

Sustainable Groundwater Management Act *GSP Preparation*

Chowchilla Subbasin

Second Technical Meeting

2:00 p.m. to 4:00 p.m., May 30, 2018
Chowchilla Water District
Chowchilla, CA



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Meeting Objectives

- Review key water budget values
 - Preliminary estimates and
 - Probable range
- Review management area options



Agenda

- Sustainable Groundwater Management Act (SGMA) Overview
- Preliminary water budget results
- Problems and Solutions
- Management areas
- Summary
- Next steps

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SGMA Overview: The Basics

- Applies to 127 medium and high priority groundwater basins in California—Chowchilla is a high priority basin
- Groundwater Sustainability Agencies (GSA) formed by June 30, 2017—Chowchilla has four GSAs
- GSA's managing high priority basins must adopt Groundwater Sustainability Plans (GSP) by January 31, 2020
- Sustainable basin management within 20 years of GSP adoption
- Sustainable groundwater management means operating a basin within its “sustainable yield”, with sustainable yield defined as avoiding “undesirable results” with respect to six “sustainability indicators”

SGMA Overview: Sustainability Indicators

- 1) Chronic lowering of groundwater levels
- 2) Reduction of groundwater storage
- 3) Seawater intrusion
- 4) Degraded water quality
- 5) Land subsidence
- 6) Depletions of interconnected surface water

Quantitative “minimum thresholds” and “measurable objectives” have to be established for each indicator.

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SGMA Overview: GSP Objective Retain Local Control of Groundwater

- Develop a set of projects and management actions that when fully implemented result in a cost effective sustainable groundwater condition for the Chowchilla subbasin
- Develop a Groundwater Sustainability Plan (GSP) that is approved by
 - California Department of Water Resources (DWR)
 - California State Water Resources Control Board (SWRCB)

SGMA Overview: GSP Requirements

- Sustainable groundwater (GW) management over a period of years during which water supply conditions approximate average conditions
- No undesirable results in sustainability indicators
 - GW levels/storage, subsidence
 - Surface water (SW) depletion
 - Impacts on GW-dependent ecosystems (GDEs)
 - Impacts on GW quality
 - Sea water intrusion
- No overdraft
 - Groundwater storage does not decrease
 - Groundwater system inflows equal or exceed outflows

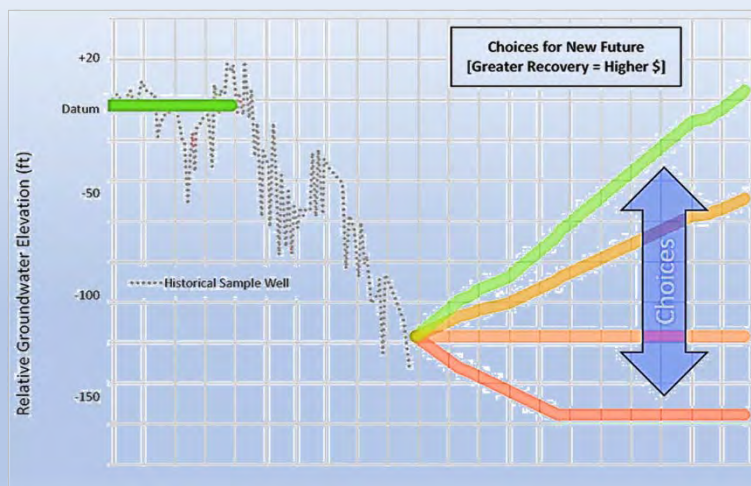


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SGMA Overview: Key Goal



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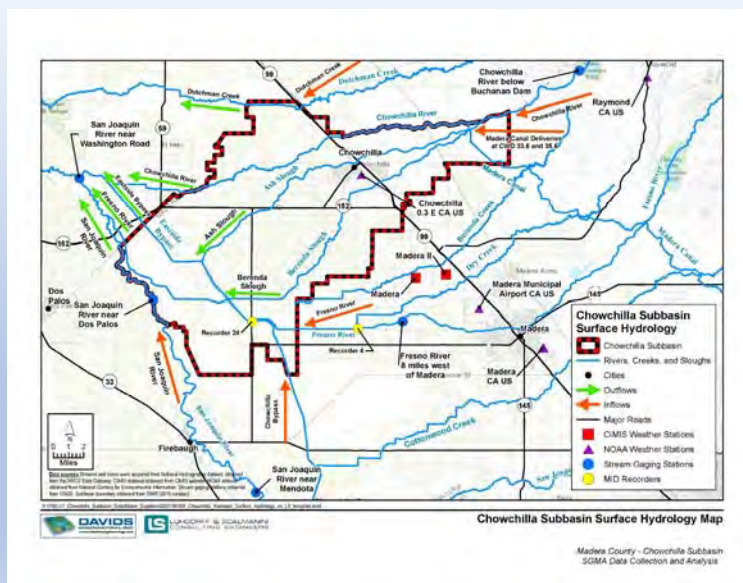
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Today—Preliminary Estimates

- Current water budgets based on 2015 land use and 1989 to 2014 hydrology and surface water supplies)
 - Subbasin boundary water budget
 - GSA surface water system budgets
- Management areas

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Chowchilla Subbasin Flow Paths



What is a Water Budget?

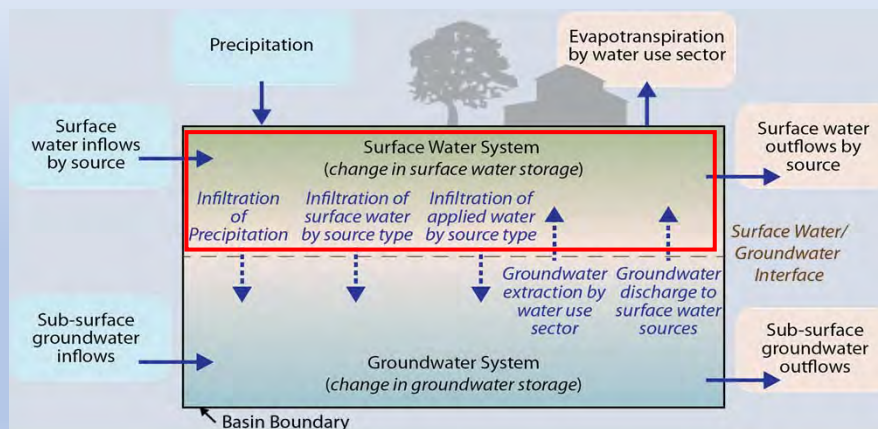
- A complete accounting of total groundwater and surface water entering and leaving a basin (the Chowchilla Subbasin) including the changes in the amount of water stored over a specified period (1989 through 2014)
- Basic Accounting Principle:
$$\text{Inflow} - \text{Outflow} \pm \text{Change in Storage} = 0$$
- Just like your checking account:
$$\text{Deposits} - \text{Withdrawals} \pm \text{Change in Balance} = 0$$



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Water Budget Schematic

Complexity of water budget varies depending on setting



Source: Water Budget BMP, December 2016



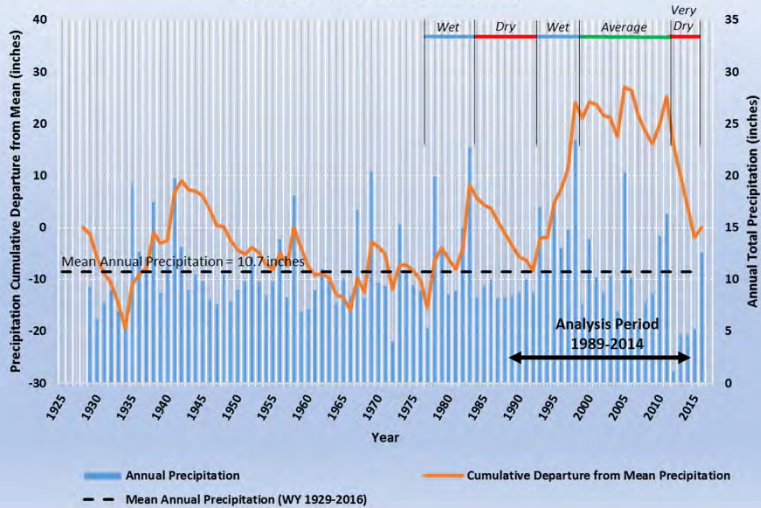
Water Budgets Required by SGMA

- **Historical: 1989-2014 (26 years)**
 - Tracks historic land uses
 - 1989-2014 climate and water supplies
- **Current:**
 - Fixed at 2015 land use
 - Applies 1989 through 2014 climate and water supplies
- **Future: projected minimum of 50 years** historical precipitation and climate, along with projected surface water inflows and outflows under a reasonably foreseeable future.

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Historical Conditions

Water Year Cumulative Departure from Mean Precipitation
 Madera, CA 045233 (1928-2016)



Historical Conditions (1989 -2014)

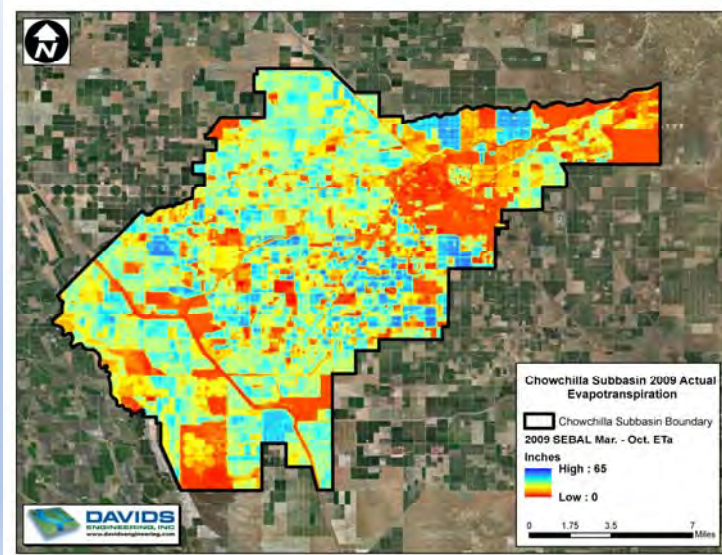
Select Inflows	Historical Record Period	Average Annual Volume		Difference (acre-feet)	Percent Difference
		Historical Record	1989-2014		
Buchanan Dam	1912-2017	70,520 AF	63,340 AF	-7,180 AF	-10.2%
Madera Canal (deliveries and flood)	1978-2016	108,770 AF	95,160 AF	-13,160 AF	-12.5%
Millerton Reservoir	1922-2014	1,718,700 AF	1,689,380 AF	-29,320 AF	-1.7%
Precipitation	1929-2016	10.72 in	10.91 in	0.19 in	1.8%

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Evapotranspiration and Precipitation

- CIMIS ET_o and precipitation Fresno/Madera/Madera II
 - 1989-2015 average ET_o = 55.3 inches
 - 1989-2015 average precipitation = 10.1 inches
- Crop Coefficients Derived from Remotely Sensed SEBAL Analysis in 2009
- Integrated Water Flow Model Demand Calculator (IDC)
- Land Use
 - DWR Land Use Surveys Madera County (1995, 2001, 2011)
 Merced County (1995, 2002, 2012)
 - Land IQ (DWR) Remotely Sensed Land Use 2014
 - County Agriculture Commission Data

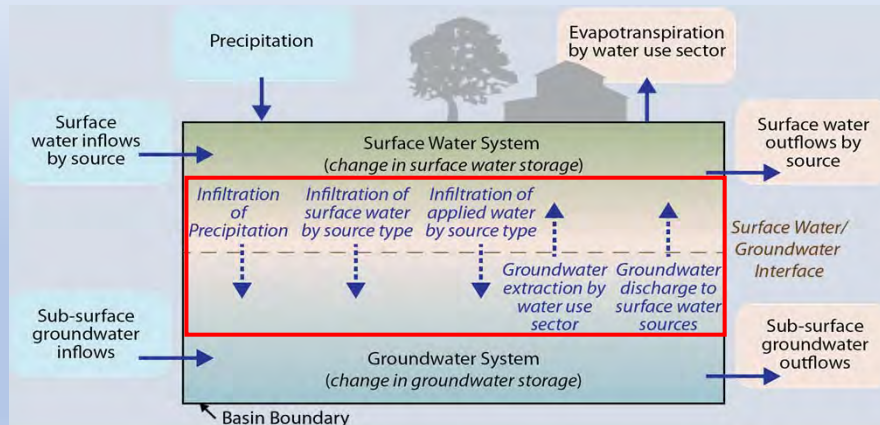
SEBAL—Sample Results



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Water Budget: Net Recharge from SWS

Complexity of water budget varies depending on setting



Source: Water Budget BMP, December 2016

Net Recharge from SWS

- Net Recharge from SWS = Recharge - Extraction
- Recharge:
 - Seepage from Canals (including rivers and sloughs when used as part of the distribution system)
 - Seepage from Rivers and Streams
 - Deep Percolation from Precipitation
 - Deep Percolation from Applied Water
- Extraction
 - Groundwater Extraction (Urban and Agriculture)
 - Groundwater Discharge



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Current (2015 Land Use) Surface Water Budget

- Average Net Recharge from SWS: -130,900 AF/yr (-104,700 to -157,100 AF/yr)
- Inflows to Groundwater System
 - Infiltration of precipitation: 33,700 AF/yr (27,000 to 40,400 AF/yr)
 - Infiltration of surface water: 55,500 AF/yr (44,400 to 66,600 AF/yr)
 - Infiltration of applied water: 89,300 AF/yr (71,400 to 107,200 AF/yr)
- Outflows from Groundwater System
 - Pumping: 309,400 AF/yr (247,500 to 371,300 AF/yr)



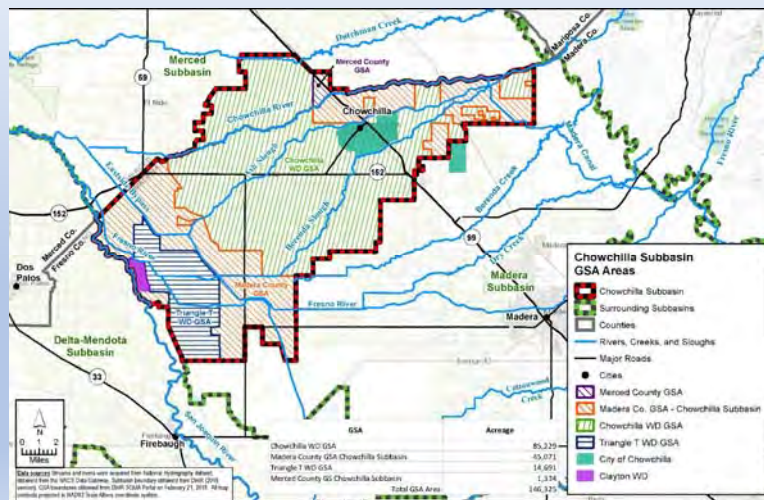
Water Budget: Current (2015 Land Use) Overdraft Estimates

- Combined Surface System and Groundwater System Water Budget (Inflows – Outflows)

Net recharge from SWS:	-130,900 AF/yr	(-104,700 to -157,100 AF/yr)
+		
Subsurface inflow:	27,500 AF/yr	(25,000 to 30,000 AF/yr)
=		
Overdraft:	-103,400 AF/yr	(-82,700 to -124,100 AF/yr)

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Chowchilla Subbasin GSAs



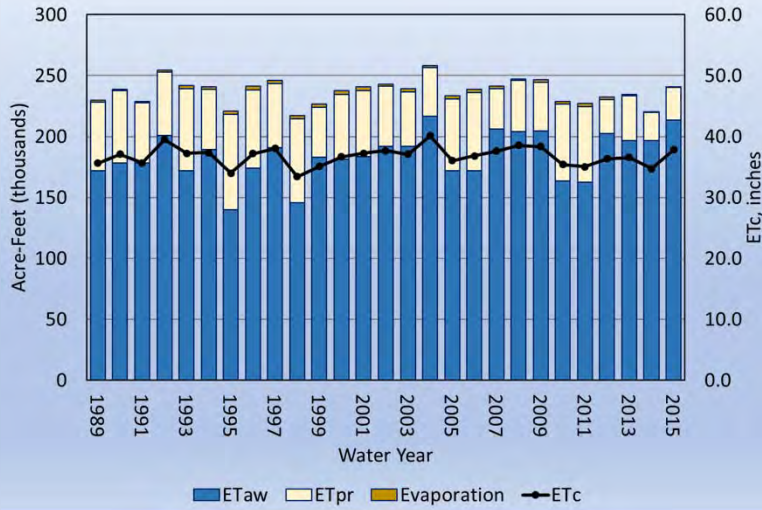
Current (2015 Land Use) Water Budget Summary Chowchilla Water District GSA

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2015 Land Use and ET

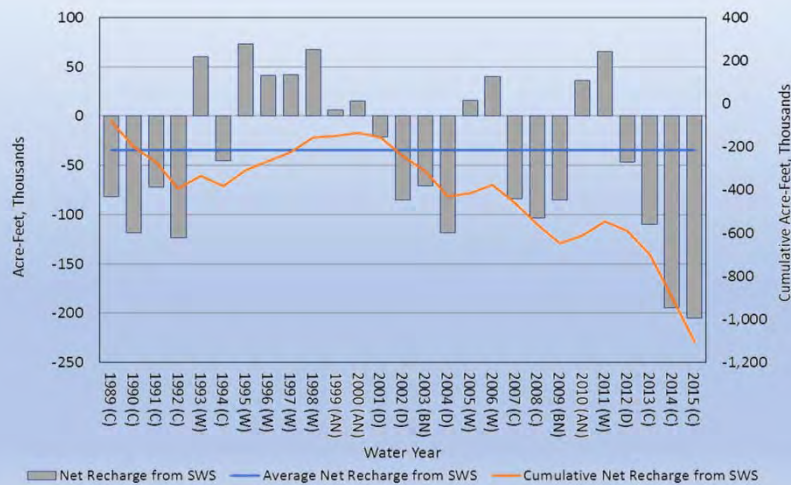
Land Use	Area (acres)		Average ET, 1989-2014 (inches)		
	1989	2015	ET_c	ET_pr	ET_aw
Citrus and Subtropical	29	112	40.3	7.6	32.7
Corn	8,340	9,803	34.3	5.6	28.7
Grain and Hay Crops	1,718	3,387	7.7	7.7	0
Grapes	5,773	6,295	26.7	6.6	20
Idle	13,578	909	6.5	6.5	0
Miscellaneous Field Crops	13,369	239	30.9	6.4	24.5
Miscellaneous Truck Crops	807	1,108	30.4	5.2	25.2
Almonds	9,829	35,616	41.6	7.1	34.5
Miscellaneous Deciduous	1,735	1,498	30.4	8.3	22.1
Pistachios	1,059	2,243	32.3	7.5	24.8
Walnuts	178	923	33.9	7.2	26.7
Pasture and Alfalfa	19,243	10,199	38.6	7.5	31
Total	75,658	72,332			

Current (2015 Land Use) Evapotranspiration



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Current (2015 Land Use) Net Recharge from SWS

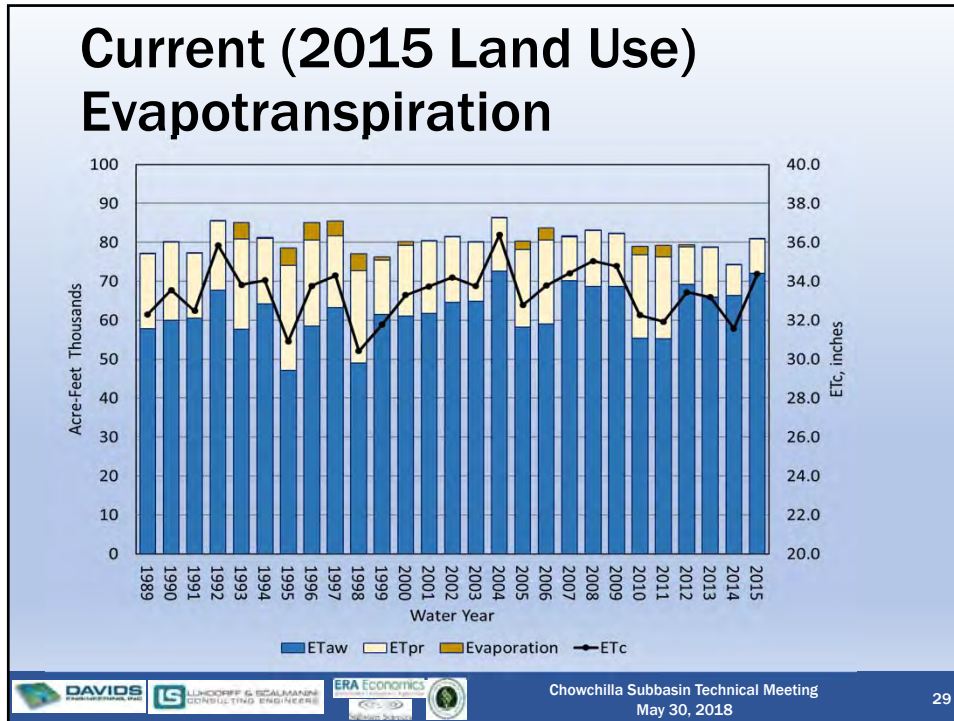


Current (2015 Land Use) Water Budget Summary Madera County GSA - West

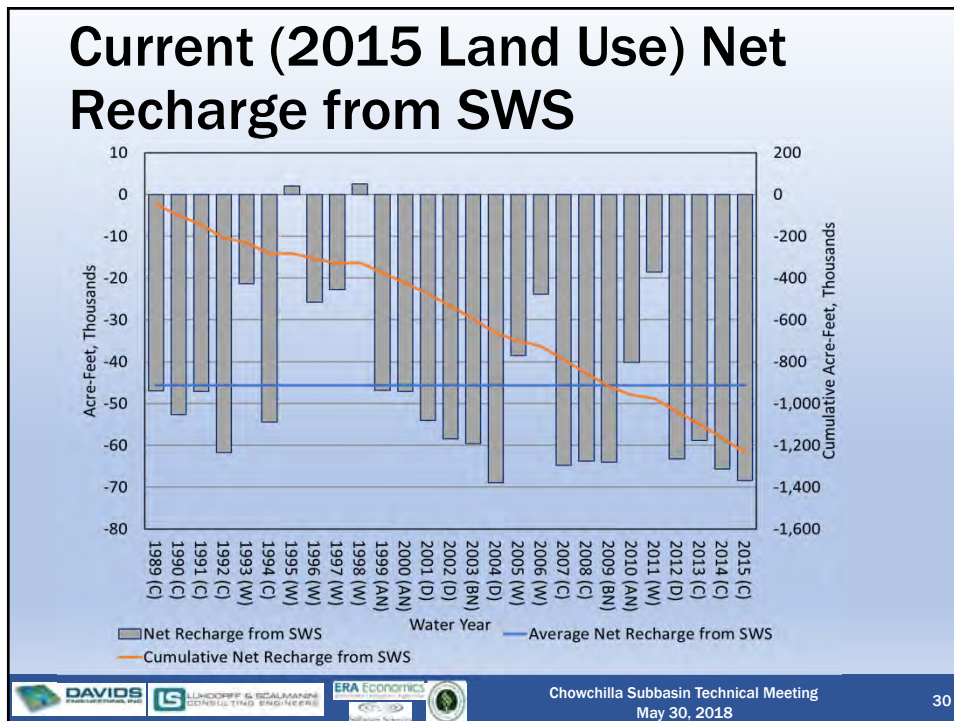
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2015 Land Use and ET

Land Use	Area (acres)		Average ET, 1989-2015 (inches)		
	1989	2015	ET_c	ET_pr	ET_aw
Citrus and Subtropical	0	0	40.3	7.6	32.7
Corn	1,820	6,513	34.3	5.6	28.7
Grain and Hay Crops	1,772	2,125	7.7	7.7	0
Grapes	467	3,945	26.7	6.6	20
Idle	3,575	85	6.5	6.5	0
Miscellaneous Field Crops	6,938	424	30.9	6.4	24.5
Miscellaneous Truck Crops	40	1,071	30.4	5.2	25.2
Almonds	1,235	5,342	41.6	7.1	34.5
Miscellaneous Deciduous	1	0	30.4	8.3	22.1
Pistachios	619	1,851	32.3	7.5	24.8
Walnuts	0	0	33.9	7.2	26.7
Pasture and Alfalfa	9,444	6,053	38.6	7.5	31
Total	25,911	27,408			



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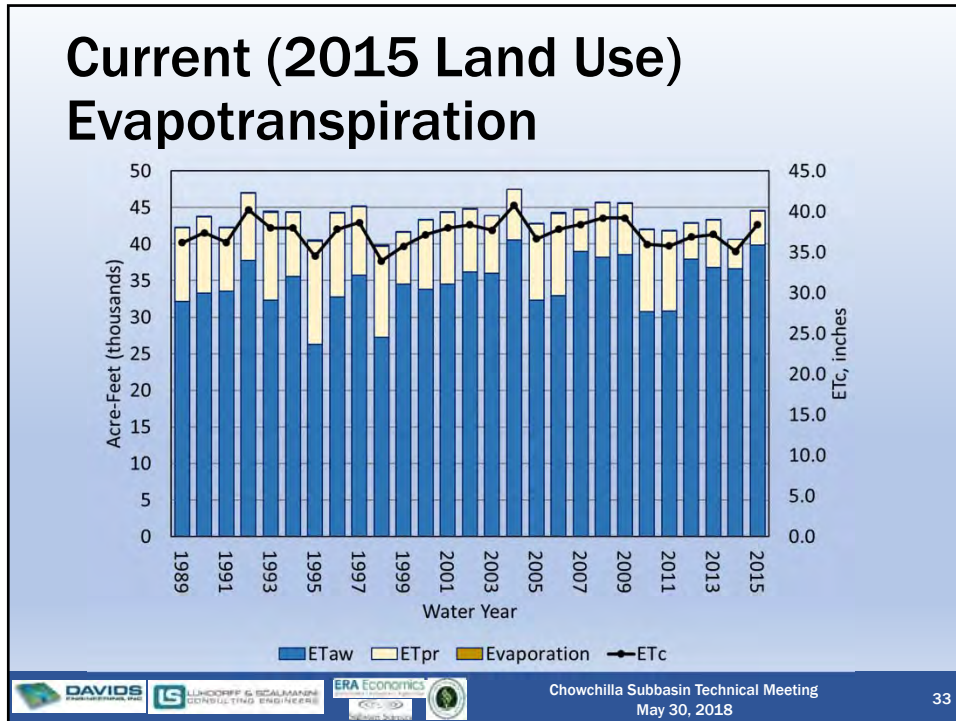


Current (2015 Land Use) Water Budget Summary Triangle T GSA

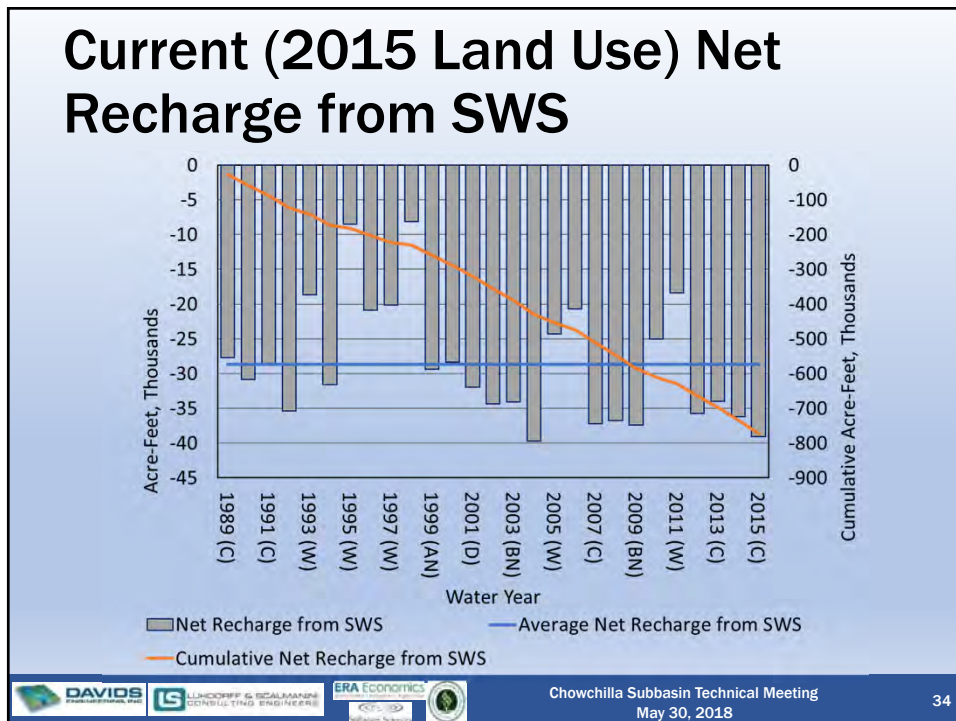
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2015 Land Use and ET

Land Use	Area (acres)		Average ET, 1989-2015 (inches)		
	1989	2015	ET_c	ET_pr	ET_aw
Citrus and Subtropical	0	0	40.3	7.6	32.7
Corn	45	1,004	34.3	5.6	28.7
Grain and Hay Crops	463	136	7.7	7.7	0
Grapes	5	126	26.7	6.6	20
Idle	473	70	6.5	6.5	0
Miscellaneous Field Crops	1,643	3	30.9	6.4	24.5
Miscellaneous Truck Crops	65	232	30.4	5.2	25.2
Almonds	13	6,732	41.6	7.1	34.5
Miscellaneous Deciduous	0	0	30.4	8.3	22.1
Pistachios	2	4,318	32.3	7.5	24.8
Walnuts	0	0	33.9	7.2	26.7
Pasture and Alfalfa	4,083	1,126	38.6	7.5	31
Total	6,792	13,746			



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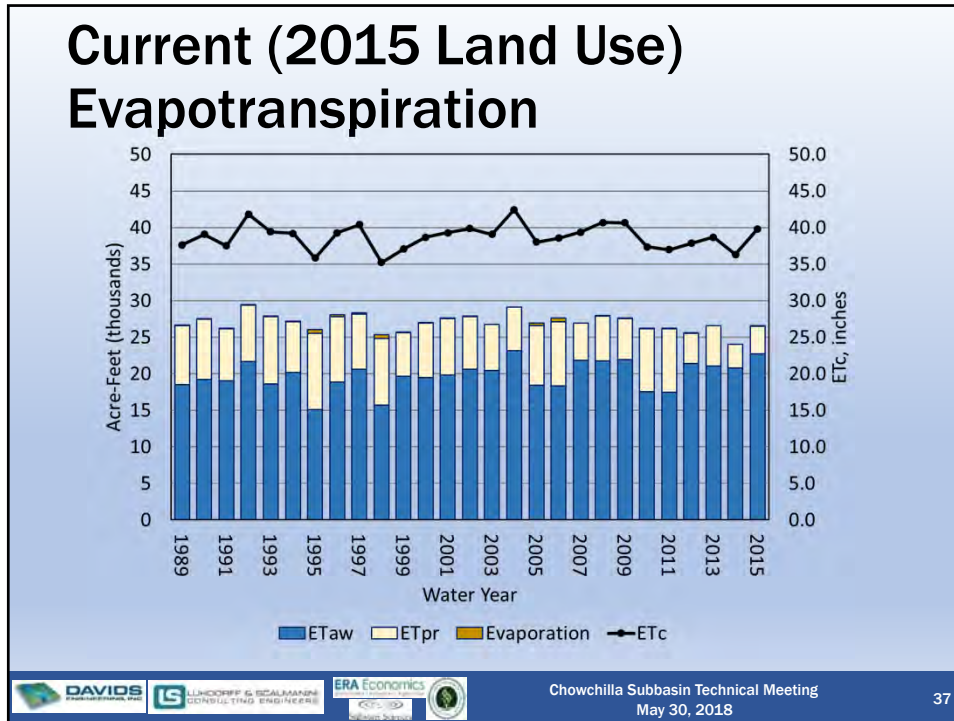


Current (2015 Land Use) Water Budget Summary Madera County GSA - East

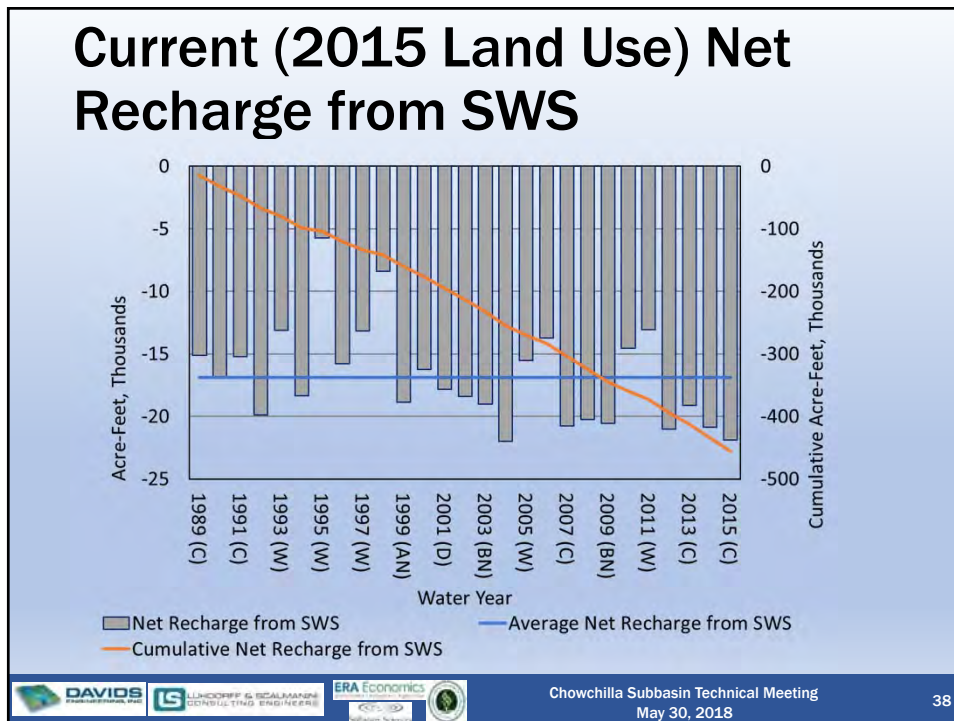
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2015 Land Use and ET

Land Use	Area (acres)		Average ET, 1989-2015 (inches)		
	1989	2015	ET_c	ET_pr	ET_aw
Citrus and Subtropical	30	17	40.3	7.6	32.7
Corn	9	29	34.3	5.6	28.7
Grain and Hay Crops	588	112	7.7	7.7	0
Grapes	1,647	492	26.7	6.6	20
Idle	1,493	18	6.5	6.5	0
Miscellaneous Field Crops	45	0	30.9	6.4	24.5
Miscellaneous Truck Crops	8	69	30.4	5.2	25.2
Almonds	1,246	5,352	41.6	7.1	34.5
Miscellaneous Deciduous	1,051	710	30.4	8.3	22.1
Pistachios	281	622	32.3	7.5	24.8
Walnuts	52	32	33.9	7.2	26.7
Pasture and Alfalfa	905	33	38.6	7.5	31
Total	7,354	7,486			



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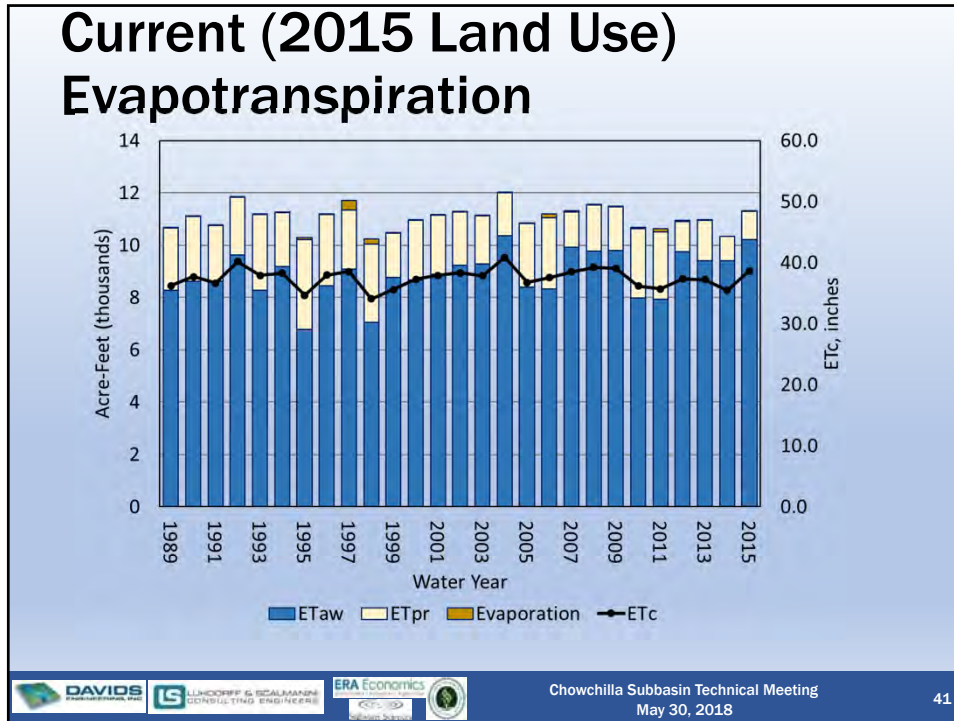


Current (2015 Land Use) Water Budget Summary Sierra Vista Mutual Water Company GSA

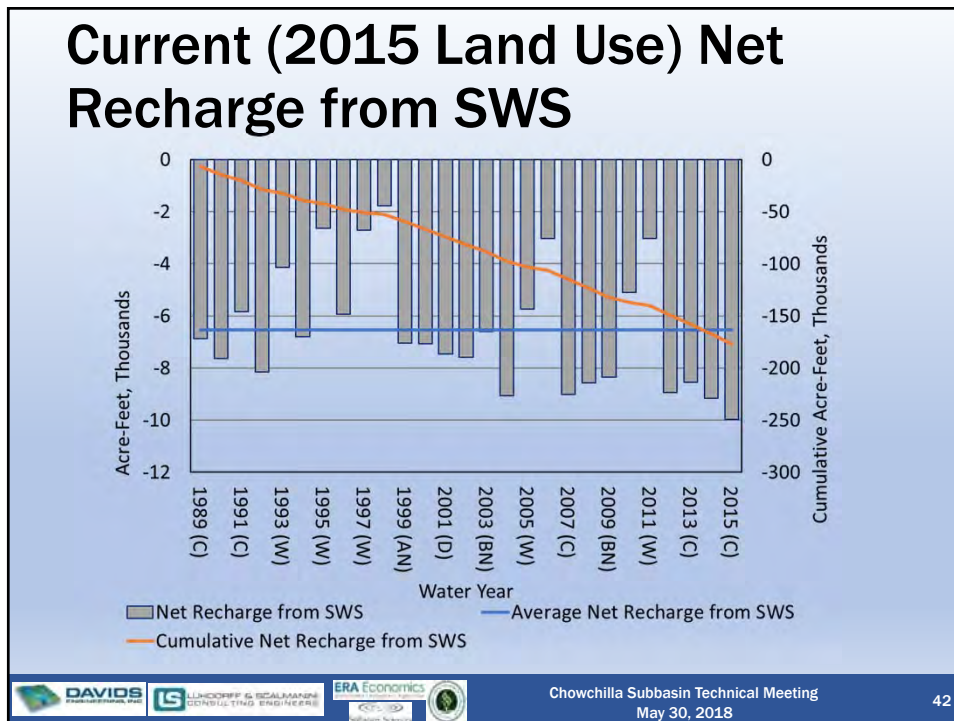
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2015 Land Use and ET

Land Use	Area (acres)		Average ET, 1989-2015 (inches)		
	1989	2015	ET_c	ET_pr	ET_aw
Citrus and Subtropical	0	0	40.3	7.6	32.7
Corn	225	768	34.3	5.6	28.7
Grain and Hay Crops	49	46	7.7	7.7	0
Grapes	131	77	26.7	6.6	20
Idle	391	3	6.5	6.5	0
Miscellaneous Field Crops	856	0	30.9	6.4	24.5
Miscellaneous Truck Crops	281	0	30.4	5.2	25.2
Almonds	14	447	41.6	7.1	34.5
Miscellaneous Deciduous	126	5	30.4	8.3	22.1
Pistachios	8	8	32.3	7.5	24.8
Walnuts	0	0	33.9	7.2	26.7
Pasture and Alfalfa	1,337	2,024	38.6	7.5	31
Total	3,419	3,378			



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GSA Policy Decision

- **Two options for allocating seepage “credits”**
 - Physical location
 - Proportional to GSA area

Defined Sub Regions	Area, Acres	Net Recharge from SWS Volume, AF		
		Physical Location of River&Stream Seepage	(River&Stream Seepage Allocated to GSA by GSA area)	Difference
Chowchilla WD GSA	85,229	-34,500	-30,800	3,700
Madera County - East GSA	11,362	-16,700	-16,100	600
Madera County - West GSA	31,213	-44,800	-47,600	-2,800
Sierra Vista MWC	3,830	-6,400	-6,900	-500
Triangle T GSA	14,691	-28,200	-29,200	-1,000
Totals	146,325	-130,600	-130,600	0

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Problem and Solutions

- **Problem:** Subbasin-wide average water budget indicates groundwater overdraft is occurring, i.e. total groundwater pumping in the subbasin is not sustainable
- **Solutions**
 - Obtain additional supply—projects
 - Reduce demand—management actions
 - Combination of both

Management Areas

- “...an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.”
- May define one or more management areas (MAs)
 - Will creation of MAs facilitate implementation of GSP?
 - MAs can define different minimum thresholds (MTs) and measurable objectives (MOs) provided undesirable results are defined uniformly throughout subbasin



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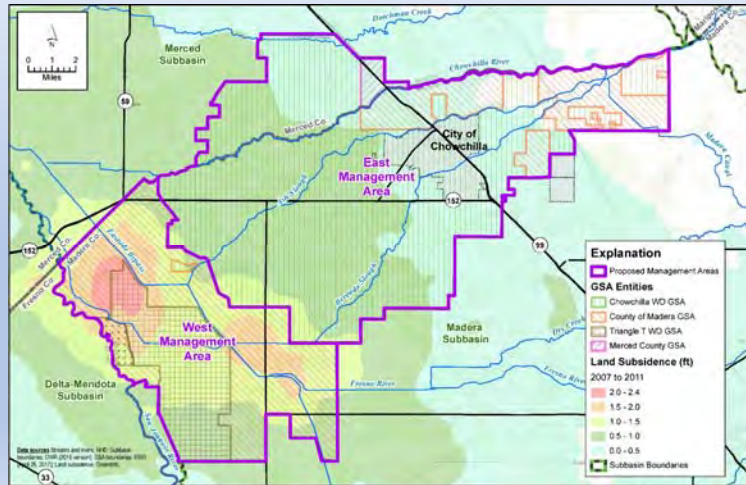
Management Areas: Options

- MA requirements same as subbasin requirements, each MA requires
 - Hydrogeologic Conceptual Model
 - Groundwater Conditions
 - Full Water Budget
- MAs vs. No MAs
 - More complicated and more work to have MAs
 - Nothing gained by having MAs
 - Can still define MTs and MOs differently across subbasin
 - GSAs have the same authority over their areas with or without MAs
 - Surface water system budget completed for each GSA



Management Areas: Two

- One option is to have two management areas, and also include GSA surface water budgets



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Summary

- **Chowchilla Subbasin preliminary overdraft estimate**
 - Current (2015 land use): -103,400 AF/yr (-77,600 AF/yr to -129,200 AF/yr)
 - Will be refined through additional technical work and modeling
- **Net recharge from SWS volumes vary across the basin**
- **Solutions include**
 - Projects: obtain additional water supply
 - Management actions: reduce demand
 - May require combination of projects and management actions
- **Two management areas is an option**
 - Less complicated and less work for GSP development and implementation
 - Can still define MTs and MOs differently across subbasin
 - GSAs have the same authority over their areas with or without MAs
 - Surface water system budget completed for each GSA

Next Steps–2018

Tentative Dates	Meeting Type	Time & Address	Major Topic	GSP Milestones (GSA Decisions needed)
3/6/2018	Public/Technical Workshop #1, GSP Development Kick-off	2 to 4 pm, Chowchilla WD Board Room	Basin Setting, Basin Boundary Water Budget	No Decisions
4/25/2018	Public Round Table/Coordination Committee #1	2 to 4 pm, Chowchilla WD Board Room	Discuss Basin Boundary Water Budget	No Decisions
5/30/2018	Public/Technical Workshop #2	2 to 4 pm, Chowchilla WD Board Room	Management Areas, Base Period, GSA water budgets, projects and management actions	No Decisions
6/27/2018	Public Round Table/Coordination #2 Committee	2 to 4 pm, Chowchilla WD Board Room	Discuss GSA water budgets, approve management areas, base period	Management Areas
7/18/2018	Public/Technical Workshop #3	2 to 4 pm, Chowchilla WD Board Room	Basin Setting, HCM, GW Conditions, Sustainability Goals, Undesirable Results, Minimum Thresholds, GDEs	
8/22/2018	Public Round Table/Coordination #3 Committee	2 to 4 pm, Chowchilla WD Board Room	Discuss Sustainability Goals, Undesirable Results, Minimum Thresholds, GDEs	Define Undesirable Results



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Next Steps–2018

Tentative Dates	Meeting Type	Time & Address	Major Topic	GSP Milestones (GSA Decisions needed)
9/26/2018	Public Round Table/Coordination #4 Committee	2 to 4 pm, Chowchilla WD Board Room	Approve Sustainability Goals, Undesirable Results, Minimum Thresholds, GDEs definition	Define Undesirable Results, Approval Sustainability goals
10/31/2018	Public/Technical Workshop #4	2 to 4 pm, Chowchilla WD Board Room	GW Model–Selection and Refinement, interbasin technical framework, projects and management actions Chowchilla Coordination Committee Agreement provisions approved (without data components)	Chowchilla Coordination Committee agreements
11/28/2018	Public Round Table/Coordination Committee #5	2 to 4 pm, Chowchilla WD Board Room	Discuss interbasin technical framework, projects and management actions	
12/19/2018	Public Round Table/Coordination Committee #6	2 to 4 pm, Chowchilla WD Board Room	Approve interbasin technical framework, projects and management actions	Interbasin technical framework, projects and management actions



Discussion

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