CMA

Santa Ynez River Valley Groundwater Basin
Central Management Area
Groundwater Sustainability Agency

April 12 2021

Stakeholder Workshop

STETSON ENGINEERS INC.

DUDEK

Geosyntec consultants

engineers | scientists | innovators

Housekeeping

- Recording the meeting for the purpose of capturing public feedback
- Recording can be made available upon request
- Opportunities for public feedback and questions throughout the workshop
- Website for additional information:

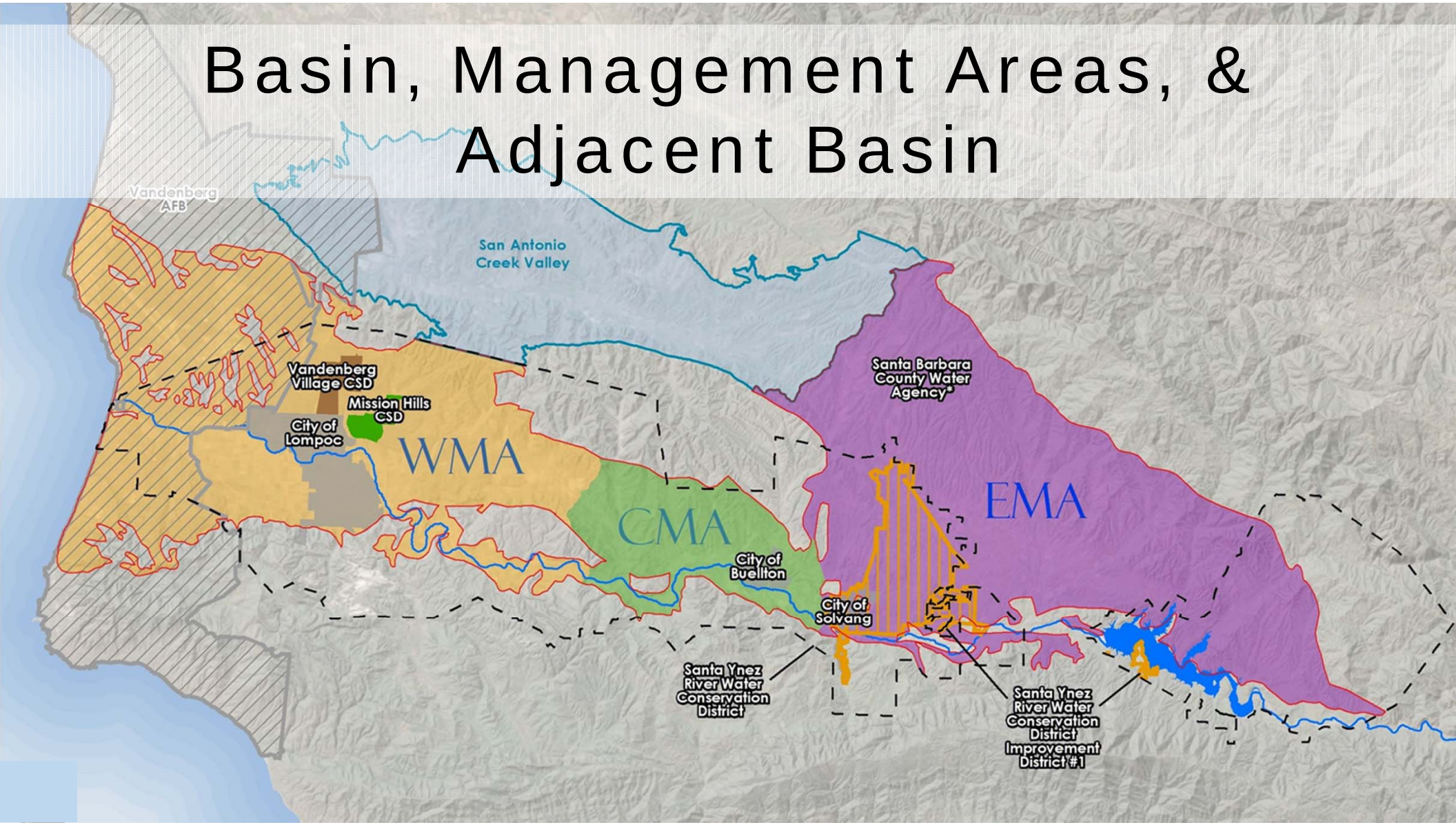
www.santaynezwater.org

- Slide numbers in lower right

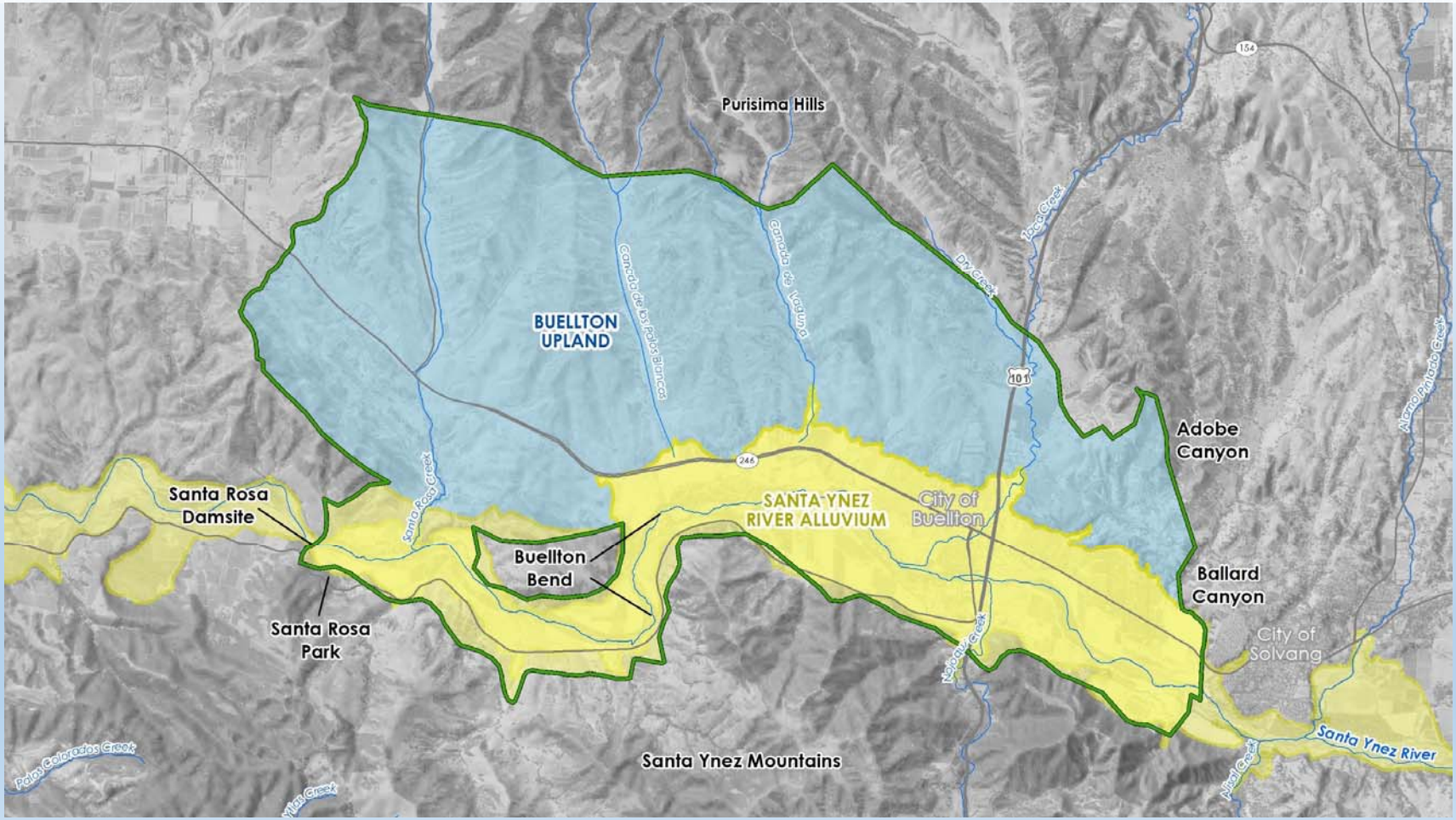
Agenda

1. Water Budget and Sustainable Yield Preliminary Determination and Discussion
    1. Time periods and data sources
    2. Historical and Current Analysis Results
    3. Future Period Assumptions and Analysis Results
2. Way Ahead/ Schedule

Basin, Management Areas, & Adjacent Basin



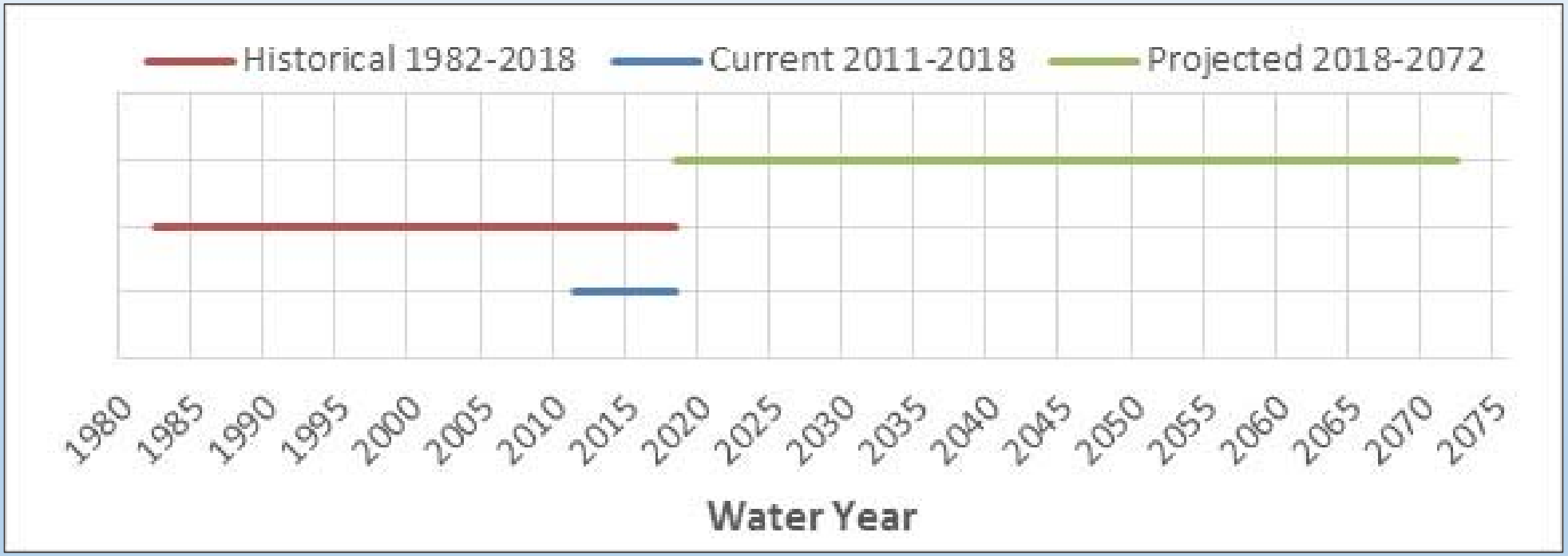
CMA Subareas



Water Budget and SGMA – Background/ Goals

- SGMA requires that the GSP one water budget include: "the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored." (GSP Regulations 23 CCR 354.18.)
- Other requirements:
  - Coordinated water budget for the basin
  - The water year type associated with the annual supply, demand, and change in groundwater stored.
  - If overdraft conditions occur, as defined in Bulletin 118, quantification of overdraft over average conditions.
  - An estimate of sustainable yield for the basin.

Water Budget Time Periods



Historical Time Period - Baseline

- **Historical – 1982 -2018**
  - **37 years, with two major drought periods**

    Meets SGMA requirement of extending back at least 10 years.
  - **Overall Balanced Average period**

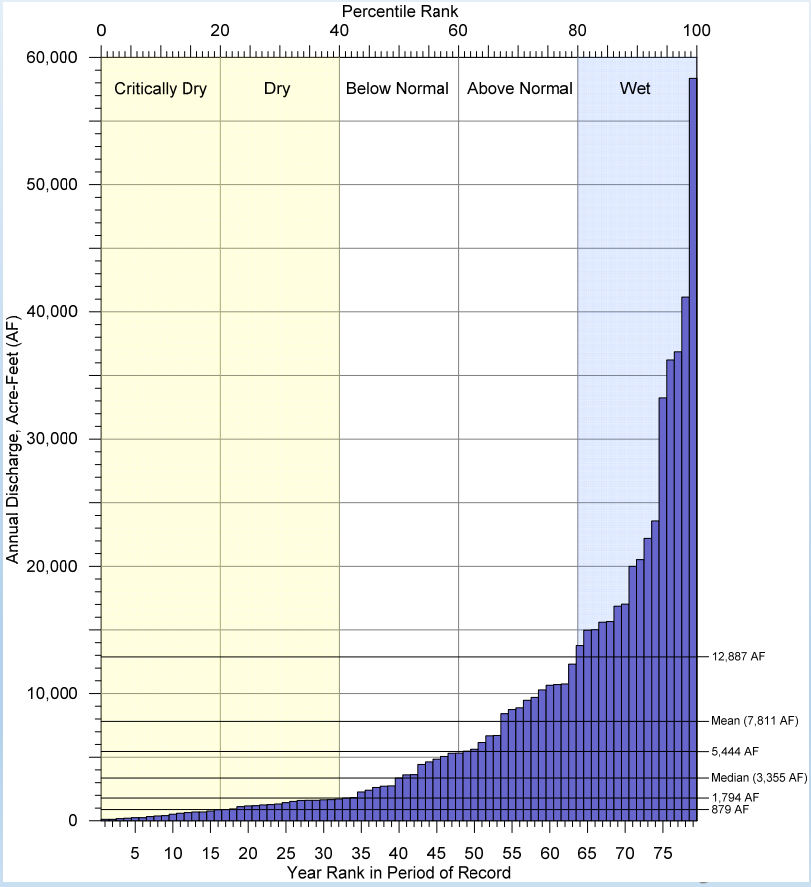
    Average precipitation at Buellton Fire Station is 16.6 inches per year for the period of 1955–2020 and 17.0 inches for the period of 1982–2018 (<2% difference).
  - **Pumping and Diversion records reported to District starting early 1980s**
  - **Coordinated with EMA and WMA**

Water Year Types

			Hydrologic Year Type Classification [1]		
	Buellton Fire Station		CMA	Upper Santa Ynez River	
Water Year	Precipitation (in/year)	% of Average [2]	USGS Gage 11132500 (Salsipuedes Creek)	SWRCB WRO 2019-148	Climatic Trends [3]
1982	14.4	86%	Dry	Below normal	Wet
1983	38.8	233%	Wet	Wet	Wet
1984	10.0	60%	Below normal	Above normal	Dry
1985	12.2	74%	Dry	Dry	Dry
1986	19.3	116%	Above normal	Above normal	Dry
1987	11.2	67%	Dry	Critical	Dry
1988	17.3	104%	Dry	Dry	Dry
1989	7.3	44%	Critical	Critical	Dry
1990	6.7	40%	Critical	Critical	Dry
1991	17.9	107%	Below normal	Above normal	Dry
1992	27.1	163%	Above normal	Wet	Wet
1993	27.4	165%	Wet	Wet	Wet
1994	12.6	76%	Below normal	Below normal	Wet
1995	34.3	206%	Wet	Wet	Wet
1996	13.3	80%	Below normal	Below normal	Wet
1997	13.5	81%	Above normal	Above normal	Wet
1998	40.9	246%	Wet	Wet	Wet
1999	14.5	87%	Above normal	Below normal	Normal
2000	18.4	111%	Above normal	Above normal	Normal
2001	28.4	171%	Wet	Wet	Normal
2002	8.5	51%	Dry	Dry	Normal
2003	17.5	105%	Below normal	Below normal	Normal
2004	9.4	57%	Dry	Dry	Normal
2005	39.6	238%	Wet	Wet	Normal
2006	19.2	115%	Above normal	Above normal	Normal
2007	7.0	42%	Critical	Critical	Normal
2008	19.3	116%	Above normal	Above normal	Normal
2009	10.8	65%	Critical	Dry	Normal
2010	18.5	111%	Below normal	Above normal	Normal
2011	21.4	129%	Wet	Wet	Normal
2012	11.4	68%	Dry	Dry	Dry
2013	7.8	47%	Critical	Critical	Dry
2014	5.9	35%	Critical	Critical	Dry
2015	7.0	42%	Critical	Critical	Dry
2016	10.7	64%	Critical	Dry	Dry
2017	20.4	122%	Above normal	Above normal	Normal
2018	7.9	48%	Critical	Dry	Normal

Water Year Type (1942-2020)

- Wet
- No Data
- Above/Below Normal
- Dry / Critically Dry



Water Year Ranking

Current and Future Time Periods

- **Current – 2011-2018 (8 years)**
  - **Includes water year 2015- SGMA's benchmark year for current conditions**
  - **Dry period 2012-2018…. 2011 included to provide some balance**
- **Future – 2018 -2072 (55 years)**
  - **2042: Meet sustainability goal in 20 years**
  - **2072: "Projected hydrology shall utilize 50 years"**

Water Budget Keys

Basic Equation for Groundwater Storage:

Inflows – Outflows = Change in Storage

More inflow than outflow:

Groundwater levels and Storage increase

More outflow than inflow:

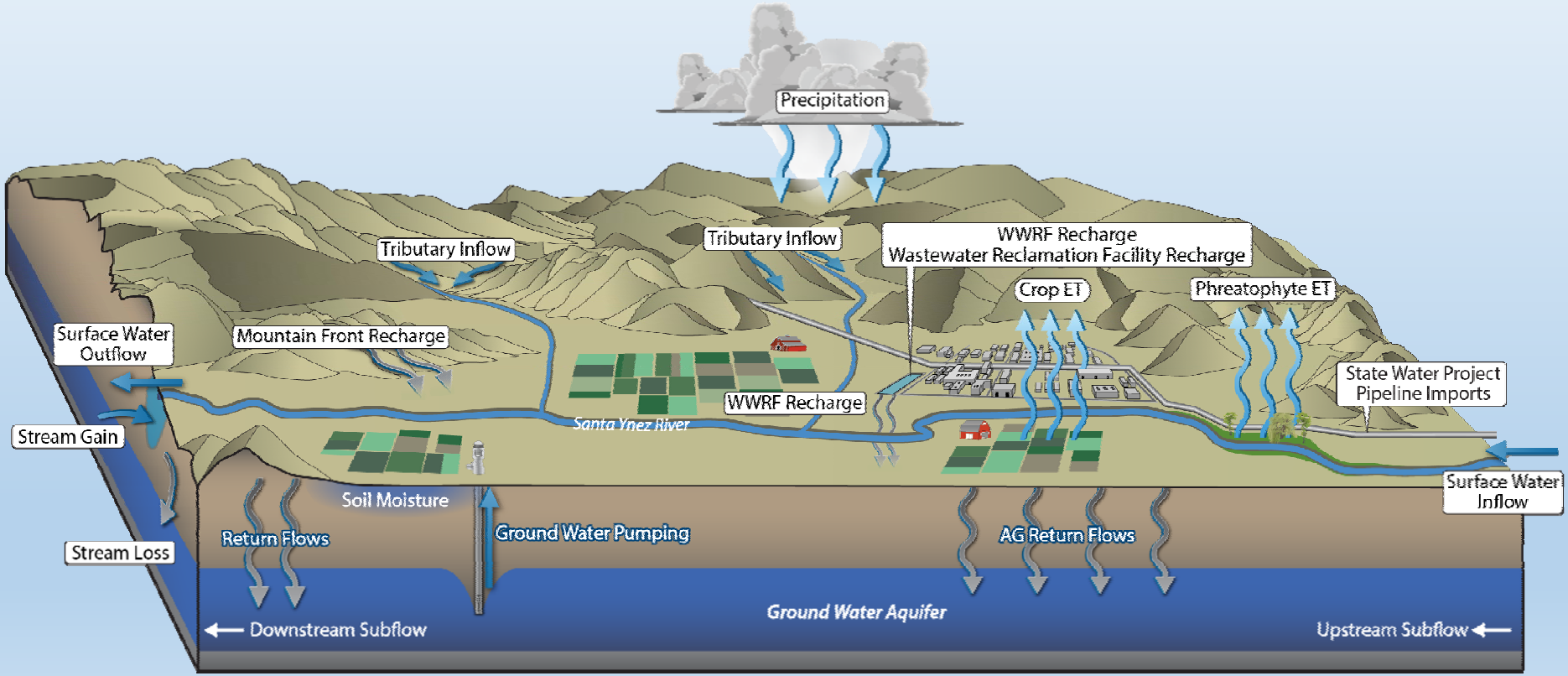
Groundwater levels and Storage decrease

Water Budget will address variability:

- Hydrologic- Droughts 1987-1991, 2012-2018; Floods i.e. 1998
- Changes in Land Use/Demands, quantity and timing
- Climate Change, quantity and timing

CMA Water

CENTRAL MANAGEMENT AREA OF THE SANTA YNEZ RIVER VALLEY GROUNDWATER BASIN



CMA Water Budget Data Sources

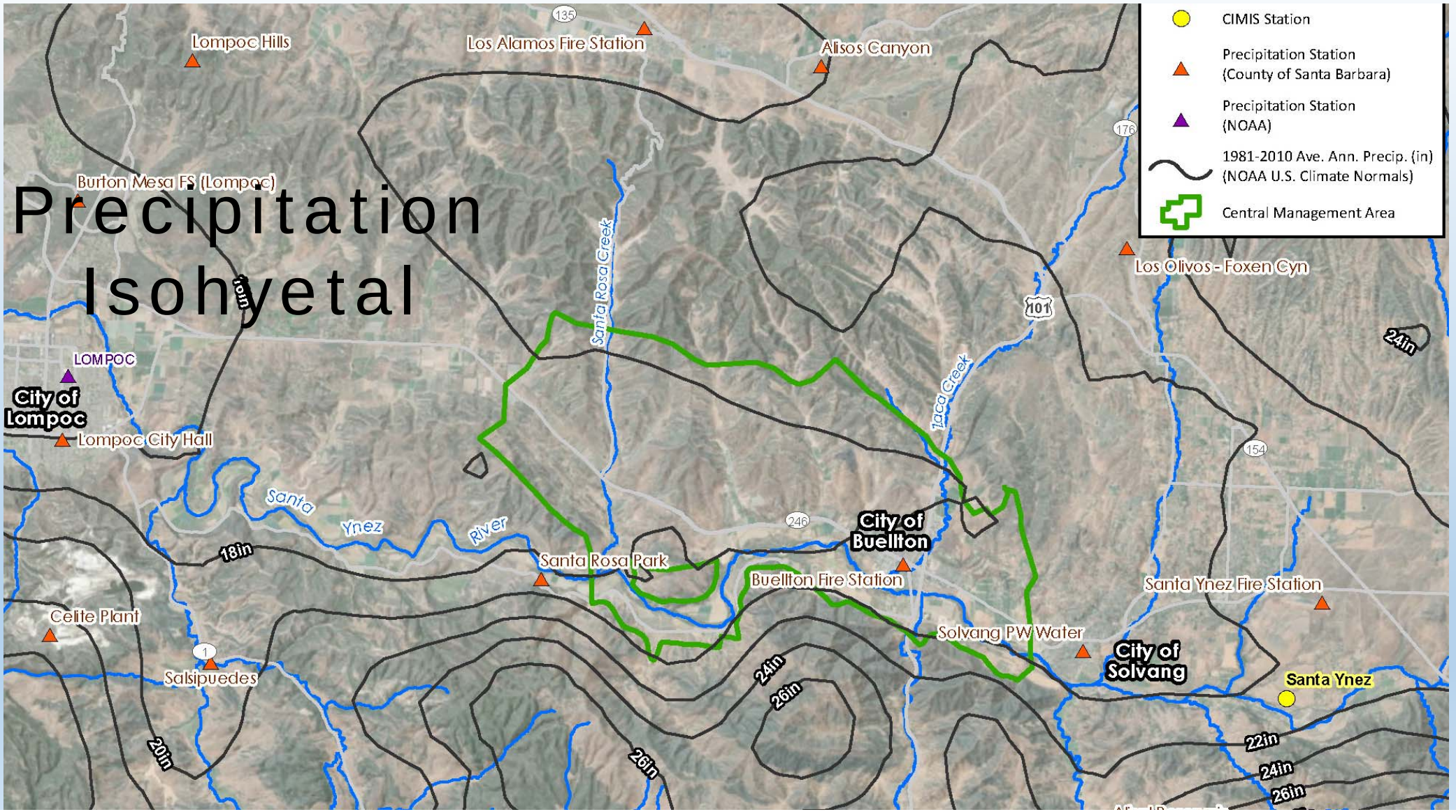
TABLE 1-2 WATER BUDGET DATA SOURCES

Water Budget Component	Data Source(s)	Comment(s)	Qualitative Data Rating
Surface Water Inflow Components			
Santa Ynez River Inflow	USGS	Solvang Gauge	Gauged – High
Tributary Inflow	Correlation with gauged data	Methods described in text	Calibrated Model – Medium
Imported: SWP	Central Coast Water Authority	—	Metered – High
Groundwater Inflow Components			
Deep Percolation of Precipitation: Overlying and Mountain Front Recharge	USGS BCM Recharge	BCM calibrated to Basin precipitation station data	Calibrated Model – Medium
Streamflow Percolation	Santa Ynez RiverWare Model, USGS BCM	Collaborative Modeling effort: Stetson and GSI	Calibrated Model – Medium
Subsurface inflow	Darcian flux calculation	Collaborative Modeling effort: Stetson and GSI	Estimated – Medium
Irrigation Return Flows	Land use surveys, self-reported pumping data	Basinwide Collaborative Estimation: Stetson and GSI	Estimated – Low
Percolation of Treated Wastewater	City of Solvang and City of Buellton	Received from cities	Metered – High
Percolation from Septic Systems	SYRWCD self-reported data, Santa Barbara County Water Agency return estimates	Methods described in text	Estimated – Low

CMA Water Budget Data Sources

TABLE 1-2 WATER BUDGET DATA SOURCES

Water Budget Component	Data Source(s)	Comment(s)	Qualitative Data Rating
Surface Water Outflow Components			
Santa Ynez River Outflow	USGS	Methods described in text	Calibrated Model - Medium
Streamflow Percolation	Santa Ynez RiverWare Model, USGS BCM	Collaborative modeling effort: Stetson and GSI	Calibrated Model - Medium
Riparian Evapotranspiration	Aerial photography, NCCAG/NWI data sets, CIMIS weather station	Methods described in text	Estimated – Medium/Low
Groundwater Outflow Components			
Agricultural Irrigation Pumping	Land use surveys, self-reported pumping data	Methods described in text	Estimated – Medium/Low
Municipal Pumping	City of Buellton self-reported pumping data	Methods described in text	High/Medium


Precipitation Isohyetal
CIMIS Station
Precipitation Station (County of Santa Barbara)
Precipitation Station (NOAA)
1981-2010 Ave. Ann. Precip. (in) (NOAA U.S. Climate Normals)
Central Management Area
Lompoc Hills
Los Alamos Fire Station
Alisos Canyon
Burton Mesa FS (Lompoc)
Los Olivos - Foxen Cyn
LOMPOC
City of Lompoc
Lompoc City Hall
Santa Rosa Creek
Ynez River
Santa Rosa Park
City of Buellton
Buellton Fire Station
Santa Ynez Fire Station
Celite Plant
Salsipuedes
Solvang PW Water
City of Solvang
Santa Ynez
18in
20in
24in
26in
22in
135
176
101
246
154
1

CMA Tributaries

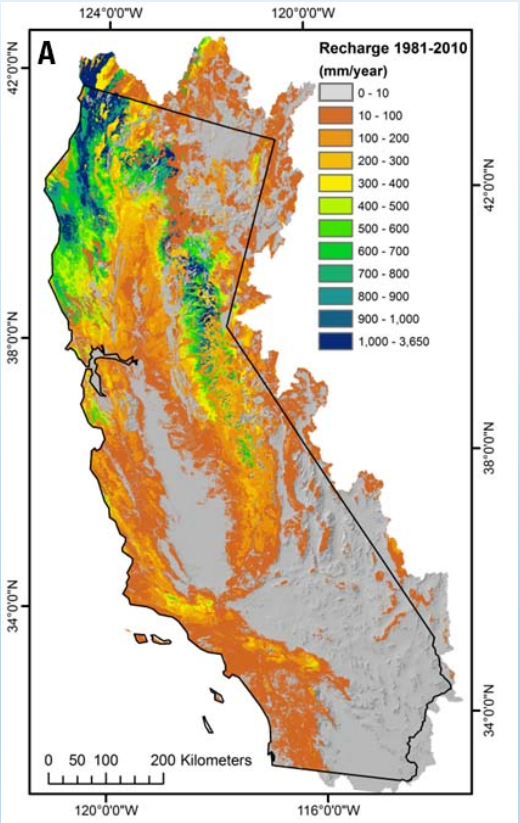
TABLE 1-3 TRIBUTARY CREEKS OF THE CMA

	Drainage Area (mi^2)	Average Annual Precipitation (in/year)[1]
North of the Santa Ynez River		
Adobe Canyon Creek	2.5	19.2
Ballard Canyon Creek	5.1	19.4
Zaca Creek	36.6	20.7
Canada de Laguna	4.1	18.7
Canada de los Palos Blancos	5.2	18.4
Santa Rosa Creek	8.3	18.6
Unnamed Tributaries	6.0	18.4
South of the Santa Ynez River		
Nojoqui Creek	15.9	25.1
Unnamed Tributaries	9.5	23.4
Salsipuedes Creek USGS Gauge	47.10	23.0

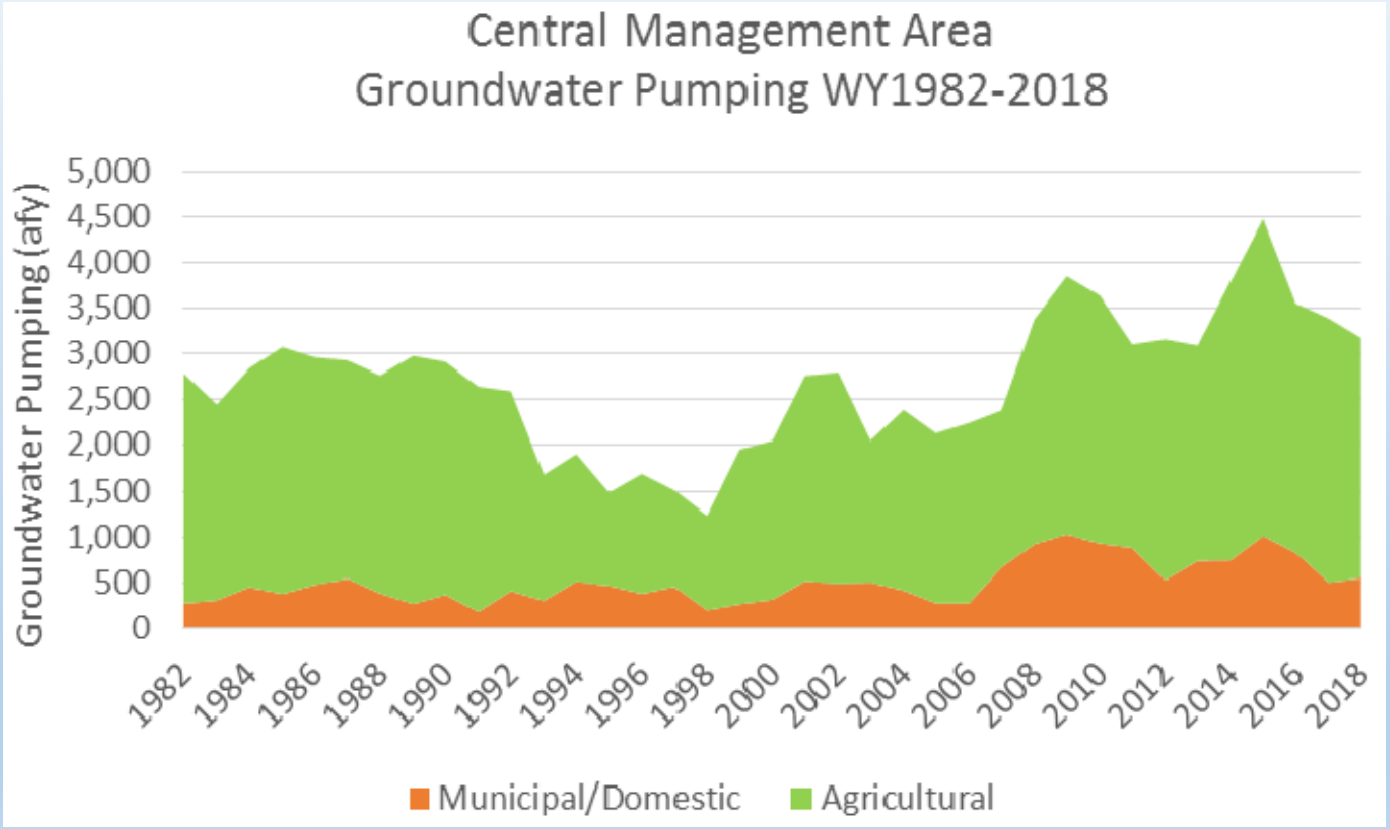
Notes: CMA = Central Management Area; USGS = U.S. Geological Survey.
1 PRISM 2014.

Recharge – USGS Basin Characterization Model

- Complex inputs to determine recharge
  - Precipitation, Temperature, Solar Radiation, Soil Properties
- 20-acre cells
  - Covers Santa Ynez Basin
  - Integrates State-wide findings (see recharge map on right)
- Monthly Timesteps
- 1980-2018
- Coordinated and corrected with EMA and WMA



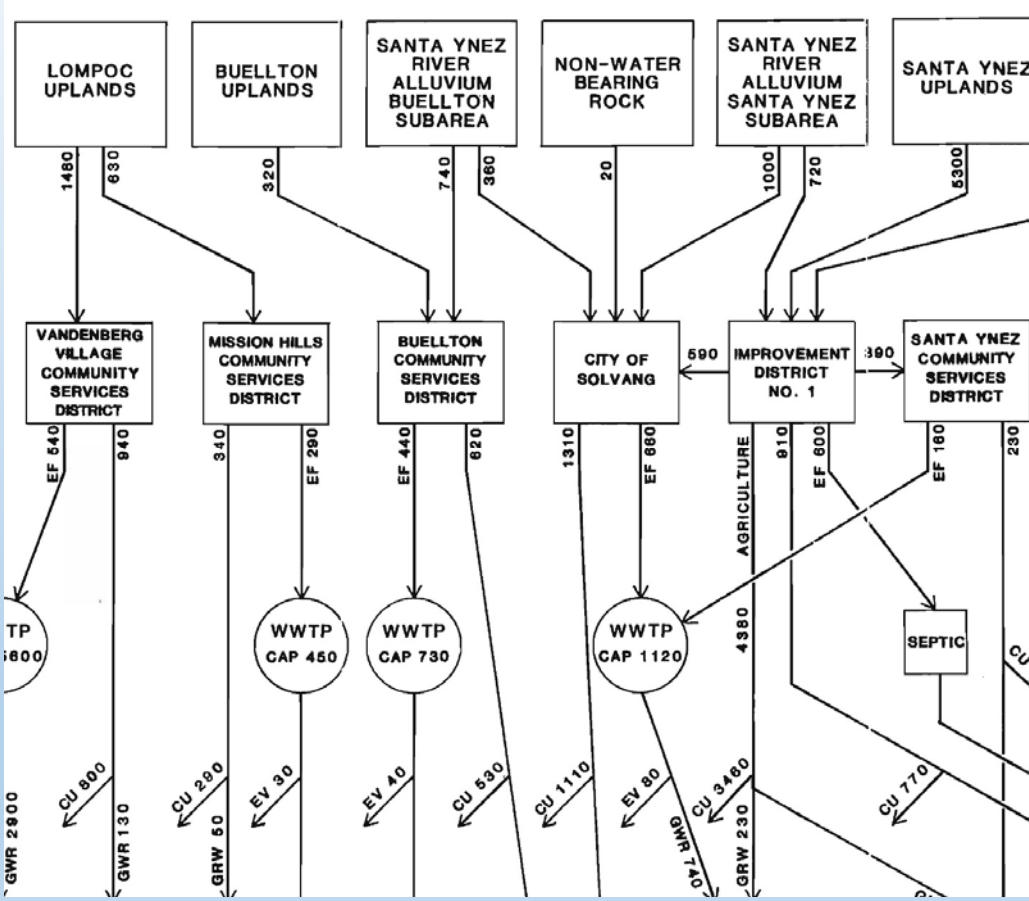
CMA Groundwater Pumping



Annual pumping based on reporting to SYRWCD. Total pumping ranges from about 1,500 to 4,500 afy. Does not include Santa Ynez River underflow diversions (SWRCB).

RETURN FLOWS

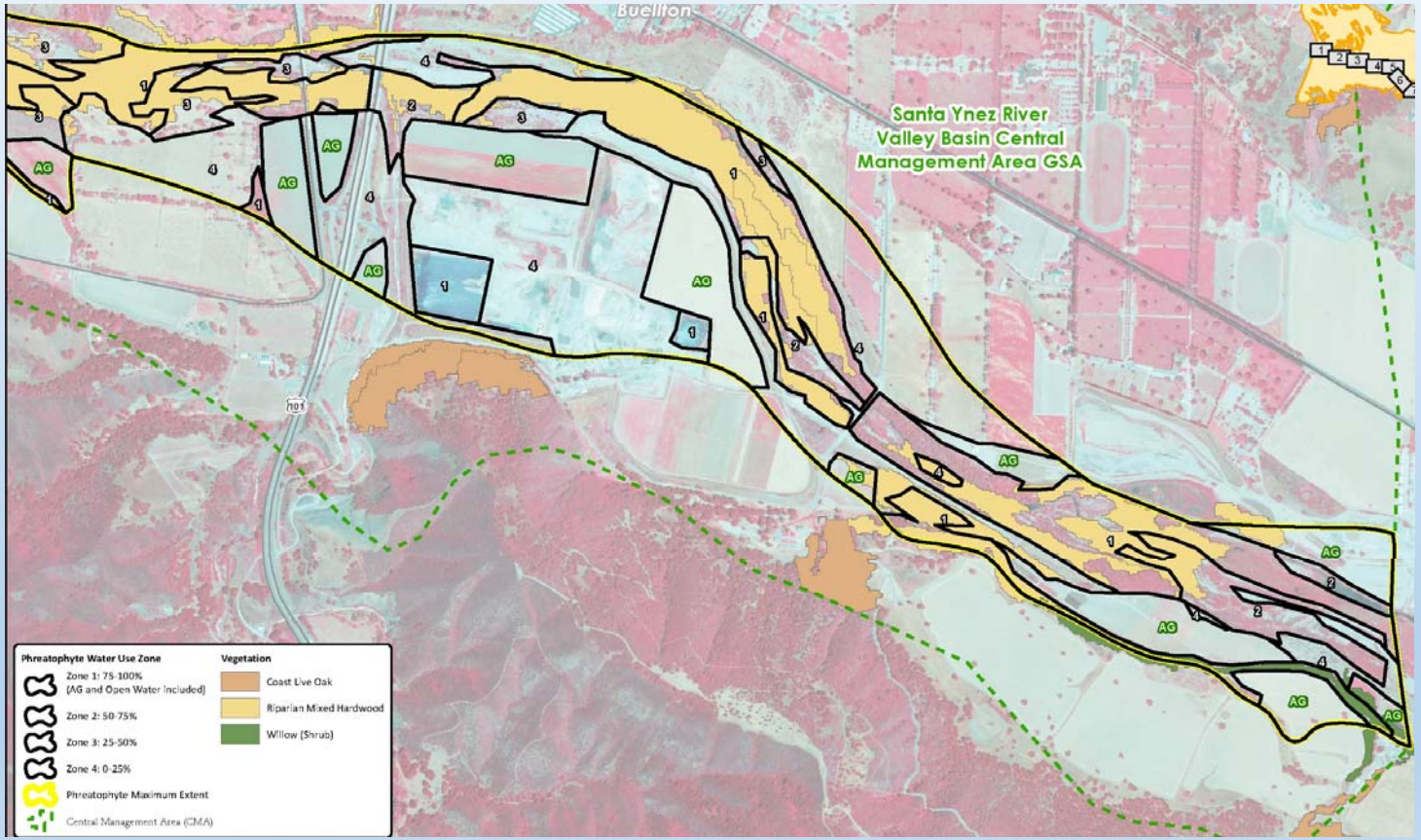
- City of Solvang and City of Buellton Wastewater Treatment Percolation Ponds
  - Historical inflow records available
- Agricultural Return Flows
  - 20% Assumed for all crops except vineyards
    - 5% Assumed for vineyards
- Urban Return Flows
  - Net 44% Assumed
    - Based on 60% Outdoor/ 40% Indoor
- Agrees with available literature and used in EMA and WMA (i.e. District's Water Resources Management Plan, 1992; excerpt of return flow accounting shown in figure on right)



SYRWCD Water Resources Management Plan 1992

Phreatophytes

- Phreatophyte acres reviewed with color infra-red aerial photography
- Consumptive Use based on CIMIS station climate data (California Irrigation Management Information System)



Water Budget – Time Periods and Sources

Questions?

Surface Water Inflow

1982-2018

Surface Water Inflow Component	Average
	AFY
Santa Ynez River Inflow from EMA	85,720
Santa Ynez River Tributary Inflow	9,060
Imported SWP	230
Santa Ynez River Alluvium Subarea (Surface Water Underflow)	
Subflow	2,490
Recharge from Precipitation (Overlying and Mountain Front)	880
Recharge from Agricultural Return Flows to Underflow	480
Recharge from Municipal Return Flows to Underflow	1,240
Recharge from Domestic Return Flows to Underflow	100
TOTAL	100,200

Surface water inflows dominated by Santa Ynez River and tributary inflows. There is very little interaction with groundwater aquifer.

Surface Water Outflow

1982-2018

Surface Water Outflow Component	Average
	AFY
Santa Ynez River Outflow to WMA	91,780
Net Channel Percolation to Groundwater	360
Santa Ynez River Alluvium Subarea (Surface Water Underflow)	
Santa Ynez River Underflow Out	350
River well pumping – Agriculture	2,720
River well pumping – Municipal	470
River well pumping – Domestic	230
Riparian Vegetation Evapotranspiration	4,170
TOTAL	100,080

Ground Water Inflow

1982-2018

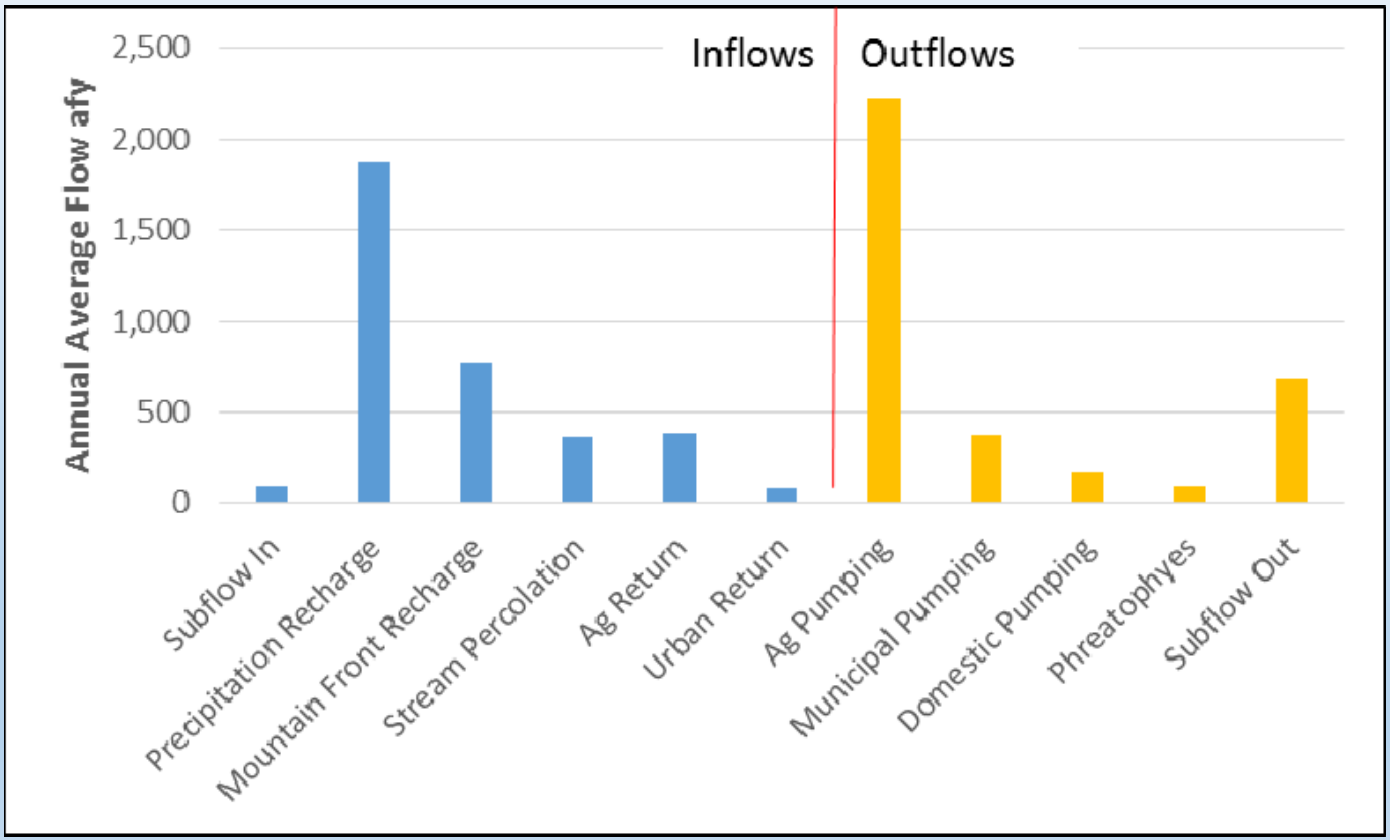
Groundwater Inflow Component	Average
	AFY
Subflow	90
Recharge from Precipitation – Overlying	1,870
Recharge from Precipitation – Mountain Front	770
Net Channel Percolation from Surface Water	360
Agricultural Return Flows	380
Municipal/Domestic Return Flows	80
TOTAL	3,550

Ground Water Outflow

1982-2018

Groundwater Outflow Component	Average
	AFY
Pumping – Agriculture	2,220
Pumping – Municipal	370
Pumping – Domestic	170
Riparian Vegetation Evapotranspiration	90
Subflow	690
TOTAL	3,540

Key Groundwater Fluxes -Average 1982-2018



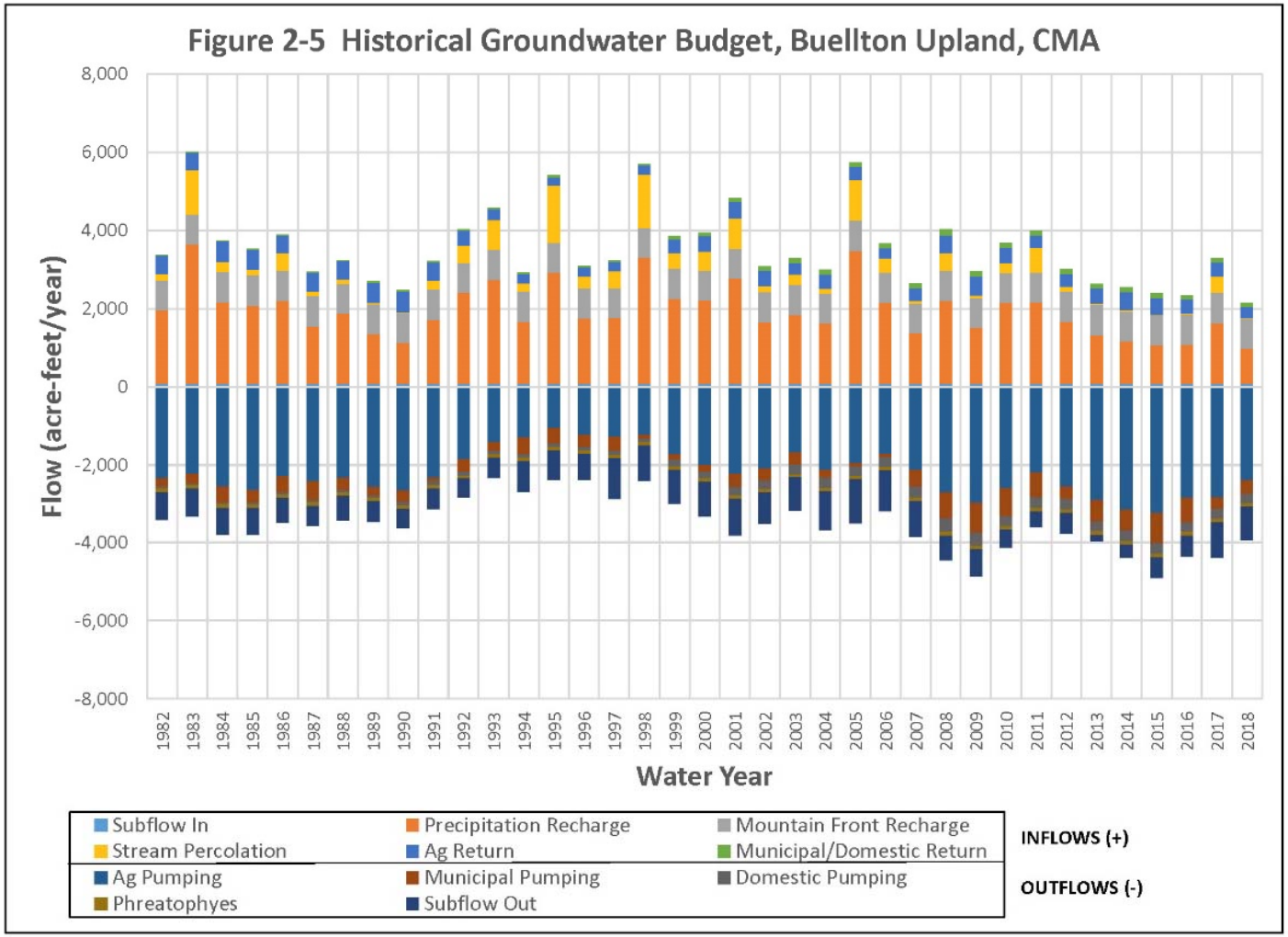
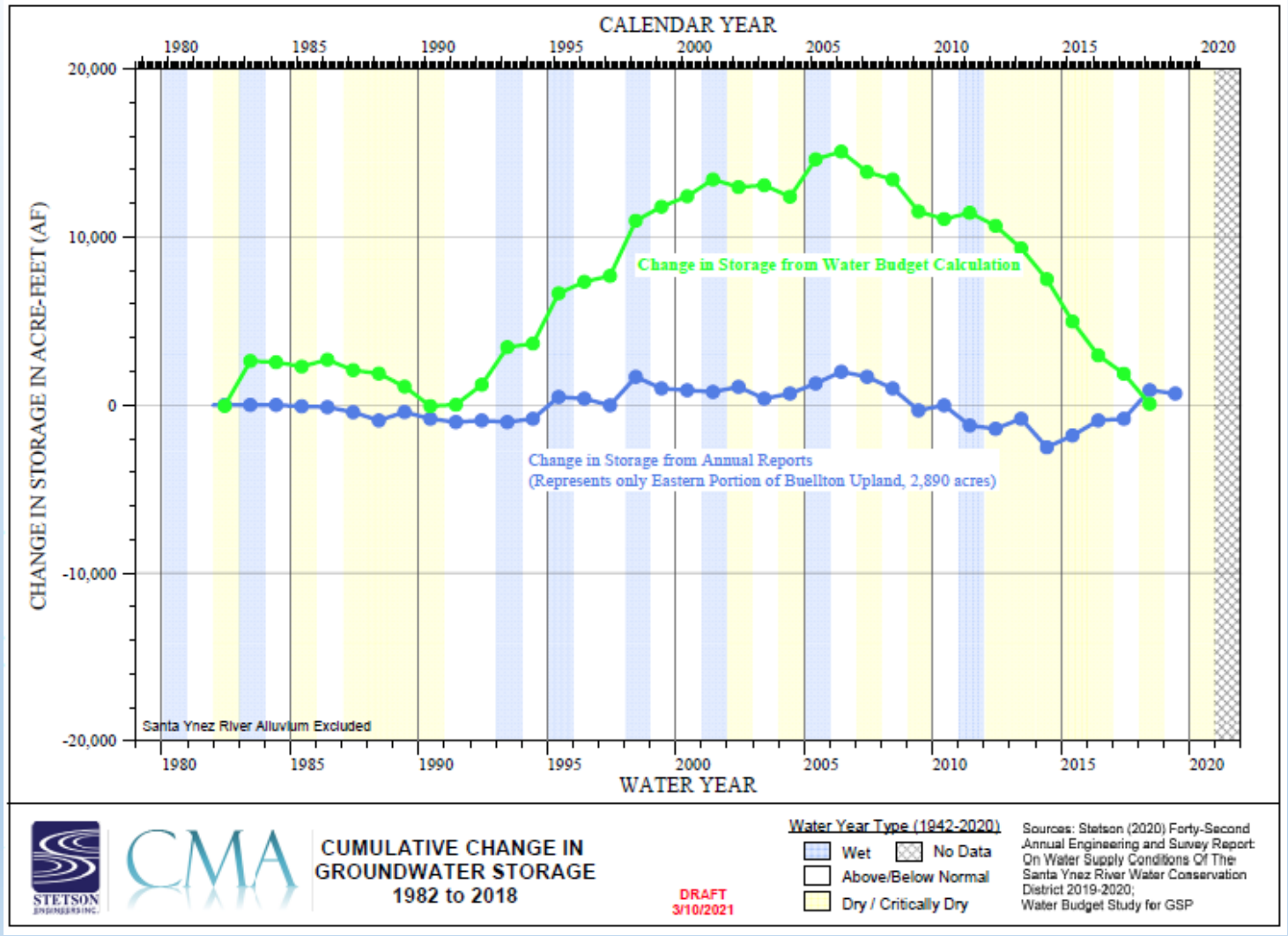
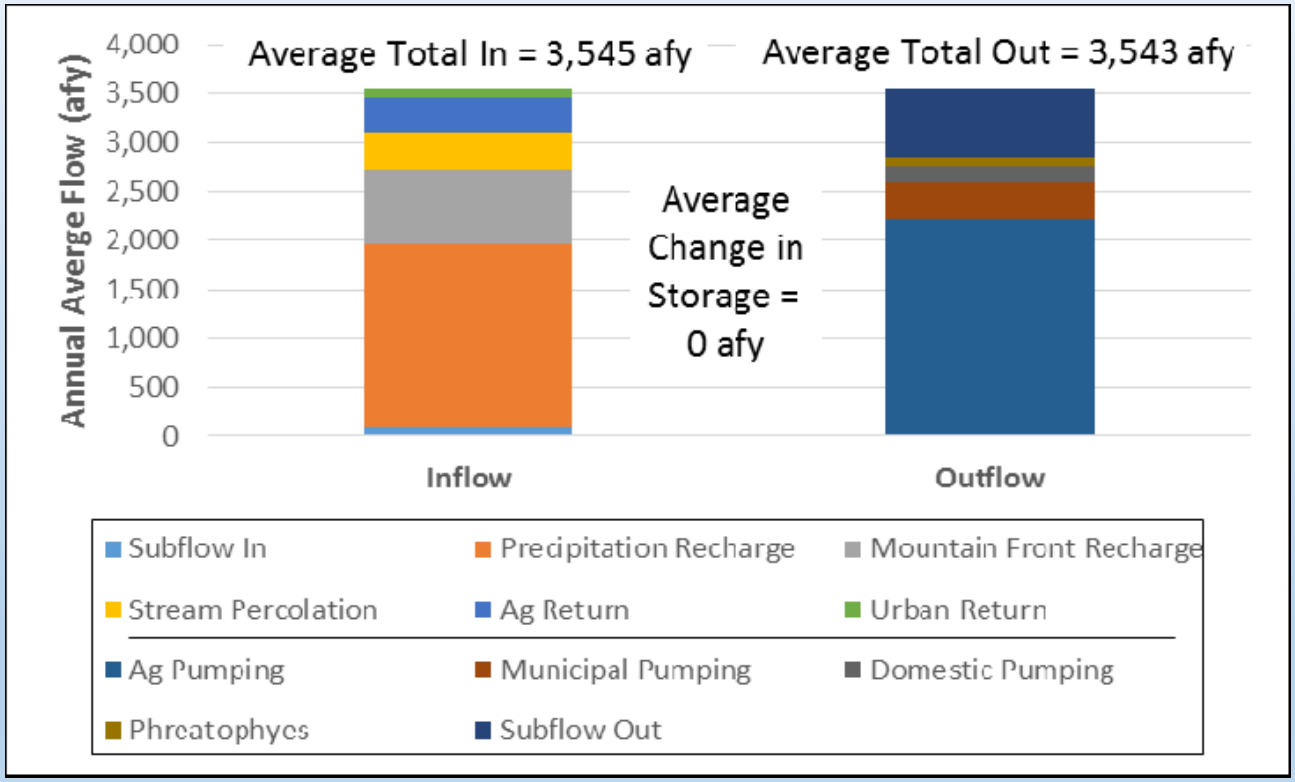


Figure 2-5 Historical Groundwater Budget, Buellton Upland, CMA
Flow (acre-feet/year)
8,000
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
-8,000
1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Water Year
Subflow In
Precipitation Recharge
Mountain Front Recharge
Stream Percolation
Ag Return
Municipal/Domestic Return
Ag Pumping
Municipal Pumping
Domestic Pumping
Phreatophyes
Subflow Out
INFLOWS (+)
OUTFLOWS (-)


CALENDAR YEAR
1980
1985
1990
1995
2000
2005
2010
2015
2020
20,000
10,000
0
-10,000
-20,000
CHANGE IN STORAGE IN ACRE-FEET (AF)
Change in Storage from Water Budget Calculation
Change in Storage from Annual Reports
(Represents only Eastern Portion of Buellton Upland, 2,890 acres)
Santa Ynez River Alluvium Excluded
WATER YEAR
STETSON ENGINEERING
CMA
CUMULATIVE CHANGE IN GROUNDWATER STORAGE
1982 to 2018
DRAFT
3/10/2021
Water Year Type (1942-2020)
Wet
No Data
Above/Below Normal
Dry / Critically Dry
Sources: Stetson (2020) Forty-Second Annual Engineering and Survey Report On Water Supply Conditions Of The Santa Ynez River Water Conservation District 2019-2020; Water Budget Study for GSP

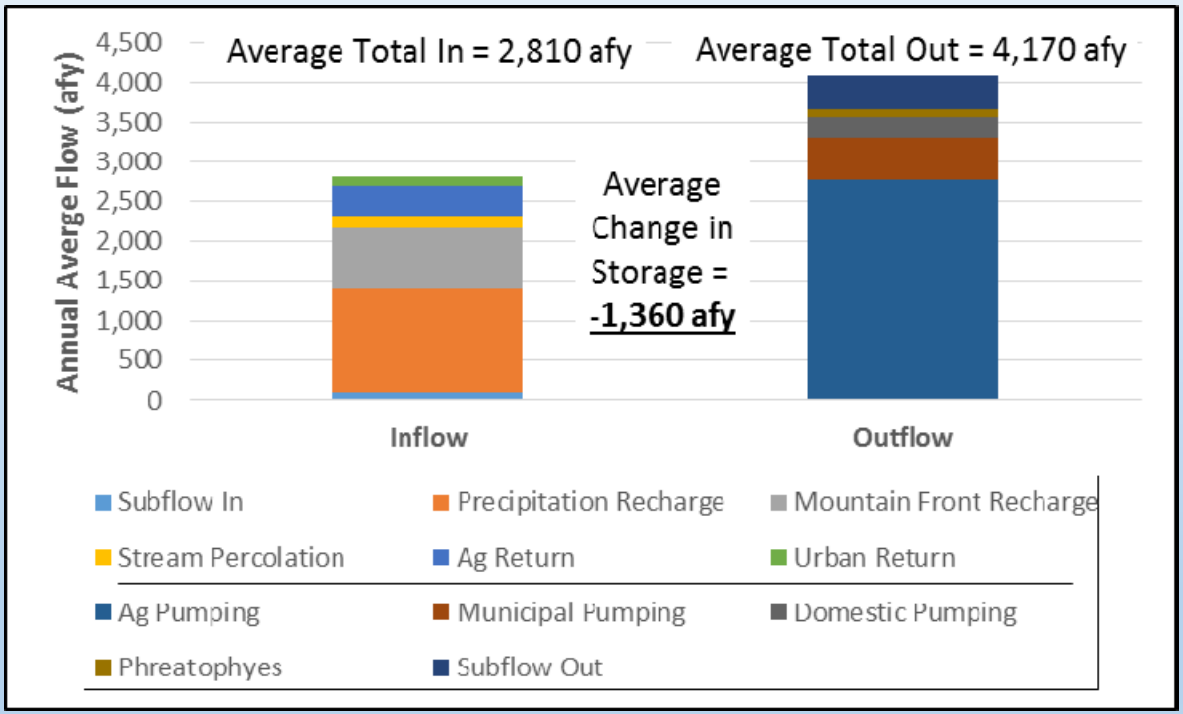
Inflows versus Outflows 1982-2018



Sustainable Yield Estimate

- The average annual groundwater pumping total of 2,760 AFY for the period of 1982–2018 resulted in zero net change in groundwater storage in the Buellton Uplands basin, so this water budget analysis indicates that the perennial yield of the basin is approximately **2,760 AFY**.
- Corroborates the safe yield estimate in the SYRWCD Annual Reports of 2,800 AFY and the range of perennial yields in the Buellton Uplands Groundwater Management Plan (SYRWCD 1995) of 2,650 to 2,900 AFY.

Inflows versus Outflows 2011 - 2018



Total groundwater storage decreased by 10,880 AF over eight year current period (average -1,360 AFY). This negative storage change is due to drought conditions.

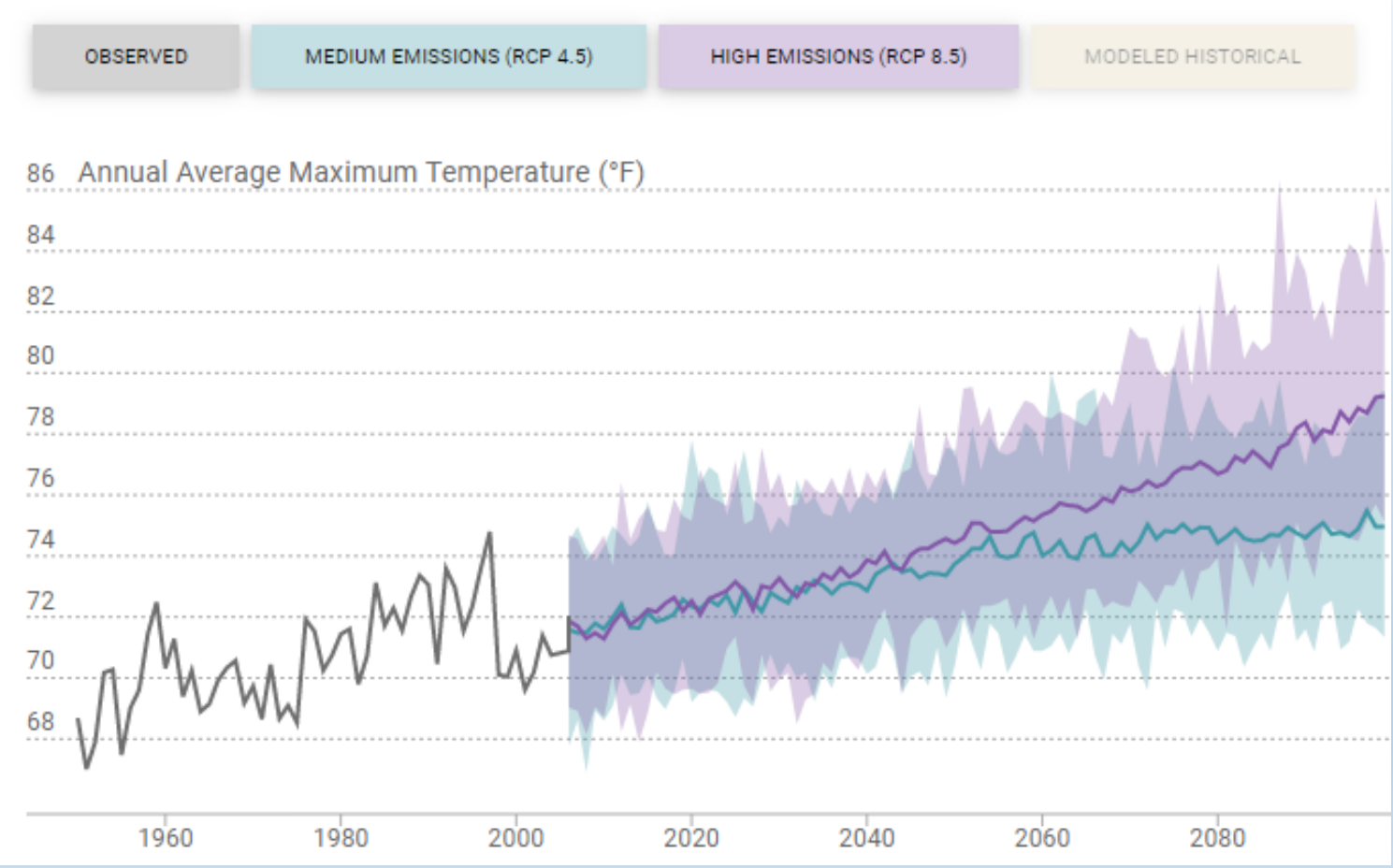
Water Budget – Historical and Current

Questions?

Climate Change and the Santa Ynez River Valley Groundwater Basin 2018 - 2072

- DWR's Climate Change Technical Advisory Group has identified the most applicable and appropriate global circulation model (GCMs) out over 30 models for water resource planning and analysis in California.
- GSP must include the "Central Tendency" Scenario for future hydrologic projections.
  - Reflects the mean of the 20 climate projections.
    - 10 selected GCMs are combined with two emission scenarios for a total of twenty scenarios utilized. The two emissions scenarios include a "middle" scenario (RCP 4.5) with emissions peaking around 2040 and a "business as usual" scenario with emission peaking around 2080 (RCP 8.5).
- Drier/Extreme Warming (2070DEW) and Wetter/Moderate Warming (2070WMW) conditions in GSPs is optional.

Future Projected Hydrology 2018-2072



DWR has provided summaries of climate change.

The 2030 and 2070 precipitation and ET climate change factors are available on 6-kilometer resolution grids.

Buellton CA; https://cal-adapt.org/tools/local-climate-change-snapshot/

Implications for CMA Hydrology

- Crop Water Use - By 2040, 3.8 percent increase relative to the baseline period. By 2070 conditions, 8.3 percent relative to the baseline period.
- Precipitation –
  - Seasonal timing changes
    - Sharp decreases are projected early fall and late spring
    - Increases in winter and early summer precipitation.
  - The CMA is projected to experience minimal changes in total annual precipitation.
    - 2030 – no change; 2070 conditions, 3 percent decrease in annual precipitation
- Streamflow - projected to increase slightly by 0.5 percent in 2030 and 3.8 percent in 2070
- Recharge- Assume same changes as precipitation

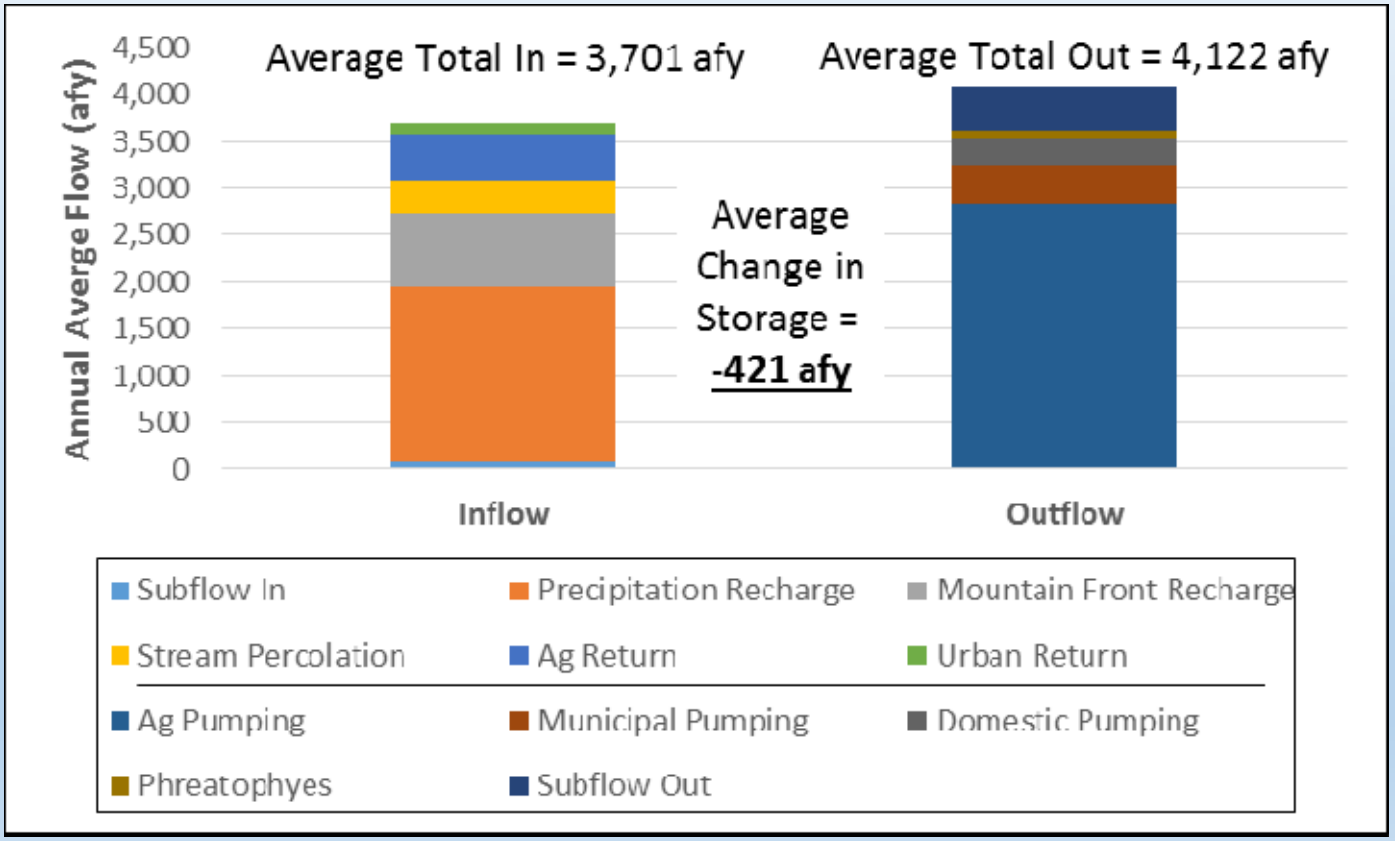
Assumptions for Future Demand

- Agriculture
  - No change in acres/ crop types assumed.
  - Consumptive use increases 3.8 percent relative to the baseline period due to higher ET rates under climate change. By 2070 conditions, 8.3 percent relative to the baseline period.
- Urban
  - Santa Barbara County Association of Governments' Regional Growth Forecasts estimate large increases in population for the Buellton area: 145% by Year 2040
  - This analysis assumes 15% by 2042 and 20% by 2072.

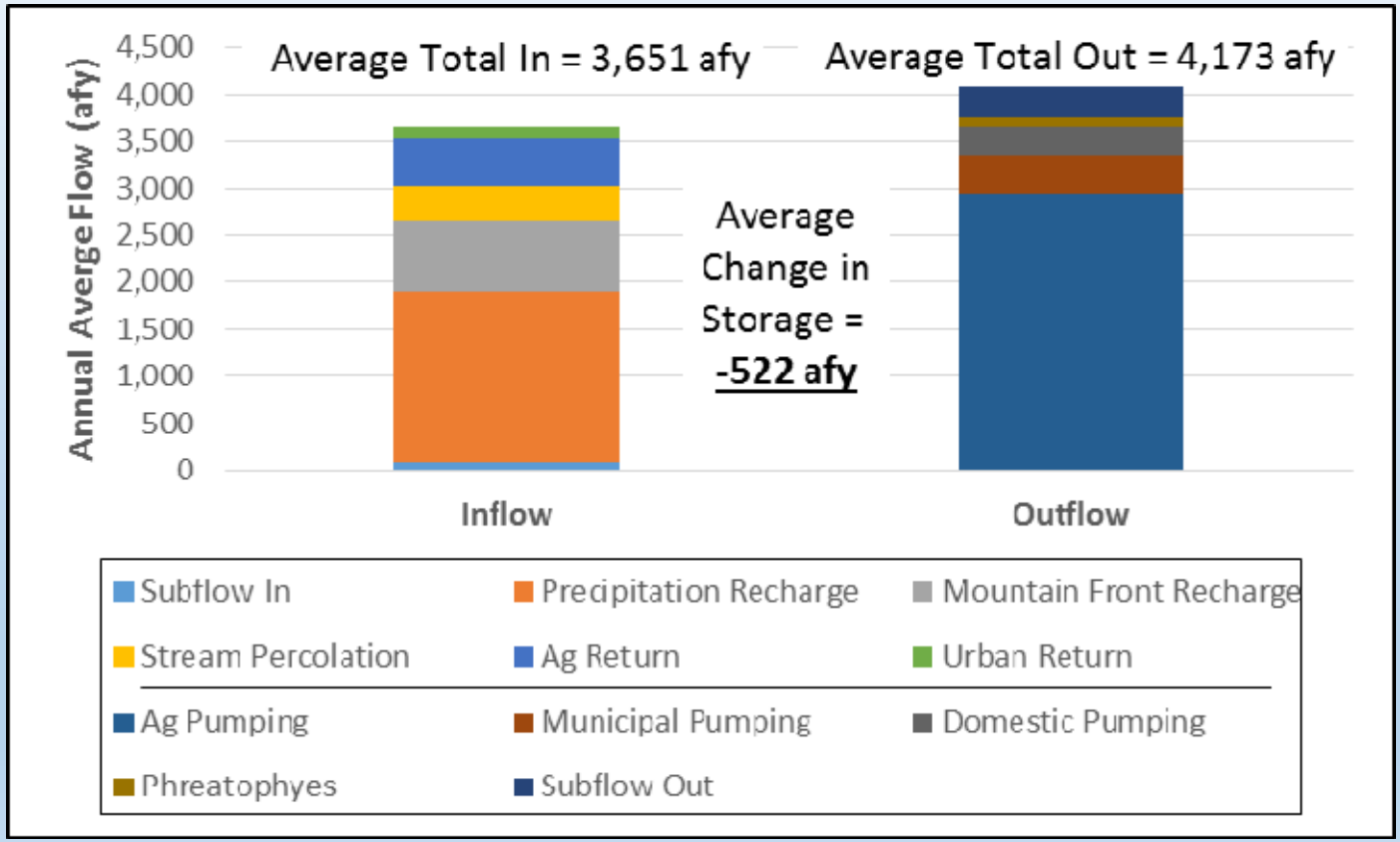
PROJECTED WATER DEMAND FOR CMA

	2018 Demand	Estimated 2042 Demand	Estimated 2072 Demand
	(Acre-Feet per Year)		
Groundwater Demand			
Pumping – Agriculture	2,415	2,840	2,940
Pumping – Municipal	350	403	420
Pumping – Domestic	250	288	293
TOTAL Groundwater Demand	3,015	3,531	3,653
Santa Ynez River Alluvium Subarea			
River well pumping – Agriculture	3,223	3,790	3,924
River well pumping – Municipal and SWP Imports	897	1,033	1,076
River well pumping – Domestic	376	434	441
TOTAL Surface Water Demand	4,497	5,257	5,441
TOTAL	7,512	8,788	9,094

Inflows versus Outflows 2042



Inflows versus Outflows 2072



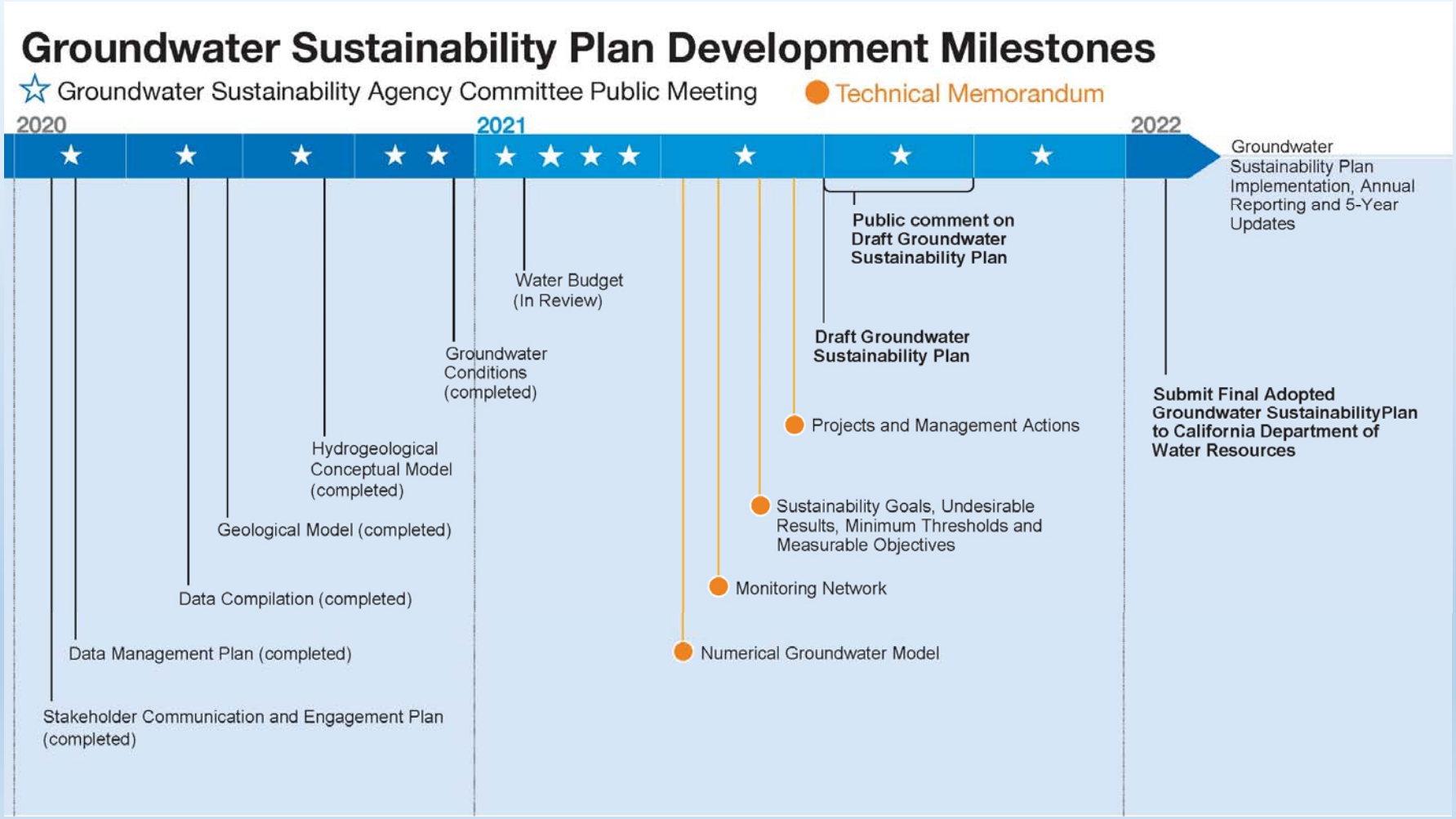
Water Budget – Future

Questions?

The Way Ahead

- ~~Complete the Groundwater Conditions Tech Memo~~
- ~~Complete the Water Budget~~
- Complete the Groundwater Model
- Establish Monitoring Network
- Establish Sustainable Management Criteria Thresholds
- Identify Projects and Management Actions
- Release DRAFT GSP

The Way Ahead



Questions?

Comments can be submitted to the website:

www.santaynezwater.org