1996
12/10/2002
7/6/2009
1/31/2016


Inland Well (Aromas Area) 1994 - 2013
Depth To Water (ft - bgs)
Water Level Relative to Sea Level (ft)
60.0
80.0
100.0
120.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
01/31/1993
06/19/1997
11/05/2001
03/24/2006
08/10/2010
12/27/2014

Aimee Meadows Monitoring Well
Water Levels 2011 - 2014

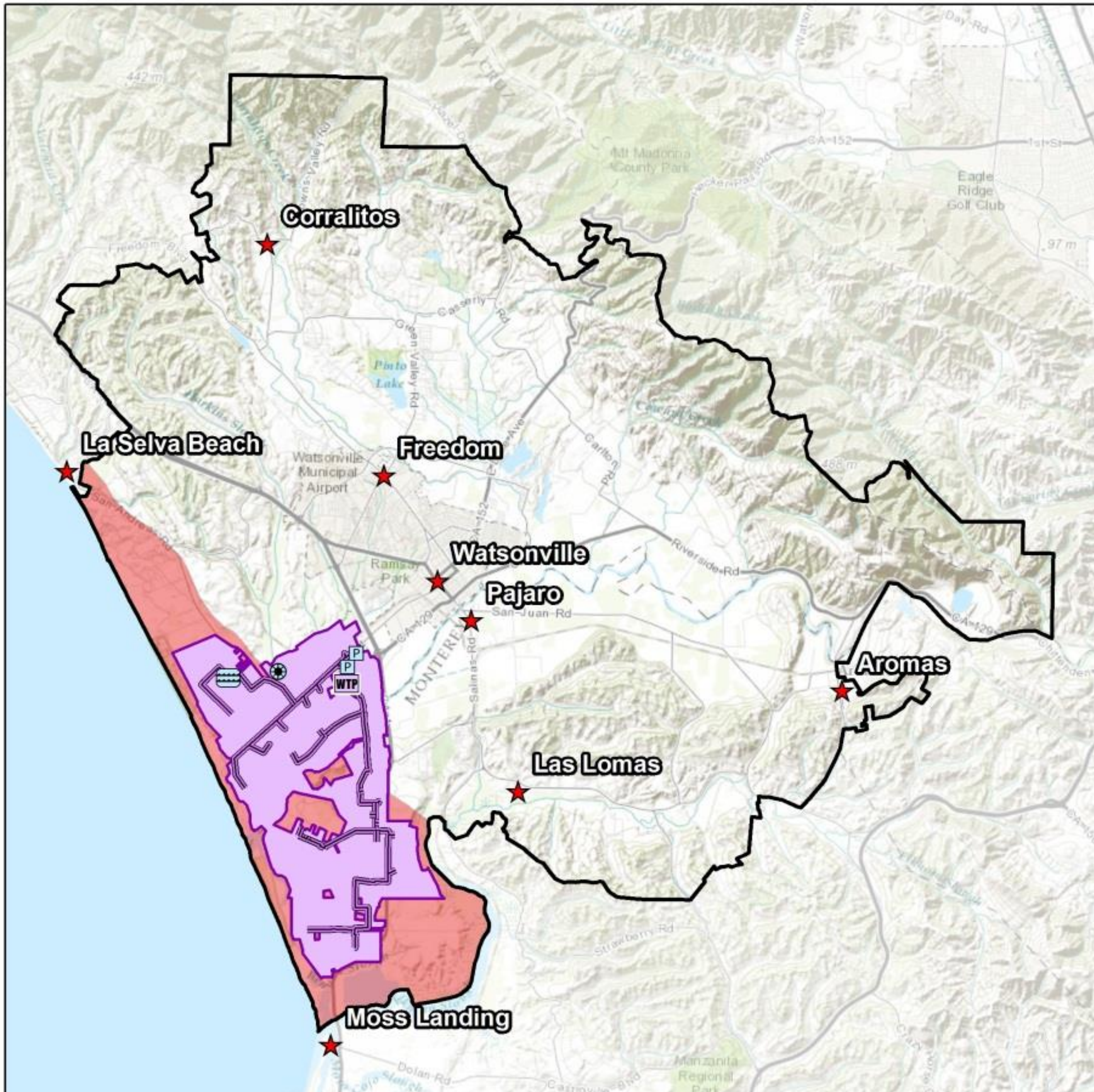




Water Supply Facilities

Water Supply Facilities to Stop Overdraft & Seawater Intrusion

- **Harkins Slough Facility**
  - Managed Aquifer Recharge & Recovery
  - Stream flow diversion
  - 7,000 AF recharged since 2002
- **Recycled Water Facility**
  - 4,000 AFY irrigation season capacity
  - Drought tolerant supply
  - Reduces discharge of secondary effluent to marine sanctuary
- **Coastal Distribution System**
  - Over 20 miles of water conveyance pipeline
- **Blend Supplies**



Water Supply Facilities & Seawater Intrusion

Explanation

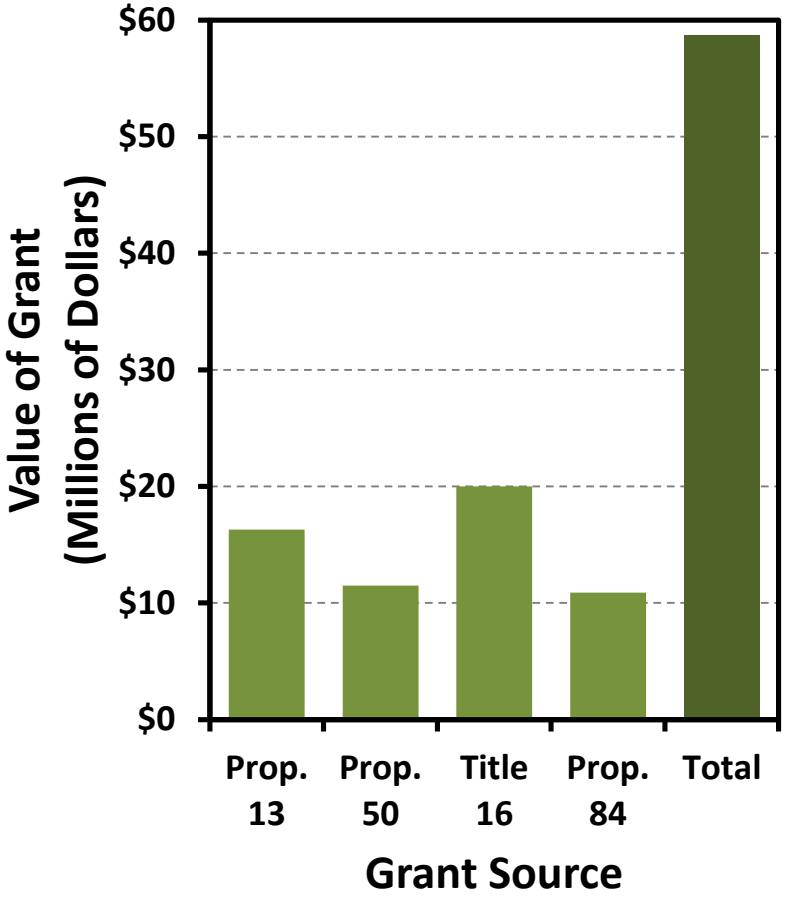
- Blend Wells
- HSP Diversion
- HSP Recharge Basin
- Recycled Water Facility
- CDS Alignment
- Delivered Water Zone
- PVWMA Boundary
- Extent of SWI

N
W E
S

0 1 2 4
Miles

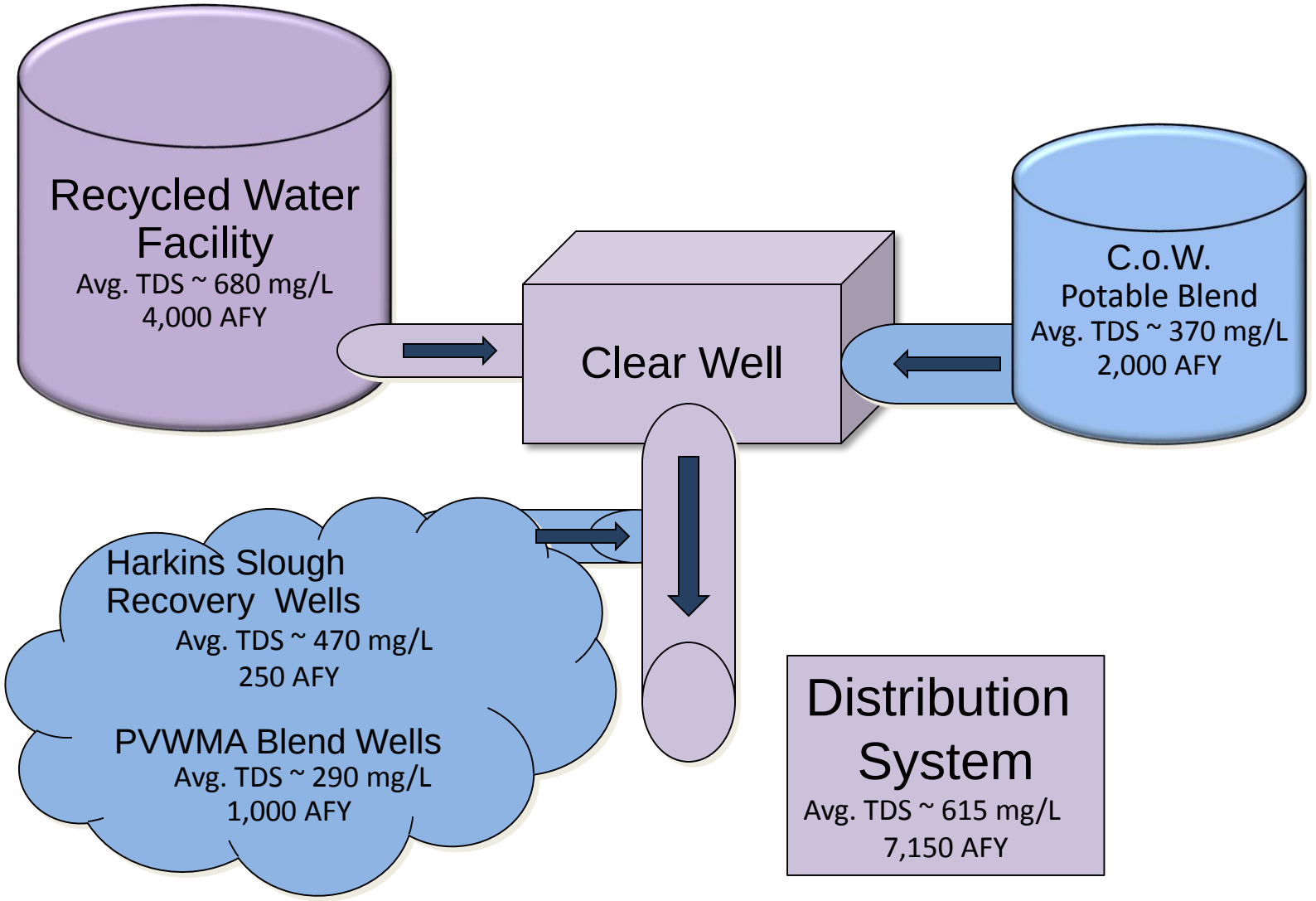
PVWMA

PVWMA has actively leveraged Grant Funding

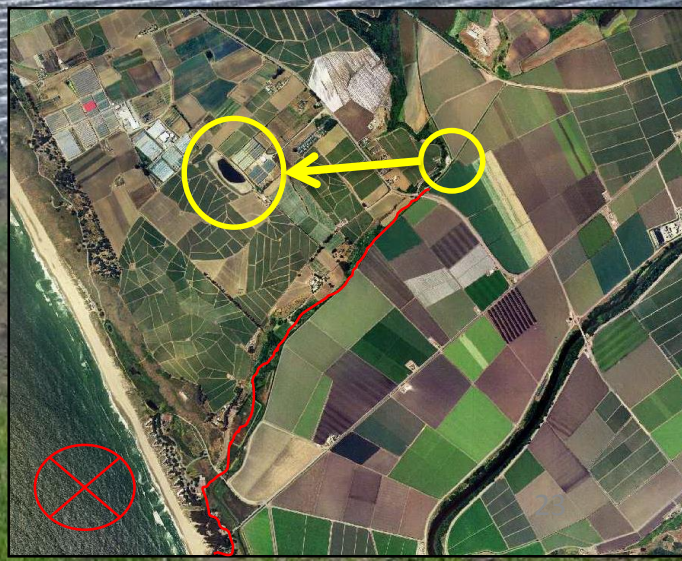


- Almost half of constructed project costs were funded by grant money
- PVWMA projects, which focus on water conservation and optimize use of local resources, are competitive for federal and state funding

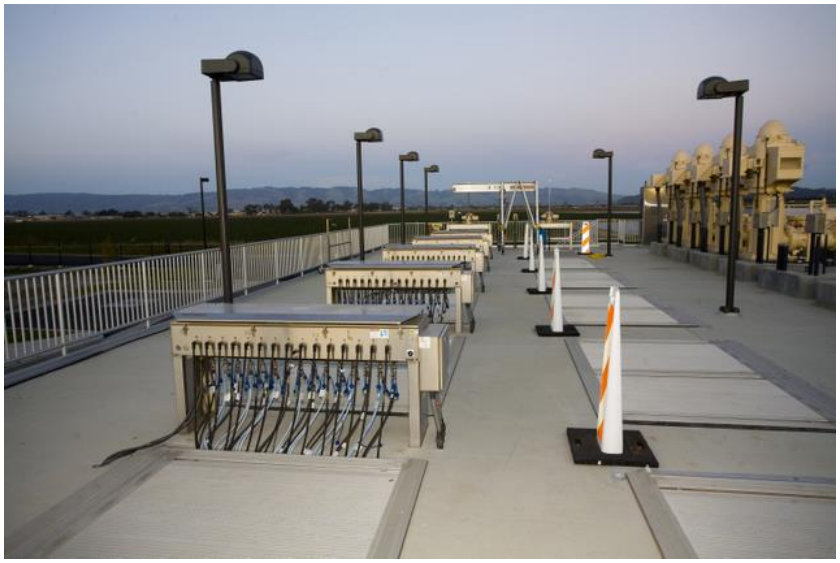
Distribution System Schematic



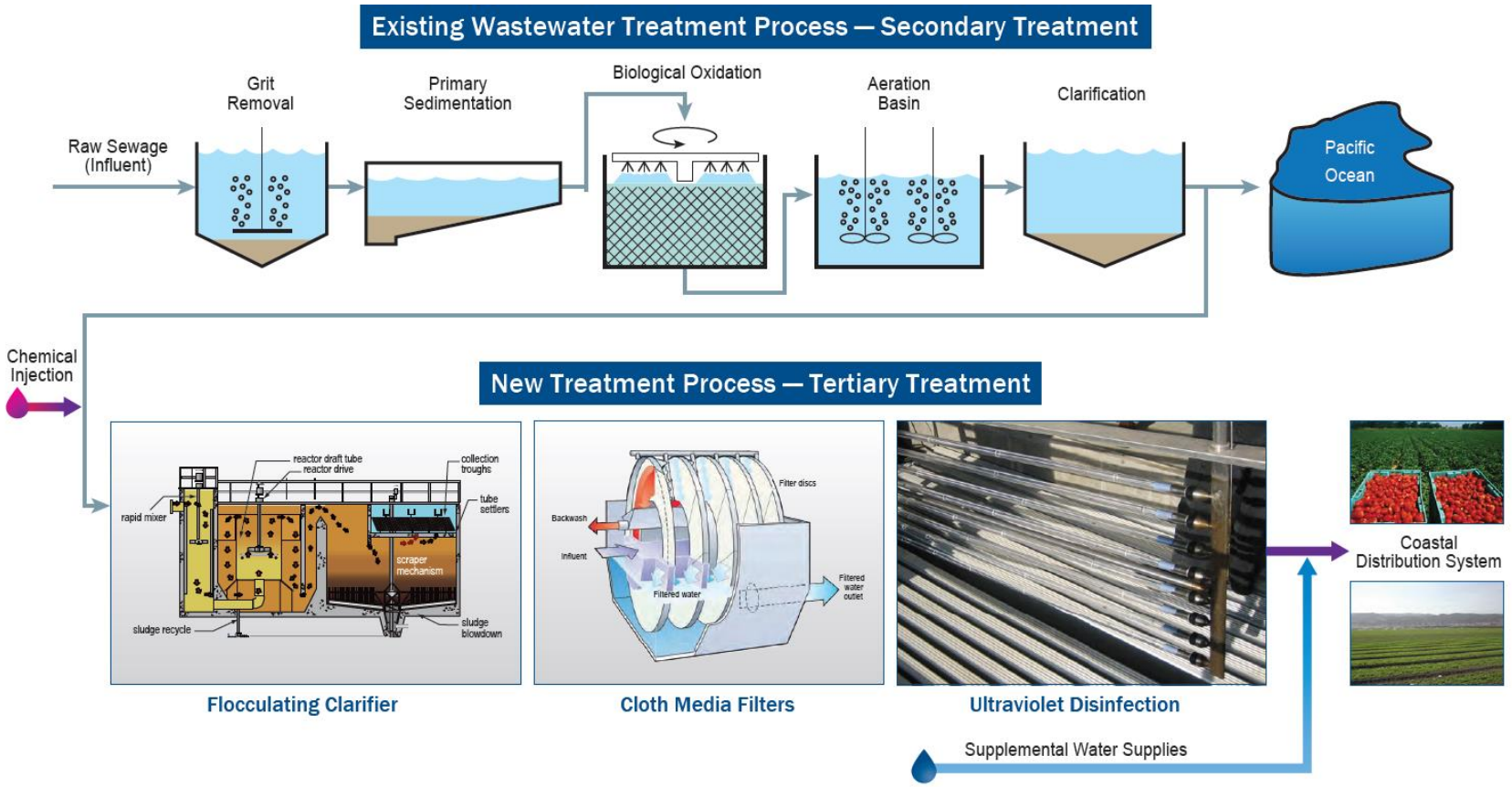
Harkins Slough Managed Aquifer Recharge & Recovery Facility



Water Recycling Facility



Recycled Water Treatment Process



2013 Water Deliveries

Irrigated Acreage:

Approx. 3,000 acres

Over 4,275 acre-feet of water delivered.

Crops Grown:

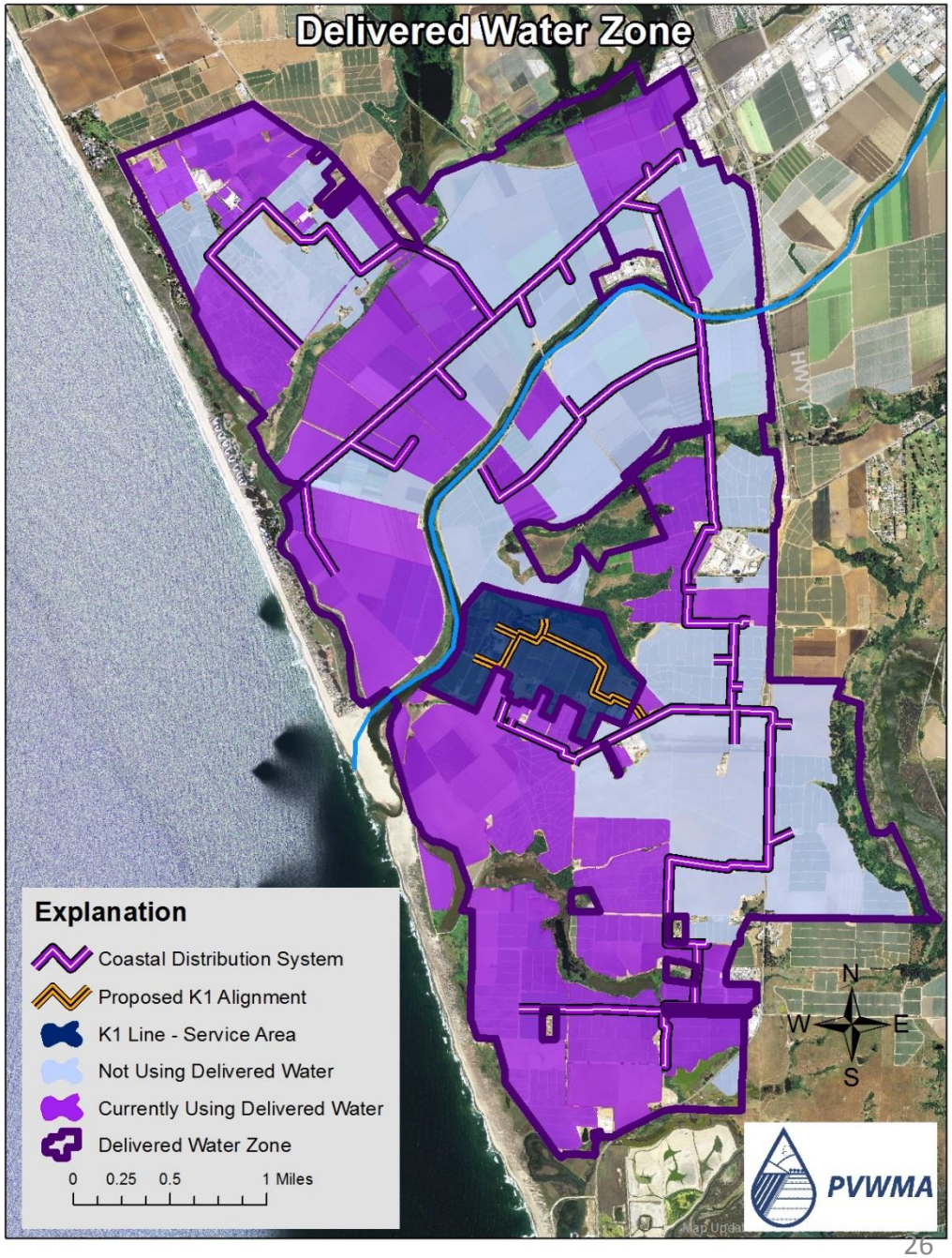
-Strawberries

-Lettuce

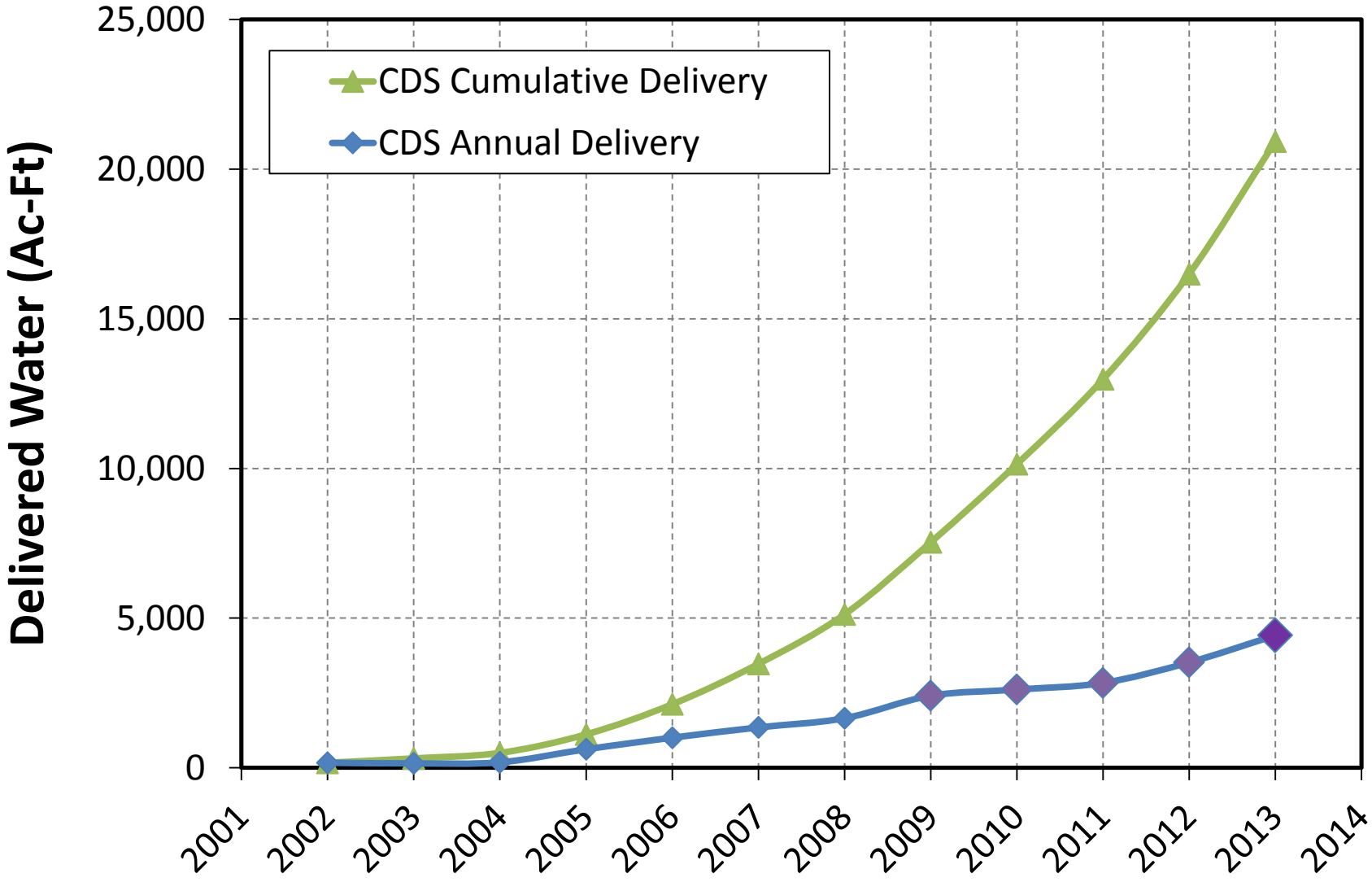
-Celery

-Artichokes

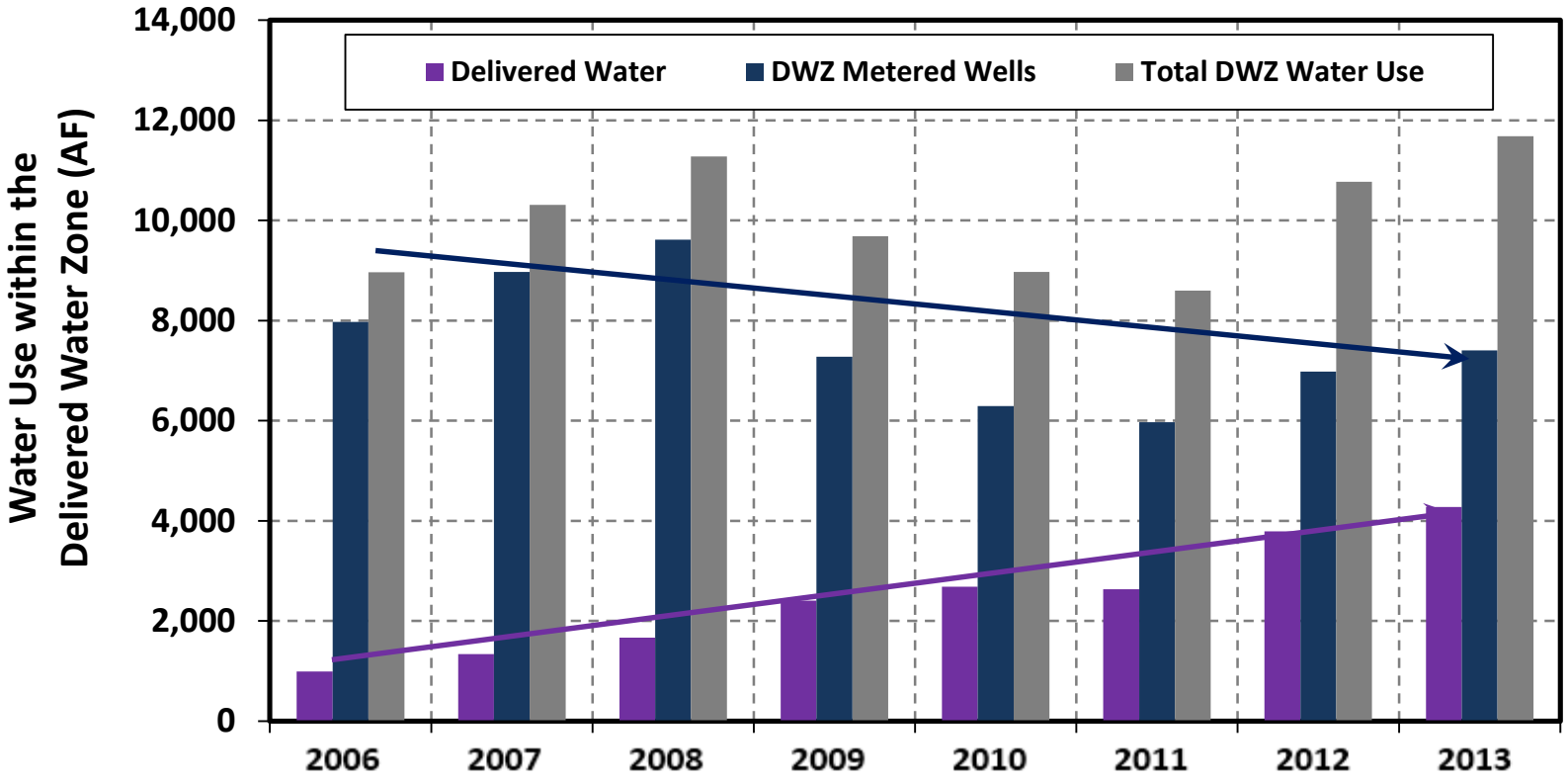
-Flowers



Coastal Distribution System Water Deliveries



Delivered Water and Groundwater Usage Trends



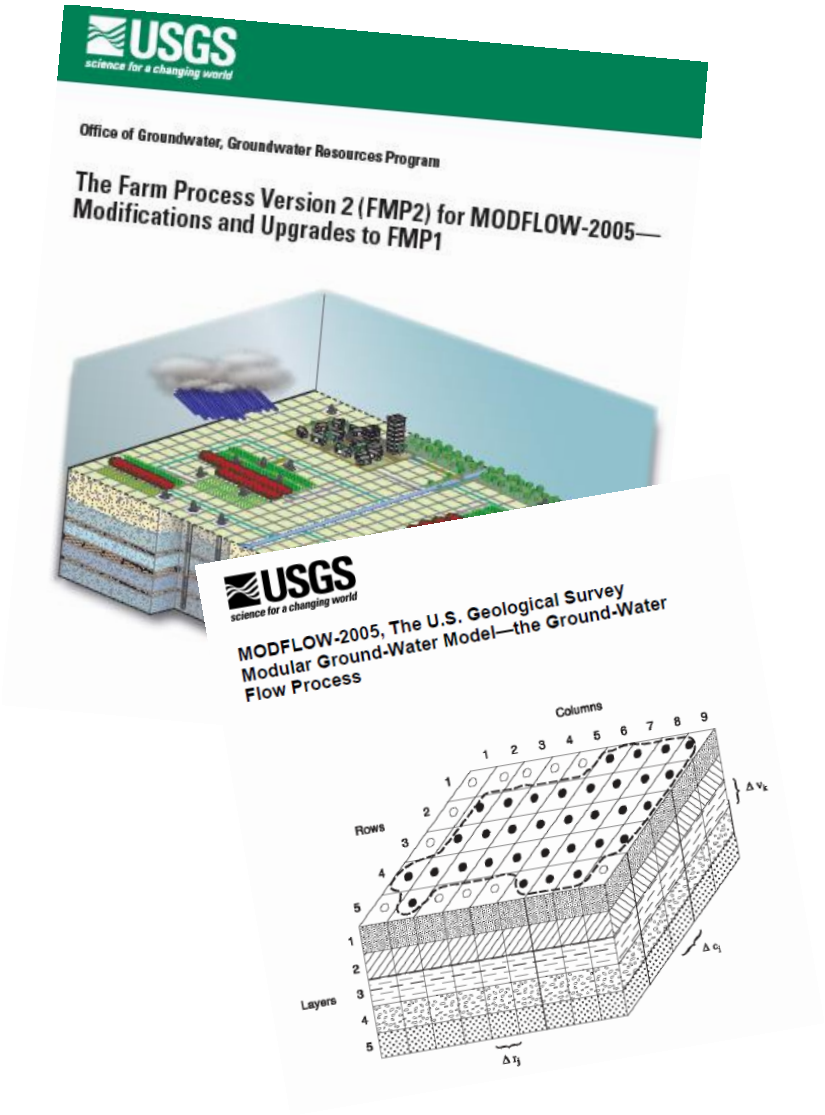
	2006	2007	2008	2009	2010	2011	2012	2013
Delivered Water (AF)	990	1,337	1,665	2,406	2,681	2,630	3,788	4,275
DWZ Metered Wells (AF)	7,976	8,974	9,614	7,278	6,293	5,971	6,984	7,407
Total DWZ Water Use (AF)	8,966	10,311	11,279	9,684	8,974	8,601	10,772	11,682
Delivered Water % of Total	11%	13%	15%	25%	30%	31%	35%	37%

(Production of Blended Recycled Water Began in 2009)

Basin Management Planning

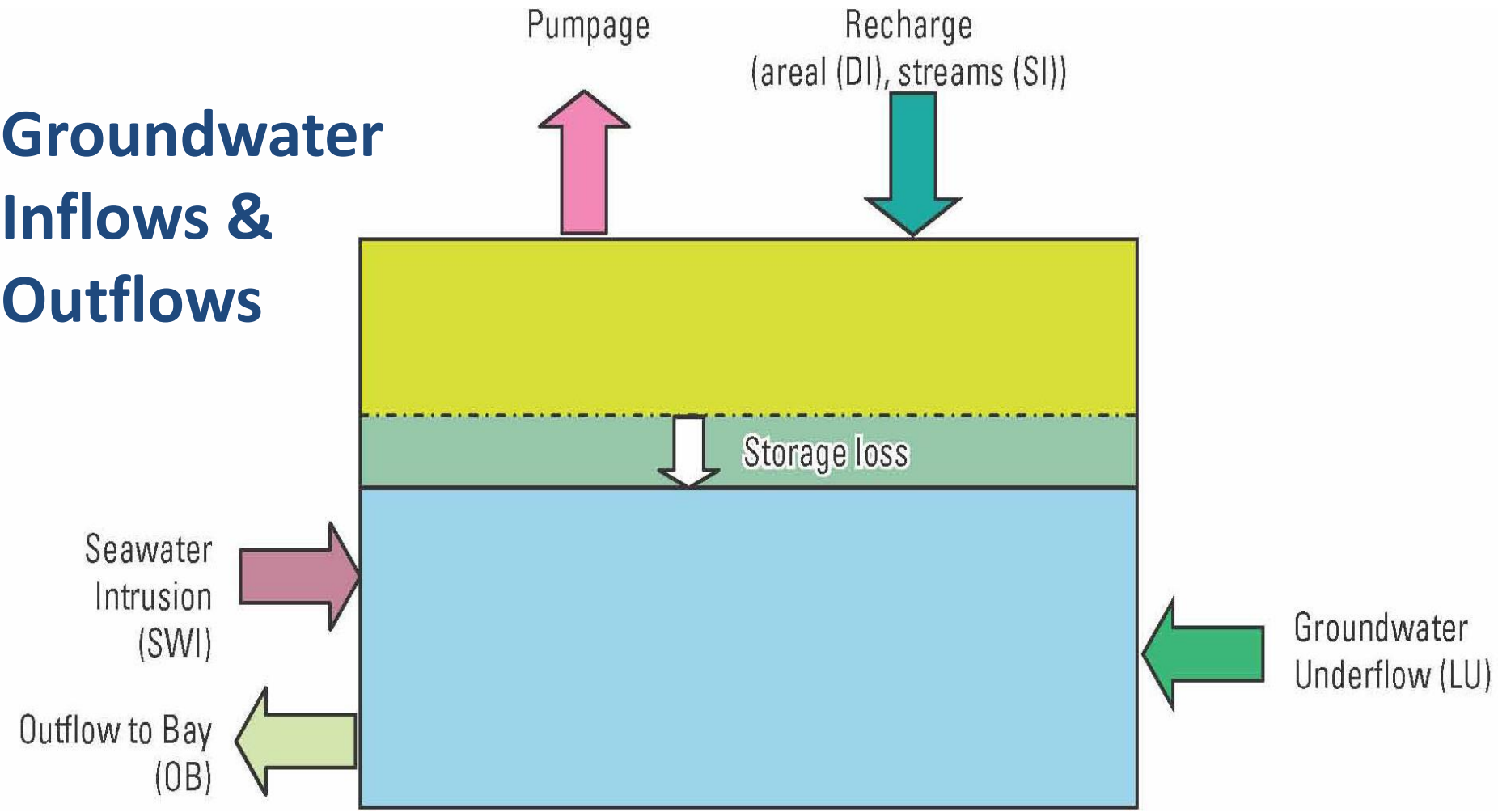
Pajaro Valley Hydrologic Model

- Designed to reproduce all natural & human components of the hydrologic system, and related climatic factors
- A hydrologic flow model accurate at scales relevant to water management decisions
- MODFLOW with Farm Process
- Model build completed - 2010



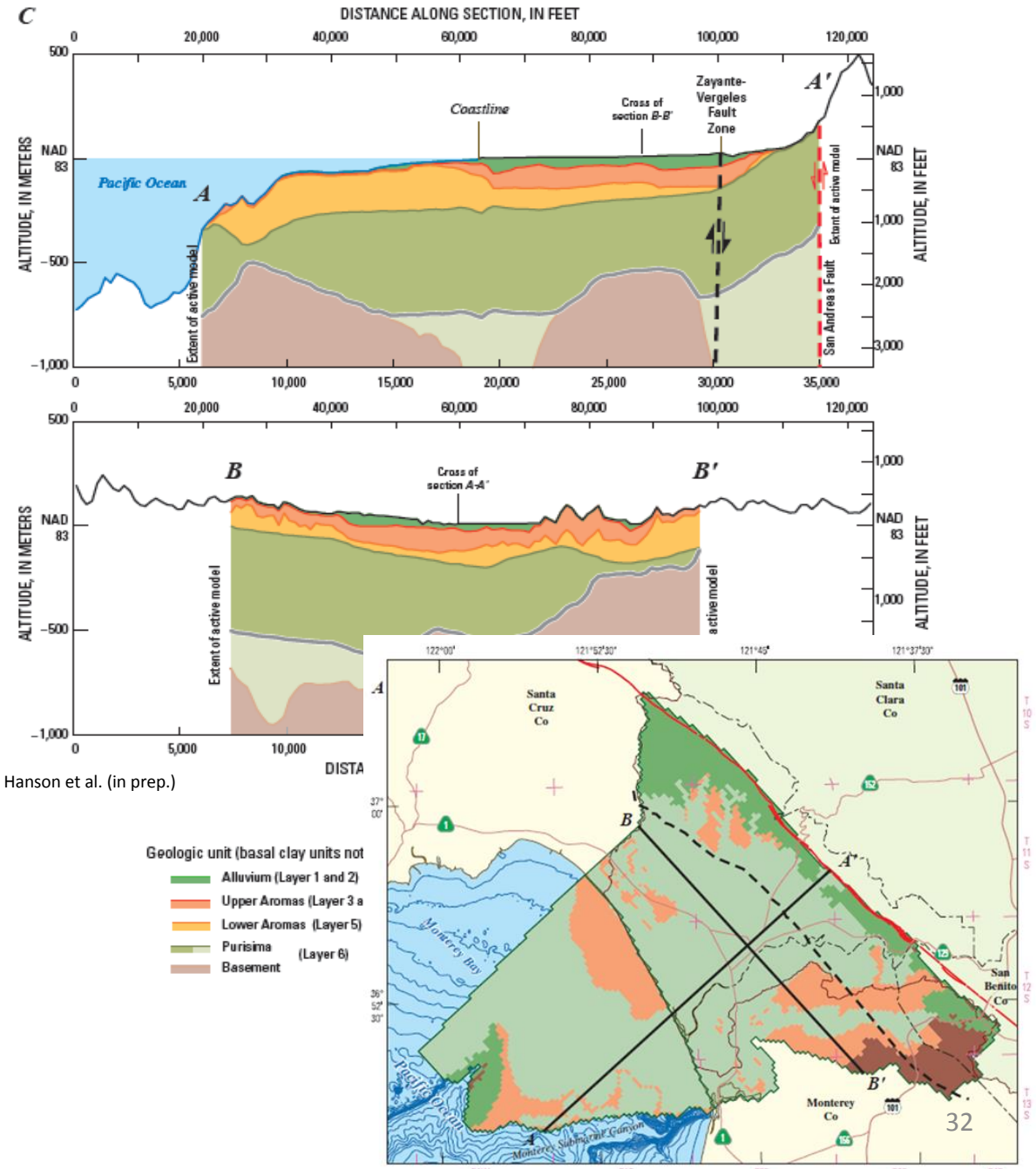
Hydrologic Modeling

Groundwater Inflows & Outflows

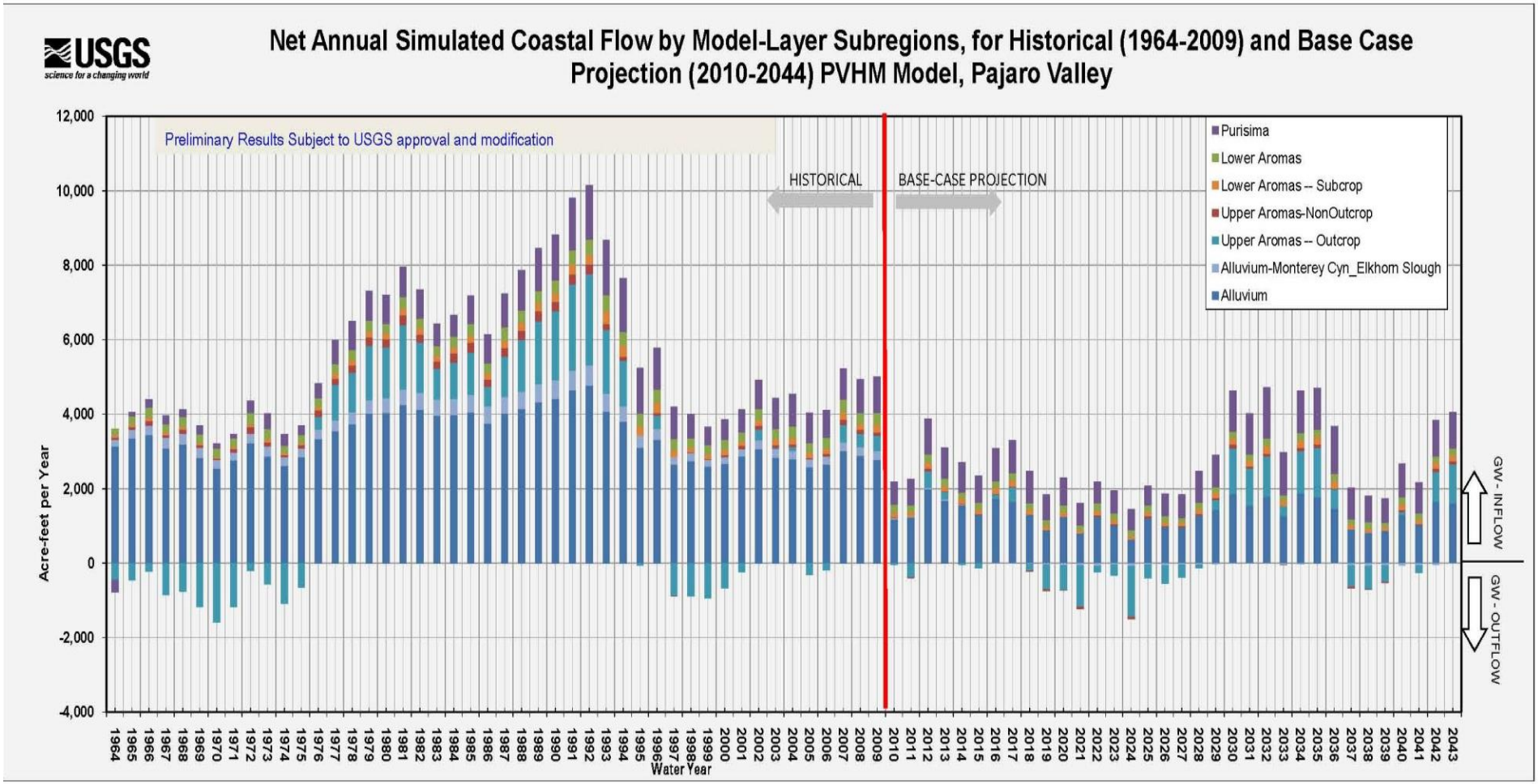


Basin Geology:
Profile View

Six Model Layers:
- Alluvium
- Alluvial Confining Unit
- Upper Aromas
- Aromas Confining Unit
- Lower Aromas
- Purisima



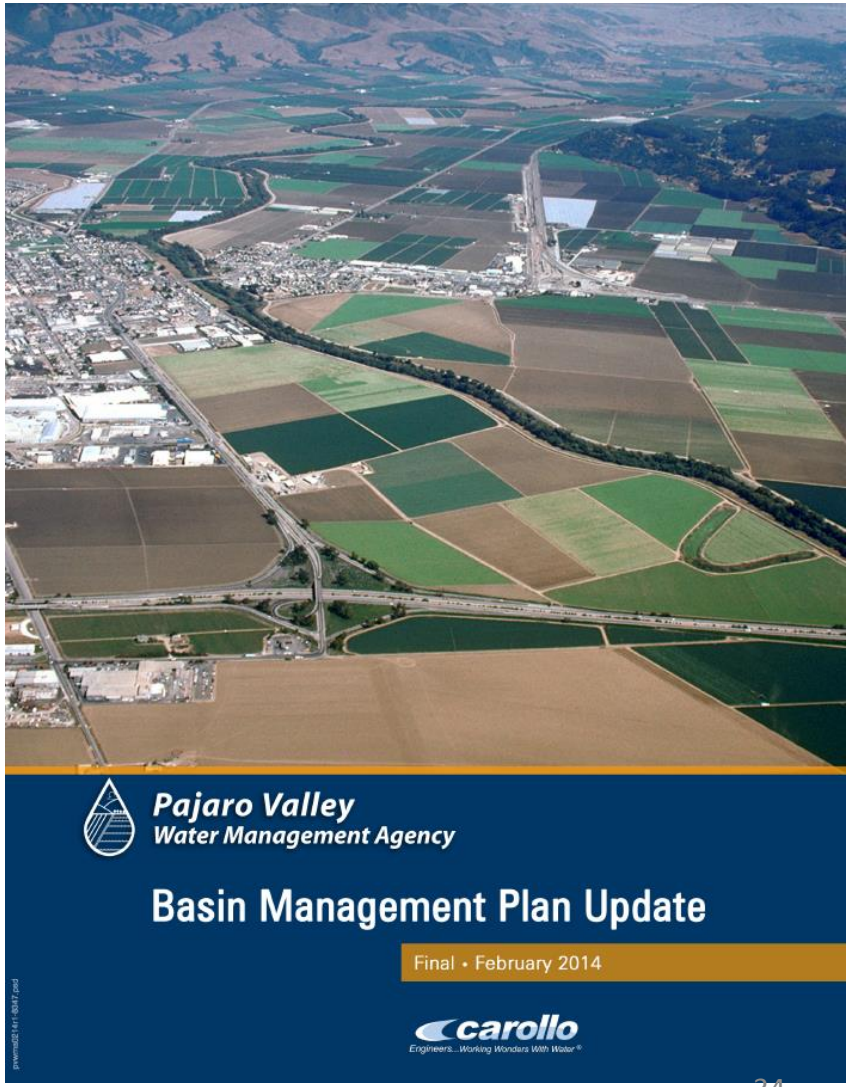
Future simulation shows reduced seawater intrusion



Basin Management Plan Update

In 2010 the PVWMA Board established an Ad Hoc Basin Management Plan Committee to…

"investigate all practical projects and programs that contribute to the efficient and economical management of existing and supplemental water supplies" and "serve as an advisory committee to the PVWMA Board so that Board decisions are fully informed and affected and guided by the community's interests".



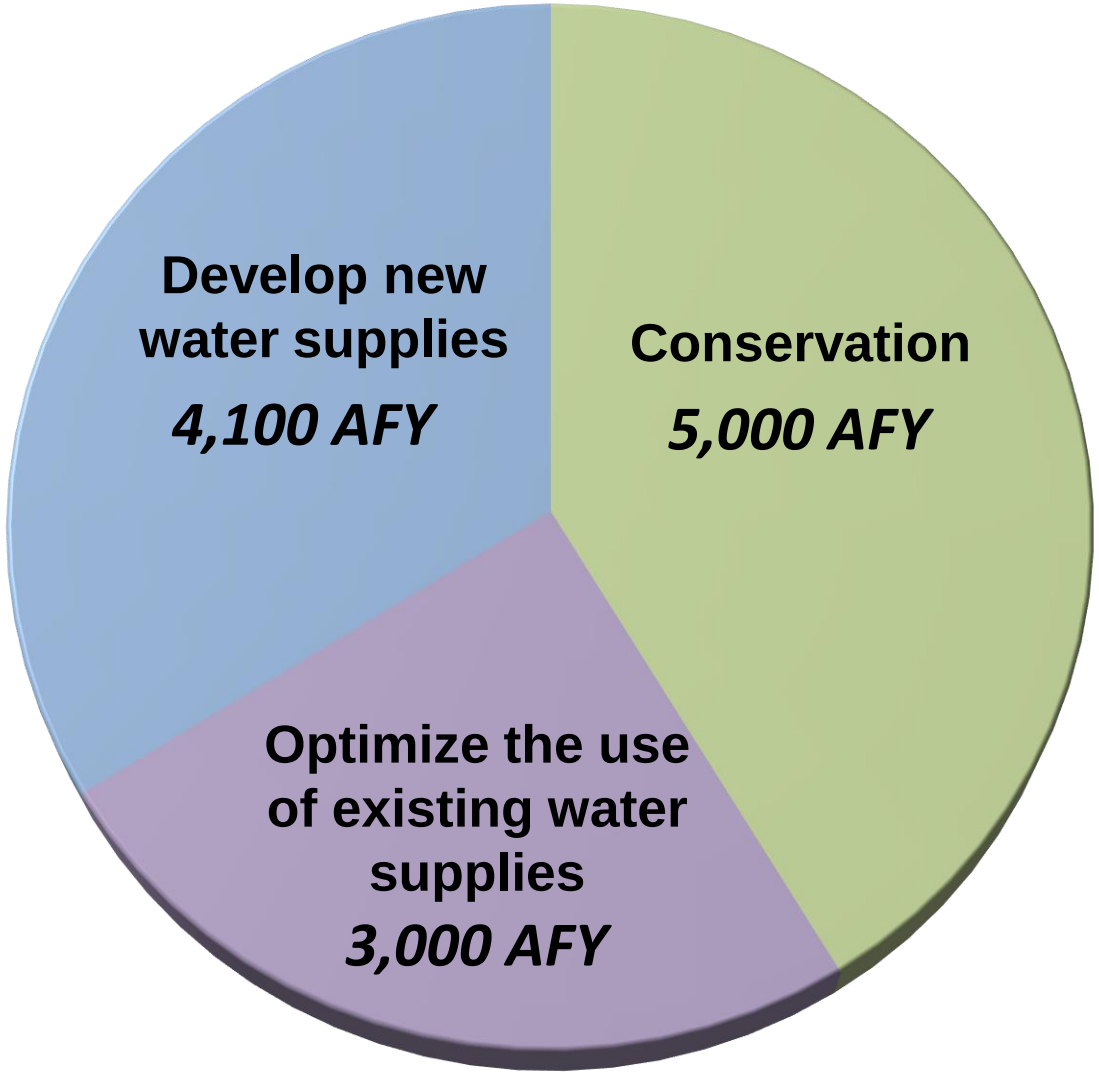
Ad Hoc BMP Committee Members

Committee Member	Member Type	Representative Entity
Dave Cavanaugh (Chair)	Appointed	Pajaro Valley Water Management Agency
Kirk Schmidt (Vice Chair)	Appointed	Agricultural
Rosemarie Imazio	Appointed	Pajaro Valley Water Management Agency
Rich Persoff	Appointed	Pajaro Valley Water Management Agency
John Ricker	Appointed	County of Santa Cruz
Ryan Kelly	Appointed	County of Monterey
Steve Palmisano	Appointed	City of Watsonville
Harry Wiggins	Appointed	Pajaro Sunny Mesa Community Services District
John E. Eiskamp	Appointed	Santa Cruz County Farm Bureau
Dave Kegebein	Appointed	Monterey County Farm Bureau
John Martinelli	Appointed	Landowner Group
Chuck Allen	Appointed	Community Dialogue Effort
Vicki Morris	Appointed	Aromas Water District
Ron Duncan	Appointed	At Large
Thomas Karn	Applicant	Rural Residential
Bob Culbertson	Applicant	Environmental
Amy Newell	Applicant	At Large
Skip Fehr	Applicant	Mutual Water Agency
Stuart Kitayama	Appointed	Agricultural
Frank Capurro	Appointed	Agricultural
Tom Rider	Appointed	Agricultural

BMP Update Objectives

- Prevent seawater intrusion, long-term groundwater overdraft, land subsidence, and water quality degradation;
- Manage existing and supplemental water supplies to control overdraft and to provide for present and future water needs;
- Create a reliable, long-term water supply, which has been identified as an important cornerstone of the long-term economic vitality of the Pajaro Valley;
- Develop water conservation programs; and
- Recommend a program that is cost effective and environmentally sound.

Basin Management Plan Update contains three primary components



Summary of projects in terms of capital and operating costs

		Yield, afy	Capital Cost	Annualized Capital & O&M	Annualized Costs/Yield $/af
D-7	Conservation	5,000		$1,000,000*	$200*
D-6	Increased recycled water demand	1,250			
S-22	Harkins Slough Recharge Project Upgrades	1,000	$1,000,000	$100,000	$100
R-6	Increased Recycled Water Storage	750	$6,200,000	$500,000	$700
S-2	Watsonville Slough and North Dunes Recharge Basin	1,200	$11,200,000	$1,000,000	$800
S-3	College Lake with Inland Pipeline to CDS	2,400	$28,500,000	$2,400,000	$1,000
S-1	Murphy Crossing with Recharge Basins **	500	$8,100,000	$600,000	$1,300

Notes:

* Cost does not include 3-5 year program cost of approximately $250,000 to $300,000 annually.

** Proposed to be included in Phase 2

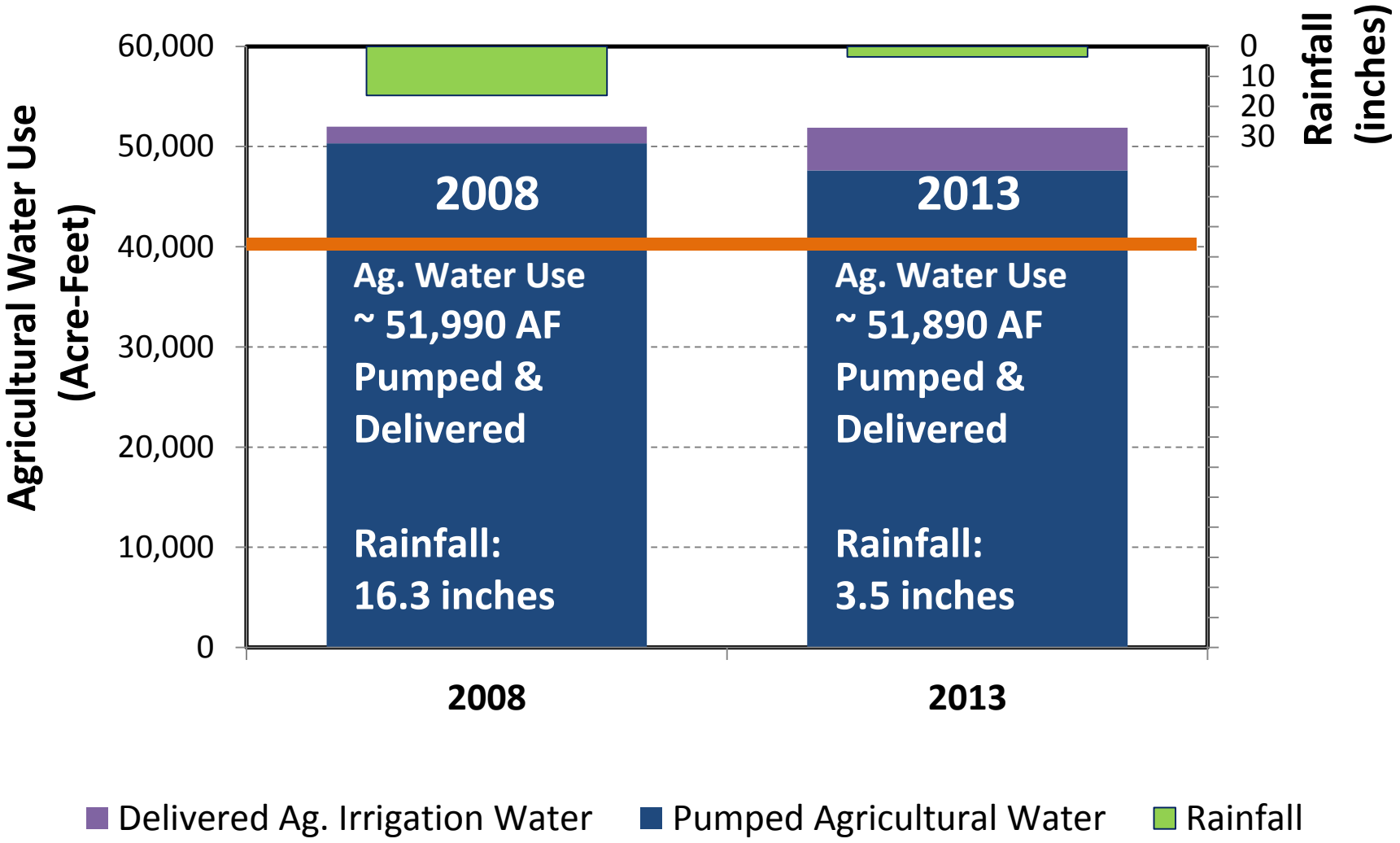
Conservation is a key component for solving the basin's problems

- Makes up 5,000 AFY of the 12,000 AFY solution
- Lowest Cost Alternative
- Potential to avoid expensive capital projects
- Improves water quality by reducing return flow
- Attains Ag Order objectives
  - Reduce nutrient loading
  - Reduce/eliminate surface irrigation runoff
  - Meet water quality objectives

Water Conservation Toolkits

- Agricultural Irrigation Water Use
- Basic Steps in an Ag Water Use Audit
- Water Use Efficiency Strategies and Practices
  - Measurement of On-Farm Water Use
  - Soil Moisture Monitoring
  - Laser Leveling
  - Drip Irrigation
  - Tailwater Reuse
  - And More…

Production and Precipitation Trends
Pajaro Valley 2008 & 2013



Rate Setting Overview

Ad Hoc Funding Committee Members

Committee Member	Representative Entity
Dave Cavanaugh (Chair)	Pajaro Valley Water Management Agency
Amy Newell	Pajaro Valley Water Management Agency
Paul Faurot	Pajaro Valley Water Management Agency
Kirk Schmidt (Co-Chair)	Santa Cruz County Farm Bureau
Skip Fehr	Water Mutual
Frank Capurro	Coastal Landowner
John E. Eiskamp	Inland Water User
Stuart Kitayama	Coastal Water User
Dick Piexoto	Inland Land Owner
Tom Karn	Rural Resident
Stephen Rider	Industrial Water User
Chuck Allen	At-Large
Steve Palmisano	City of Watsonville
John Martinelli	Landowner Group
Bill Lipe	Monterey County Farm Bureau

2015 Rate Setting Process is being performed in two phases

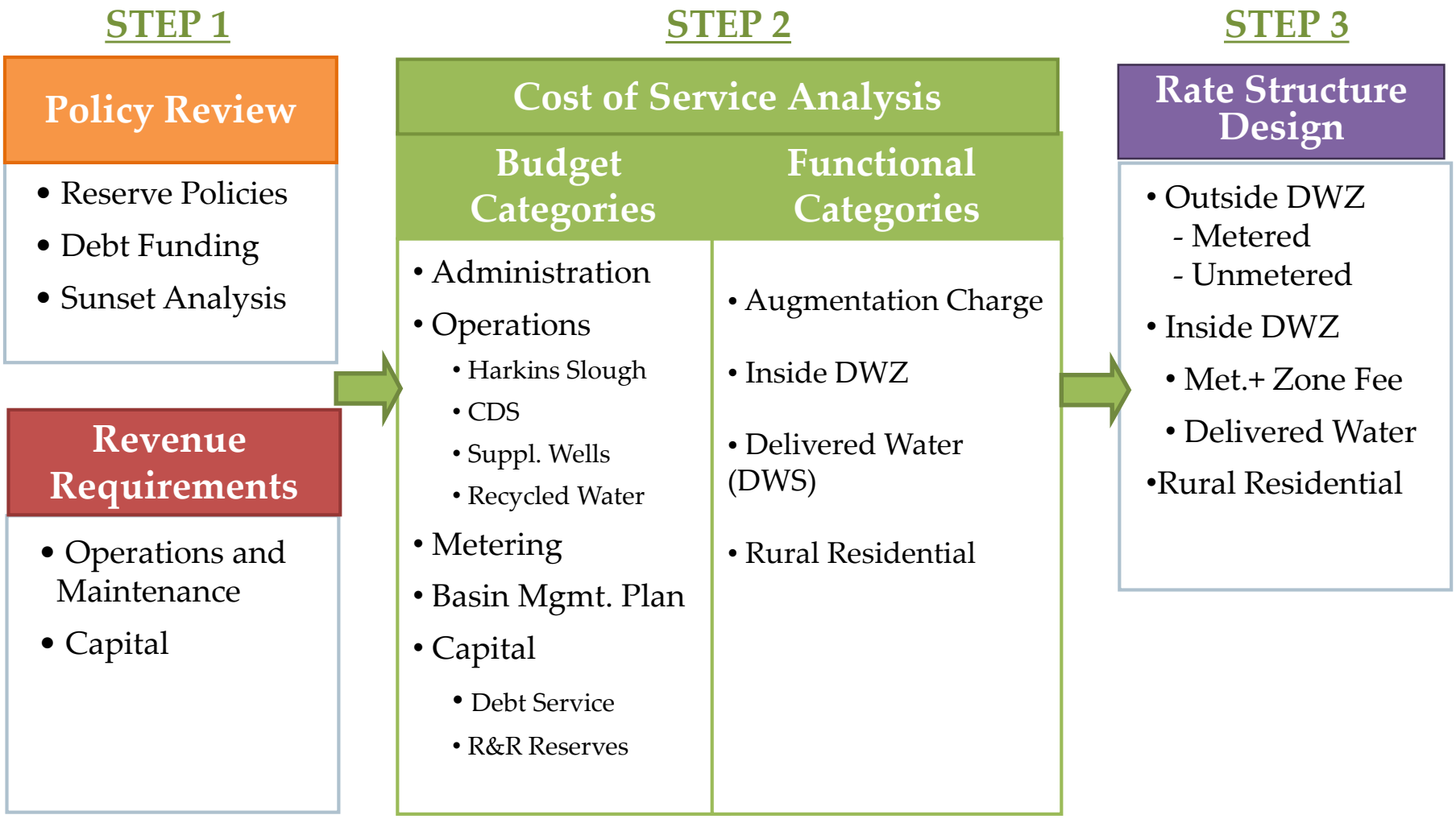
Phase I: Rate Setting Methodology & Development

Evaluation of available cost recovery mechanisms
(i.e., Uniform Rates, Tiered Rates, Assessments)

Phase II: Rate Calculation & Implementation

Calculation of rate structure to support
ongoing and forecasted expenditures

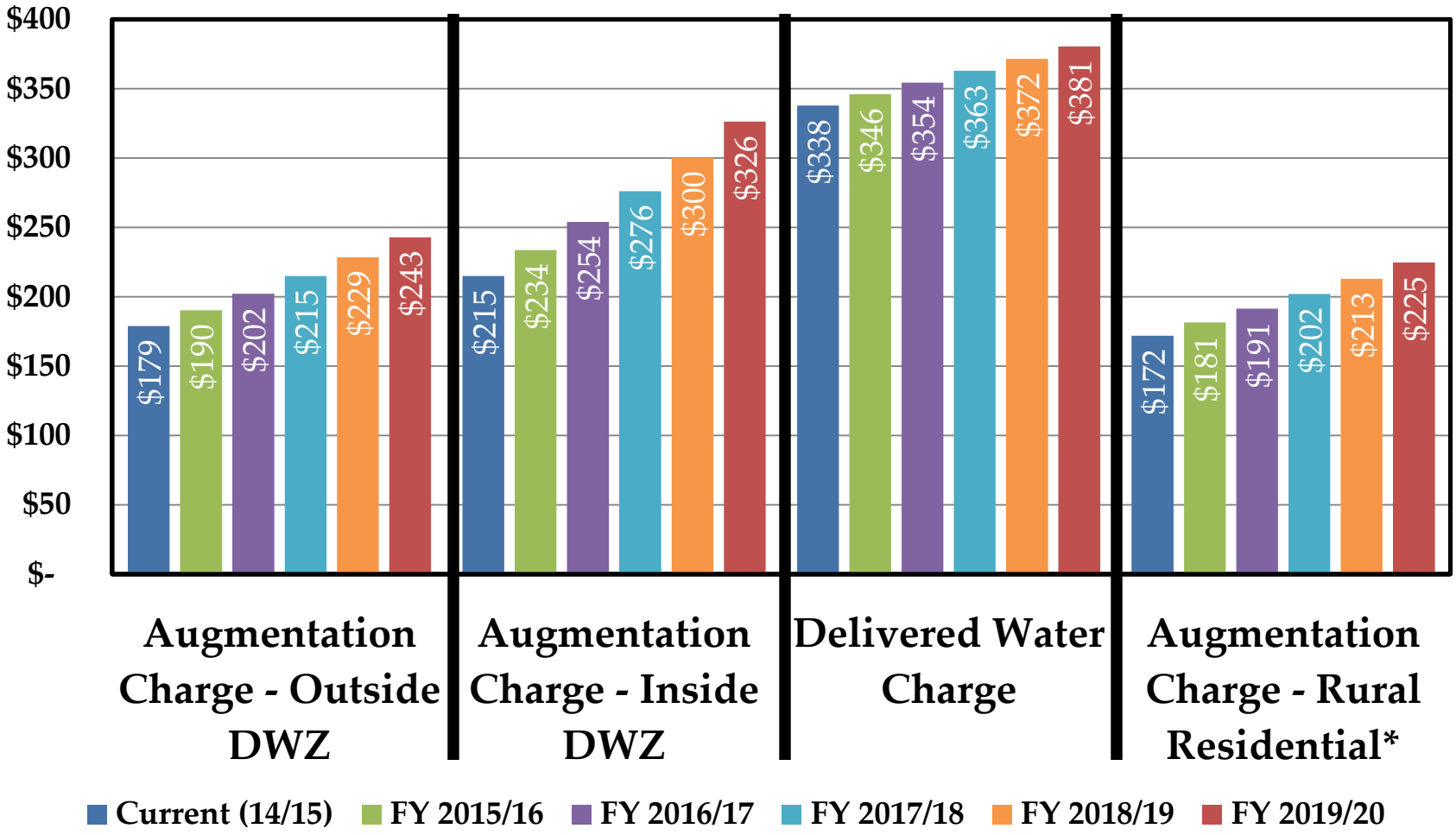
Phase II Cost of Service & Rate Calculation analysis is performed in three key steps



AHFC Final Recommendations

1. Utilize Rate Smoothing
2. Increase Allocation to Delivered Water Zone
3. Utilize Debt/Grants to fund tanks
4. Maintain use of Baseline (5-yr Average) Demands

Incorporating rate smoothing & increased DWZ allocation addressed AHFC's primary concerns



*Rural Residential users charged 60% of an AF

** Rates are not reflective of Final Cost of Service Report

2014: A Big Year for Water

- Drought Deepens
- "Groundwater Sustainability Act"
  - Historic groundwater legislation
  - Metered Production
  - Fees for Groundwater Production
- Proposition 1: "Water Quality, Supply and Infrastructure Improvement Act of 2014"

Next Step: Early Out Projects

Construct Grant Funded Projects, Implement Programs

- Storage Tanks at the Recycled Water Facility
- Supplemental Wells Blending Enhancement
- Additional Distribution Pipeline
- City of Watsonville Surface Water Facility Upgrade
- Augmented Conservation / Drought Response Program

For More Information…

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By email: info@pvwater.org

Or visit our website: pvwater.org