CV-SALTS Workshop
Central Valley RWQCB
17 August 2016

Technical Foundation

Data Compilation and Modeling

- ✓ Conceptual Model
- ✓ GIS Beneficial Use/ AGR Zone Efforts

Beneficial Use

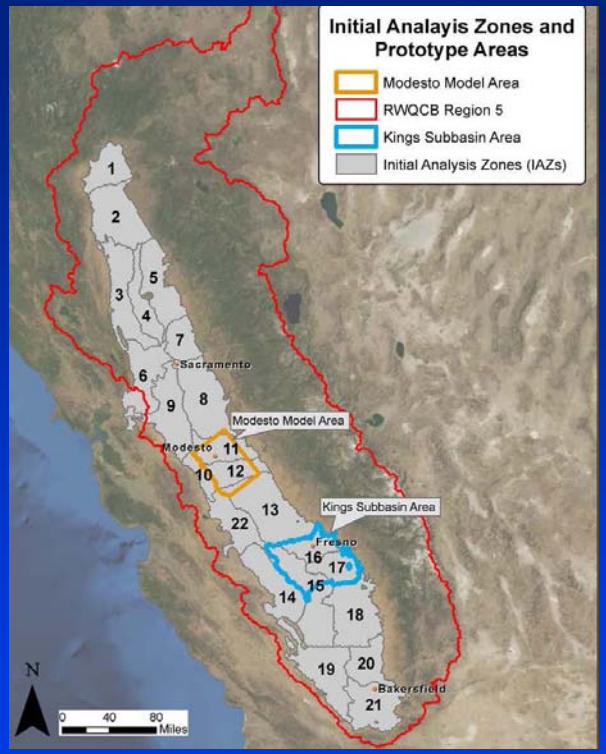
- ➢ Tulare Lake Groundwater
- ➢ MUN in Ag Dominated Waterbodies

Water Quality Objectives

- ✓ Aquatic Life
- ✓ Stock Watering
- ✓ Salt Effects on Irrigated Ag
- ✓ Salt Effects on MUN
- ➢ Lower San Joaquin River

Implementation

- ➢ SSALTS (Accumulation/Transport)
- ➢ NIMS (Nitrate Management Strategy)
- ➢ Alternate Compliance Strategy (Management Zone)



CV-SALTS Workshop Outline

- Salinity Water Quality Objectives in the Lower San Joaquin River
- MUN Evaluation in Ag-Dominated Water Bodies
- MUN/AGR De-designation in a Portion of the Tulare Lake Bed

CV-SALTS Workshop
Proposed Basin Plan Amendment to Establish Salinity Objectives in the Lower San Joaquin River

Jim Brownell
Engineering Geologist

Anne Littlejohn
Sr. Environmental Scientist

Presentation Overview

I. Background and Setting (Board Staff)

II. Beneficial Uses & Salt Sensitivity (Panel)

III. Water Quality Objectives (Panel)

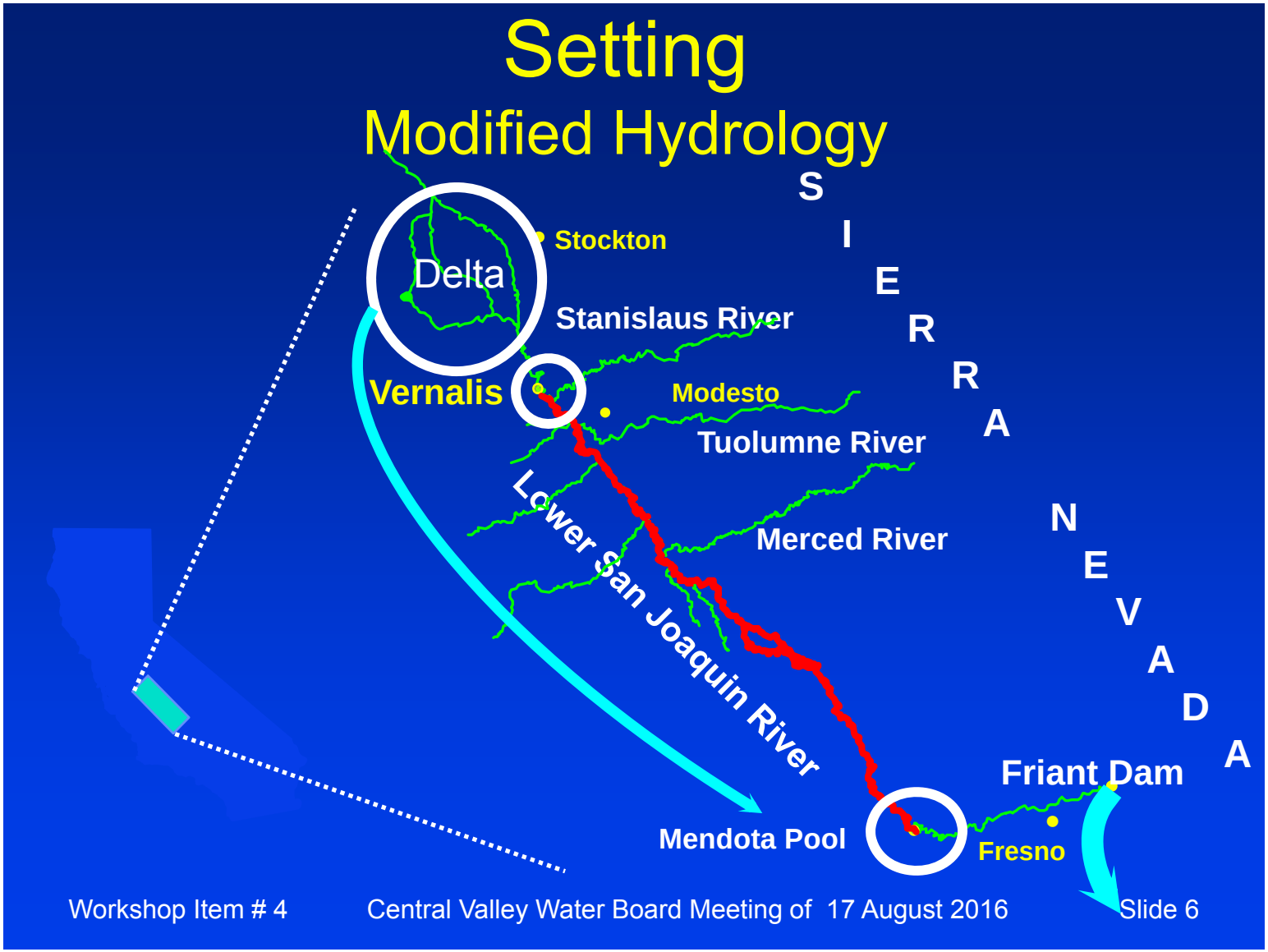
IV. Preferred Alternative & Implementation (Panel)

V. Special Considerations (All)

VI. Next Steps & Timeline (Board Staff)

Setting

Modified Hydrology



Setting

LSJR Salt and Boron Control Program

1. Implementation program to meet Vernalis salinity WQOs
2. Establishment of upstream salinity WQOs

Background
Control Program (Adopted 2004/2006)

- Step 1 of Control Program (Vernalis):
  - Established salinity TMDLs, compliance options to meet Vernalis WQOs
    - Strict Load Limits by Subarea (WDR)
    - Board approved RTMP
  - Maximize Salt Export out of the LSJR Basin

Background

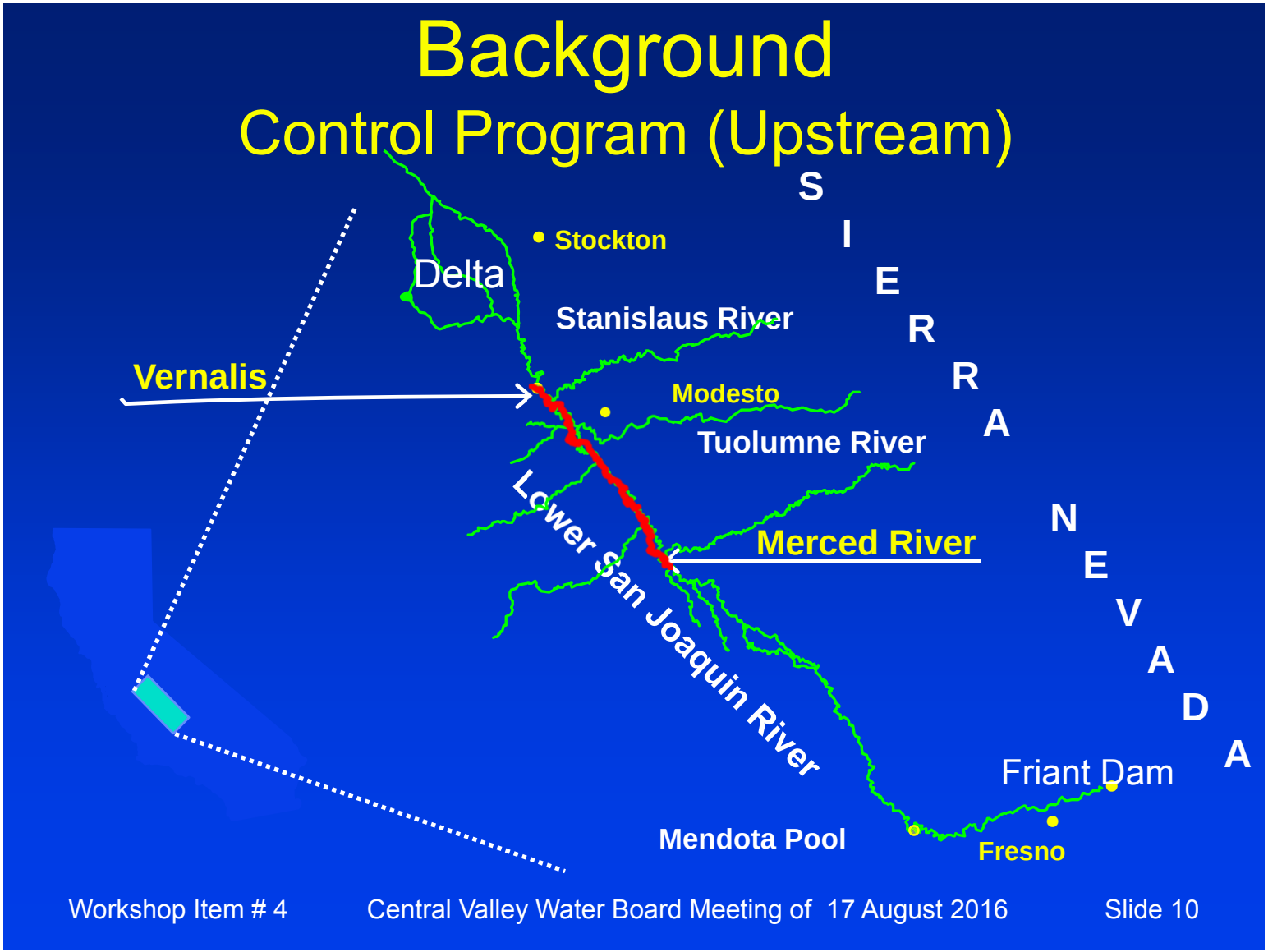
Control Program (Vernalis)

- Status:
  - Vernalis Objectives Met Since 1995
  - Grassland Bypass Project salt loads decreasing
  - Provisions of the Control Program incorporated by reference into ILRP General Orders
  - Real-time Salinity Management Program approved by the CV Water Board in December 2014
  - Coalitions and Cooperating Agencies participating

* NOT CHANGING WITH NEW EFFORTS *

Background

Control Program (Upstream)



Background
Control Program (Upstream)

- 2005 – June 2010
  - Project led by CV Water Board staff
  - CEQA Scoping Sessions (in 2005 and 2009) and Public Workshops (2006)
  - Soil Salinity Modeling for the LSJR
    - ✓ Draft Water Board Staff Technical Report: Salt Tolerance of Crops in LSJR Basin March 2010
    - ✓ Response to Minor Public Comments June 2010

Background
Control Program (Upstream)

June 2010 – Current Day

- Project was incorporated into CV-SALTS Initiative June 2010
- Formation of the LSJR Committee Oct 2010
  - ✓ Agriculture
  - ✓ Water Supply Districts
  - ✓ City, County, State and Federal Agencies
  - ✓ Water Quality and Watershed Coalitions
  - ✓ Clean Water and Wastewater
  - ✓ Other interested parties

Background
Control Program (Upstream)

- LSJR Committee Process
  - Public technical/policy comments addressed
  - Beneficial Uses reviewed
  - Baseline water quality established
  - Water quality criteria ranges evaluated
  - Salt reduction actions modeled
  - Alternatives developed/screened
  - Preferred Alternative selected

Beneficial Uses & Salt Sensitivity

Introduction

- Basin Plan Beneficial Uses
- Evaluation of Beneficial Uses
- Identification of Salt-sensitive Uses

SJR at Crows Landing

SJR at Airport Way

Beneficial Uses & Salt Sensitivity

Lower San Joaquin River Reach	MUN	AGR		PROC	REC-1		REC-2	WARM	COLD	MIGR		SPWN		WILD
	Municipal and Domestic Supply	Irrigation	Stock Watering	Industrial Process Supply	Contact	Canoeing and Rafting	Other Noncontact	Freshwater Habitat-Warm	Freshwater Habitat-Cold	Warm	Cold	Warm	Cold	Wildlife Habitat
Merced River to Vernalis	P	E	E	E	E	E	E	E		E	E	E		E

P = potential E = existing

Beneficial Uses & Salt Sensitivity
Evaluation of Existing Uses

- Beneficial Uses: Merced River to Vernalis
  - Identify need for changes to Beneficial Uses
    - Add Beneficial Uses
    - Modify Beneficial Uses
    - Remove Beneficial Uses
  - Determine if changes have been scoped
  - Determine if changes necessary for WQOs Amendment

Beneficial Uses & Salt Sensitivity
Conclusions

- No changes to Beneficial Uses needed
- Completed water quality criteria review for:
  - Municipal and Domestic Supply
  - Agricultural Irrigation Supply
  - Agricultural Stock Watering
  - Aquatic Life

Water Quality Objectives

- Potential MUN protection
  - SMCL range (900 – 1,600 umhos/cm EC)
  - Short term SMCL (2,200 umhos/cm EC)

- AGR Irrigation protection
  - Narrative Interpretation
    - Ayers and Westcot (1985)
  - Sensitive: 700 umhos/cm EC
  - Moderate: 700 – 3,000 umhos/cm E
  - Severe: >3,000 umhos/cm EC

Water Quality Objectives

Evaluation Process

- Reviewed 2010 Staff Report
  - Utilized Hoffman Model to Evaluate Soil Salinity Conditions to Predict Crop Sensitivity Under Different Conditions (inputs to model)
    - Crop to Protect
    - Percent Yield Acceptable
    - Annual Precipitation (drier years more conservative)
    - Leaching Fraction

Water Quality Objectives

Evaluation Process

- Updated Information for Hoffman Model
  - Current cropping patterns
  - Updated Climate Data
- Selected Inputs (endorsed by CV-SALTS)
  - Crop to Protect: 95% most sensitive commercial
  - 95% Yield
  - 95th percentile driest water year
  - 15% Leaching Fraction

Water Quality Objectives

Evaluation Process

- Updated 2010 Staff Report w/Addendum
  - Almonds most salt sensitive crop
  - 1,550 umhos/cm EC protective
    - Using selected modeling inputs

Water Quality Objectives

Ranges For Alternative Analysis

- 700 umhos/cm EC: Vernalis objective
- 1,010 umhos/cm EC: Vernalis/10% Leaching
- 1,350 umhos/cm EC: Water Quality Modeling
- 1,550 umhos/cm EC: Revised Hoffman Modeling

  Almonds, 95% yield, 95th percentile driest year, 15% leaching fraction

Preferred Alternatives & Implementation

- Identified salinity WQOs alternatives
- Feasibility review of Alternatives
  - Modeling of potential implementation scenarios
  - Economics review
- Selection process
- Implementation Program
- Monitoring and Surveillance Program

EC Water Quality Objective Alternatives

1. No Objective (No Action)
2. 1,550 µmhos/cm
3. Tiered Objective for Water Year Considerations:
   1,350 µmhos/cm & 1,550 µmhos/cm during critical years
4. 1,550 µmhos/cm Objective and 1,350 µmhos/cm
   Perf Goal for Seasonal & Water Year Considerations
5. 1,350 µmhos/cm
6. 1,010 µmhos/cm
7. 700 µmhos/cm

Selection Criteria

- Consistent with federal/state laws, plans and policies
- Consistent with other relevant WQOs (e.g., existing boron in Reach 83; seasonal EC objectives at Vernalis)
- Reduces dependency on New Melones Reservoir water quality releases
- Supports salt transport out of basin
- Scientifically Defensible (protects Beneficial Uses)
- Meets CV-SALTS Goals
- Feasible to Implement

Salinity Management Alternatives

Implementation Action	Planned	Planned + Max Treatment	Planned + Max Mgmt
Controlled Timing of Salinity Discharges	X	X	X
Reduce Point Source	X	X	X
Reduce Non-Point	X	X	X
Water Conservation	X	X	X
High Eff Irrigation	X	X	X
Reuse/Vol Reduction	X	X	Expanded
Tailwater Recovery	X	X	X
Tilewater Recovery	X	X	X
Regional Treatment	---	X	---

EC Water Quality Objective Alternatives

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2. 1,550 µmhos/cm
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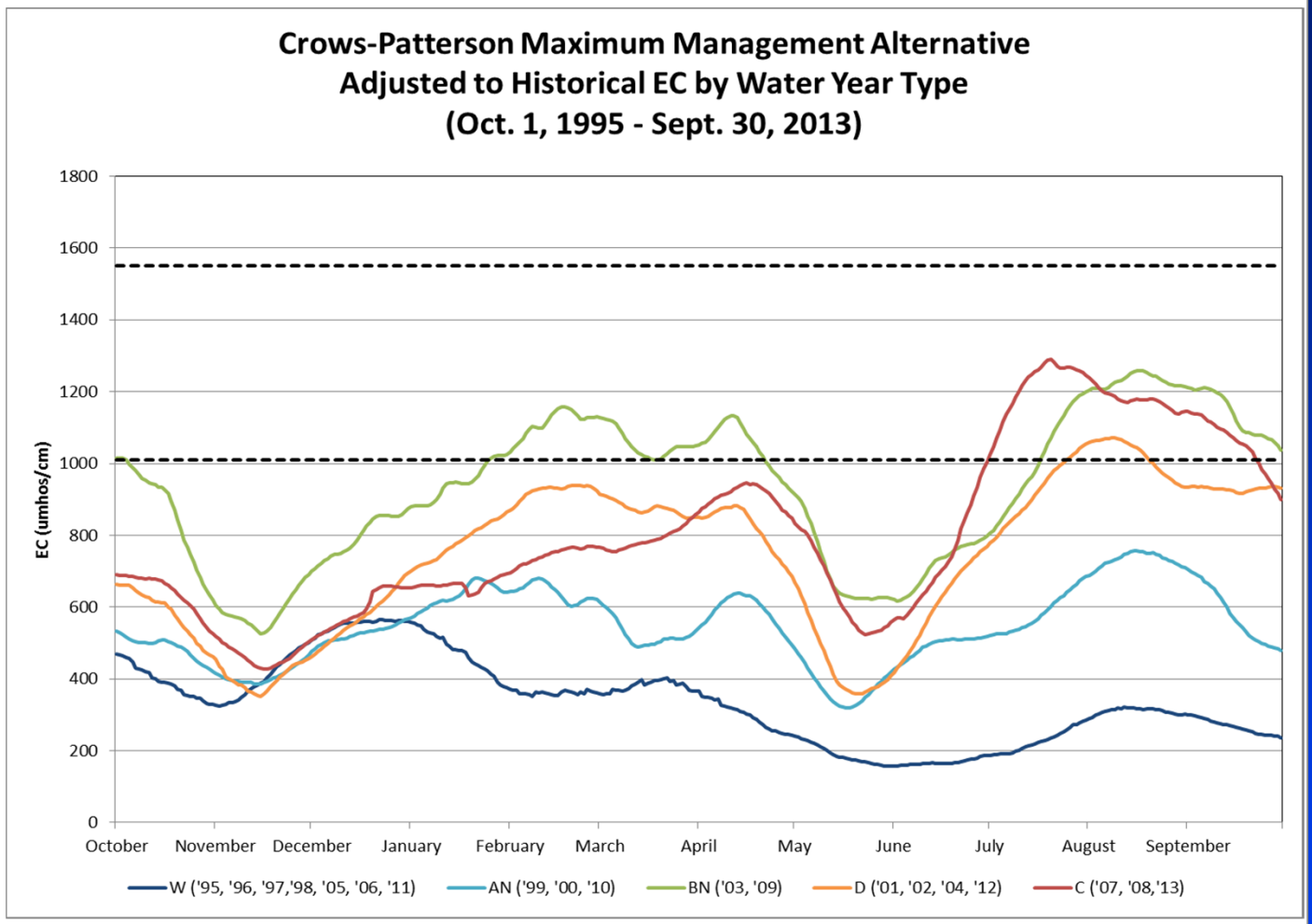
4. 1,550 µmhos/cm Objective and 1,350 µmhos/cm Perf Goal for Seasonal & Water Year Considerations
5. 1,350 µmhos/cm
6. 1,010 µmhos/cm
7. 700 µmhos/cm


Crows-Patterson Maximum Management Alternative
Adjusted to Historical EC by Water Year Type
(Oct. 1, 1995 - Sept. 30, 2013)
EC (umhos/cm)
1800
1600
1400
1200
1000
800
600
400
200
0
October
November
December
January
February
March
April
May
June
July
August
September
W ('95, '96, '97,'98, '05, '06, '11)
AN ('99, '00, '10)
BN ('03, '09)
D ('01, '02, '04, '12)
C ('07, '08,'13)

Reduction in New Melones Water Quality Releases

- New Melones Operational Model
- Evaluate Potential Changes in Water Quality Releases
- Results Range - Maximum Reduction 56,000 acre feet

Economic Analysis

- Costs of project alternatives & WQOs
  - No Action – dismissed from further consideration
  - 1,550 – Minimal – Lower costs ($)
  - 1,550 + Perf Goal – Minimal – lower costs ($)
  - 1,010 – High costs ($$$$) [30 year $1.15 billion]
- Information used with other selection criteria to identify the Preferred Alternative

Selection Process

Management Alternatives Model Results ✚ WQO Alternatives Evaluation ✚ Economic Analysis

⇩

Preferred Alternative (#4)

1,550 µmhos/cm EC WQO &
1,350 µmhos/cm EC Performance Goal for Seasonal and Water Year Considerations

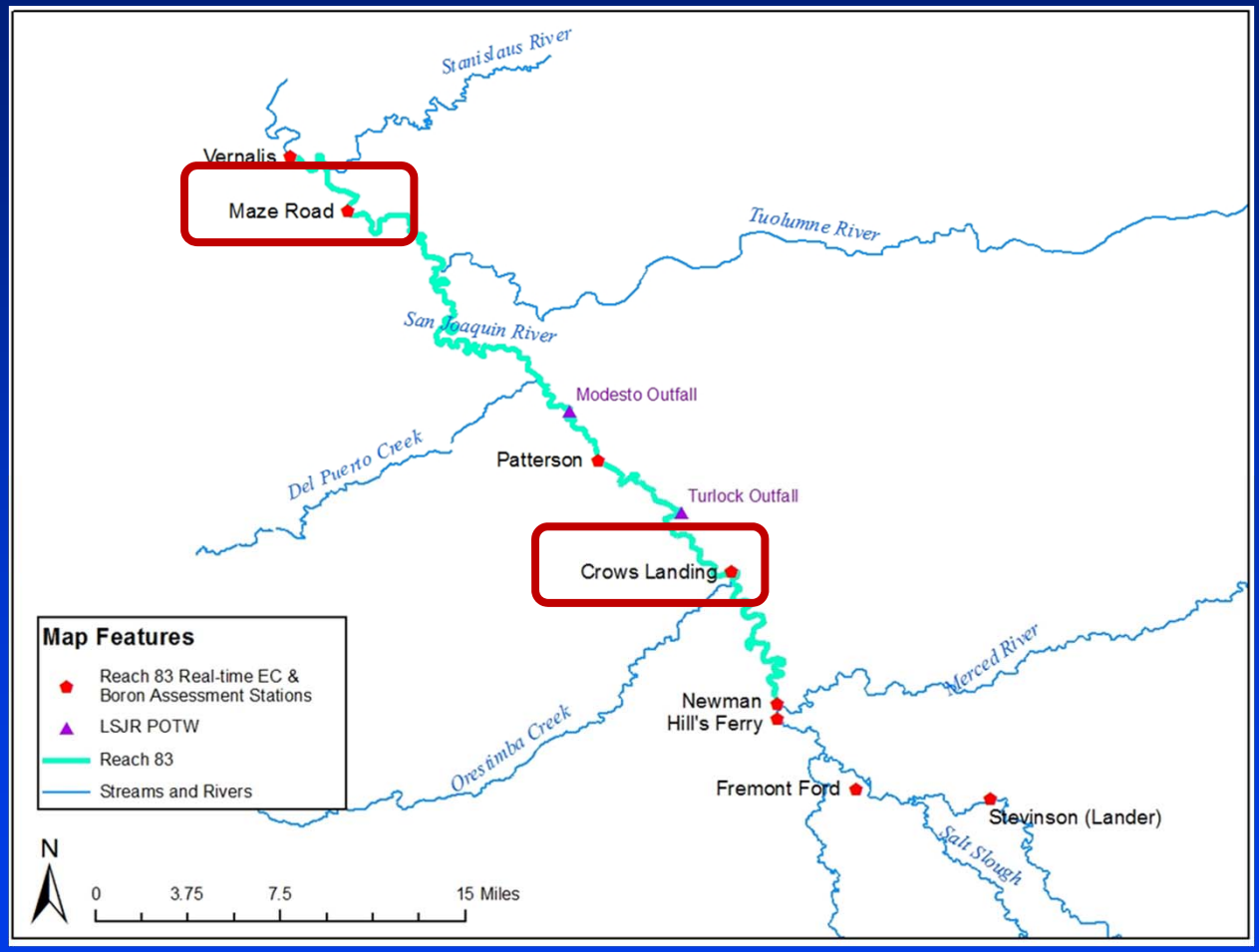
Implementation Program

- Salinity Management – Planned Bundle
  - Full Implementation of Grassland Bypass Project
- Monitoring and Surveillance
- More control and timing of discharges
  - RTMP efforts to meet Vernalis objective

Monitoring Program Goals

- Assess compliance with the EC and boron WQOs;
- Characterize long-term changes/trends in ambient EC and boron concentrations;
- Assess the effectiveness of the implementation program in controlling salt and boron; and
- Use the results to identify potential revisions to the WQOs, Performance Goal, and/or implementation program.

Monitoring Program



Special Considerations

- Extended Dry Periods
- Performance Goal and Basin Plan reopener
- POTW compliance

Special Considerations
Extended Dry Periods

Goals for Salinity Water Quality Objectives in the LSJR:

- Beneficial Use Protection
- Protect Downstream Beneficial Uses
- Reduce Dilution Flows from New Melones Reservoir
- Remove Salts from the Basin for Sustainability

Special Considerations
Extended Dry Periods

Considerations:

1. Level of Beneficial Use Protection Needed

2. Defining an Extended Dry Period

Special Considerations
Extended Dry Periods

1. Level of Beneficial Use Protection

- Quantity overrides quality
- Any water is better than none
- Crop Survival begins to outweigh crop yield
- Any changes to salinity levels need to be short-term

Special Considerations
Extended Dry Periods

Short-Term Salinity Protection Levels

- 2,470 µmhos/cm for Ag irrigation
  - Crop to Protect: Almonds
  - **75% Yield**
  - 95th percentile driest water year
  - 15% Leaching Fraction
- 2,200 µmhos/cm for Potential MUN
  (an average of the previous 4 quarterly samples)

Special Considerations
Extended Dry Periods

2. Defining an Extended Dry Period

- Used State Water Board's D-1641 Analysis
- Basin Hydrology Defined as 60-20-20 (defines a three year period)
- Hydrologic Years divided into 5 types based on flow
    - **Wet**
    - **Above Normal**
    - **Below Normal**
    - **Dry**
    - **Critical**

Special Considerations
Extended Dry Periods

Assigned Value

- Each Water Year type is assigned a numerical value

Wet	-	5
Above Normal	-	4
Below Normal	-	3
Dry	-	2
Critical	-	1

Special Considerations
Extended Dry Periods

Definition

- Extended Dry Period occurs when the sum of the current water year and the previous two water years is 6 or less

Example # 1	
Dry	2
BN	3
Dry	2
Total	7

Example # 2	
BN	3
Crit	1
Dry	2
Total	6

Special Considerations
Extended Dry Periods

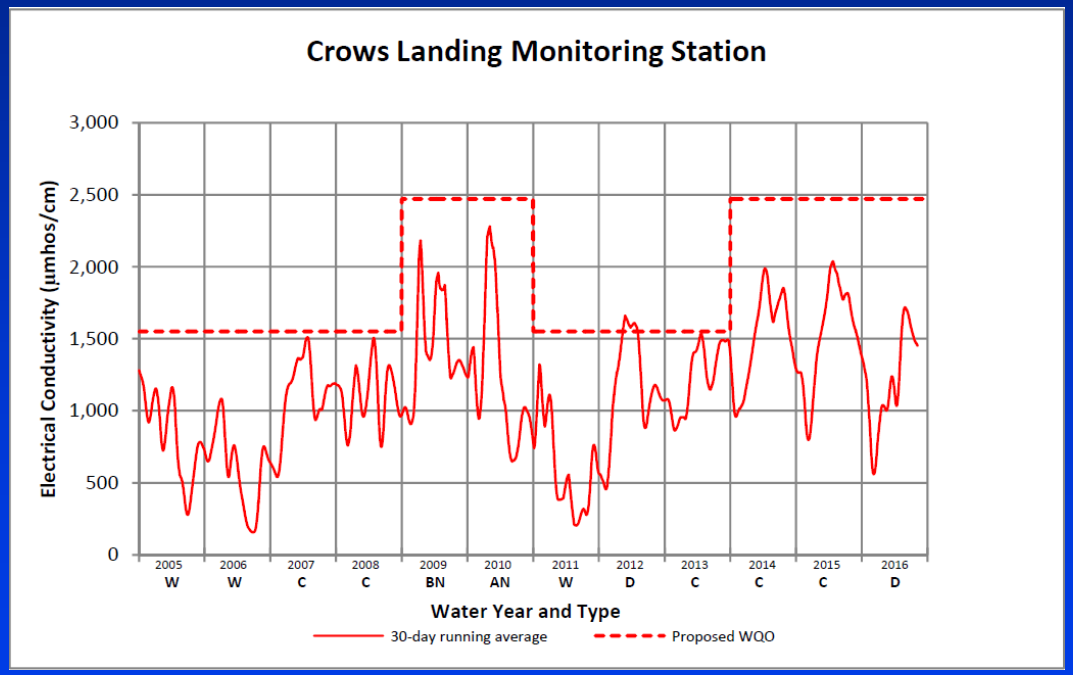
Length

- Would continue while the sum of the current year and the previous two years is 6 or less
  - Use the 30-day running average of 2,470 µmhos/cm for protection of AGR
  - Use the SMCL of 2,200 µmhos/cm for potential MUN protection
- An Extended Dry Period shall be deemed to exist for one water year (12 months) following a period with an indicator value total of six (6) or less

Special Considerations

Extended Dry Periods

Influence of Water Year Types on Salinity Levels



Special Considerations

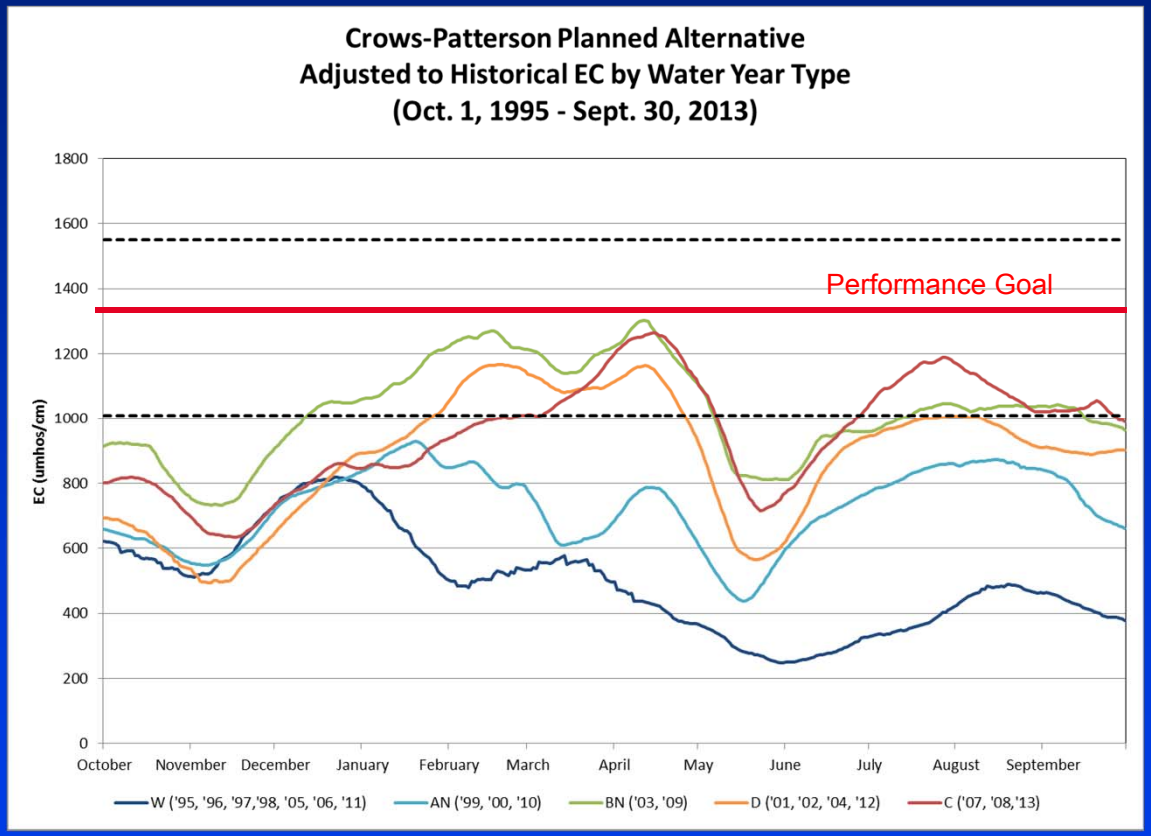
Performance Goal and Basin Plan reopener

Proposed Performance Goal Periods

WY Type	Irrigation Season		Non-irrigation Season
	Mar-Jun	Jul-Oct	Nov-Feb
Wet	1350 µmhos/cm		
Above Normal	1350 µmhos/cm		
Below Normal	1350 µmhos/cm		
Dry	1350 µmhos/cm		
Critical			

Special Considerations

Performance Goal and Basin Plan reopener



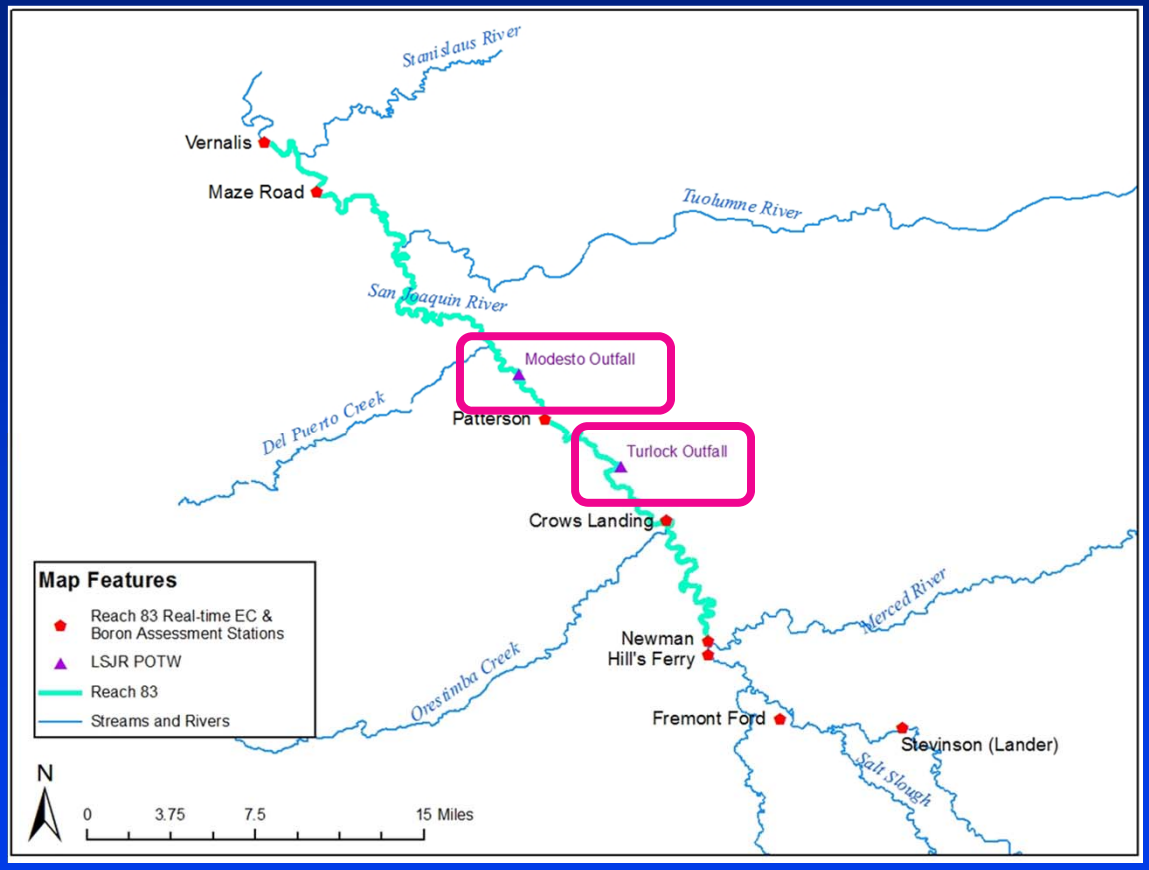
Special Considerations
Performance Goal and Basin Plan reopener

Reopener After 10 Years

- Evaluate implementation projects
  - Grasslands Bypass Project- full implementation scheduled for the end of 2019
- Evaluate Monitoring Data
  - Look at compliance with the WQOs and achievability of the Performance Goal
  - Consider a variety of water year types

Special Considerations

POTW Compliance



Special Considerations
POTW Compliance

1. Control Program (Vernalis)
   - End-of-pipe discharge limits: 700 and 1,000 µmhos/cm by 2022
   - Participation in a Board-approved Real Time Management Program
2. Control Program (Upstream)
   - Options are under development

Special Considerations
POTW Compliance—Upstream Options

Issue

- WQOs can be incorporated directly as end-of-pipe limits
- Doesn't account for Recycling and Conservation activities that increase salt concentration
- Doesn't allow salt transport out of the basin
- Additional issues - CVCWA

Special Considerations
POTW Compliance—Upstream Options

Potential Direction

- Utilizing Reasonable Potential Analysis (RPA)
  - Potential to cause or contribute to WQO exceedance
- Options for developing Effluent Limits

Special Considerations
POTW Compliance—Upstream Options

Utilizing Reasonable Potential Analysis (RPA)

- Upstream
  - Flow - worst case
  - Ambient Concentration - exclude Extended Dry Period data
- Effluent
  - Flow - Average Dry Weather
  - Projected 30-day Avg. Concentration - exclude Extended Dry Period data
- Other?

Special Considerations
POTW Compliance—Upstream Options

Effluent Limits

- Averaging period
  - Annual
  - Seasonal (Irrigation/Non-irrigation)
  - 30-day running average
- Point of compliance
  - End of pipe
  - Mixing zone
- Concentrations/Loads

Special Considerations
POTW Compliance—Upstream Options

CVCWA Comments

Next Steps & Timeline

Board Hearing Announcement & Meeting Materials (Draft Staff Report)	October – November 2016
Public/Peer Review	November – December 2016
Board Hearing (split)	December 2016
Response to Public Comments	January 2017
Board Hearing to consider Adoption	February 2017

Questions/Comments?

EXTRA SLIDES

Background and Purpose

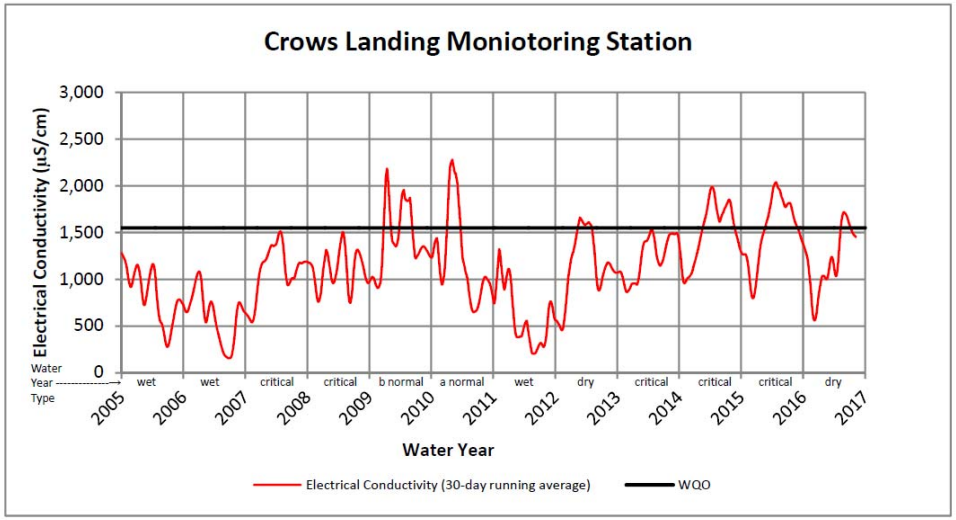
Existing Control Program

Schedule

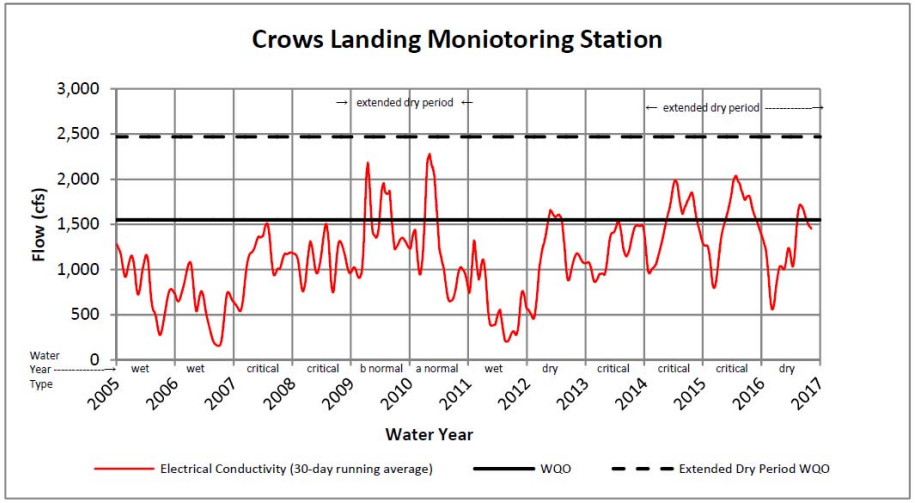
Subarea		Deadlines: Wet to Dry Water Years	Deadlines: Critical Water Years
Northwest Side	1	July 28, 2014	July 28, 2018
Grassland	1	July 28, 2014	July 28, 2018
Delta Mendota Canal (DMC) [a]	1	July 28, 2014	July 28, 2018
Tuolumne River	2	July 28, 2018	July 28, 2022
East Valley Floor	3	July 28, 2022	July 28, 2026
SJR Upstream of Salt Slough	3 3	July 28, 2022	July 28, 2026
Merced River	3	July 28, 2022	July 28, 2026
Stanislaus River		July 28, 2022	July 28, 2026

Special Considerations

Extended Dry Periods



Special Considerations
Extended Dry Periods



Background

Modified Hydrology

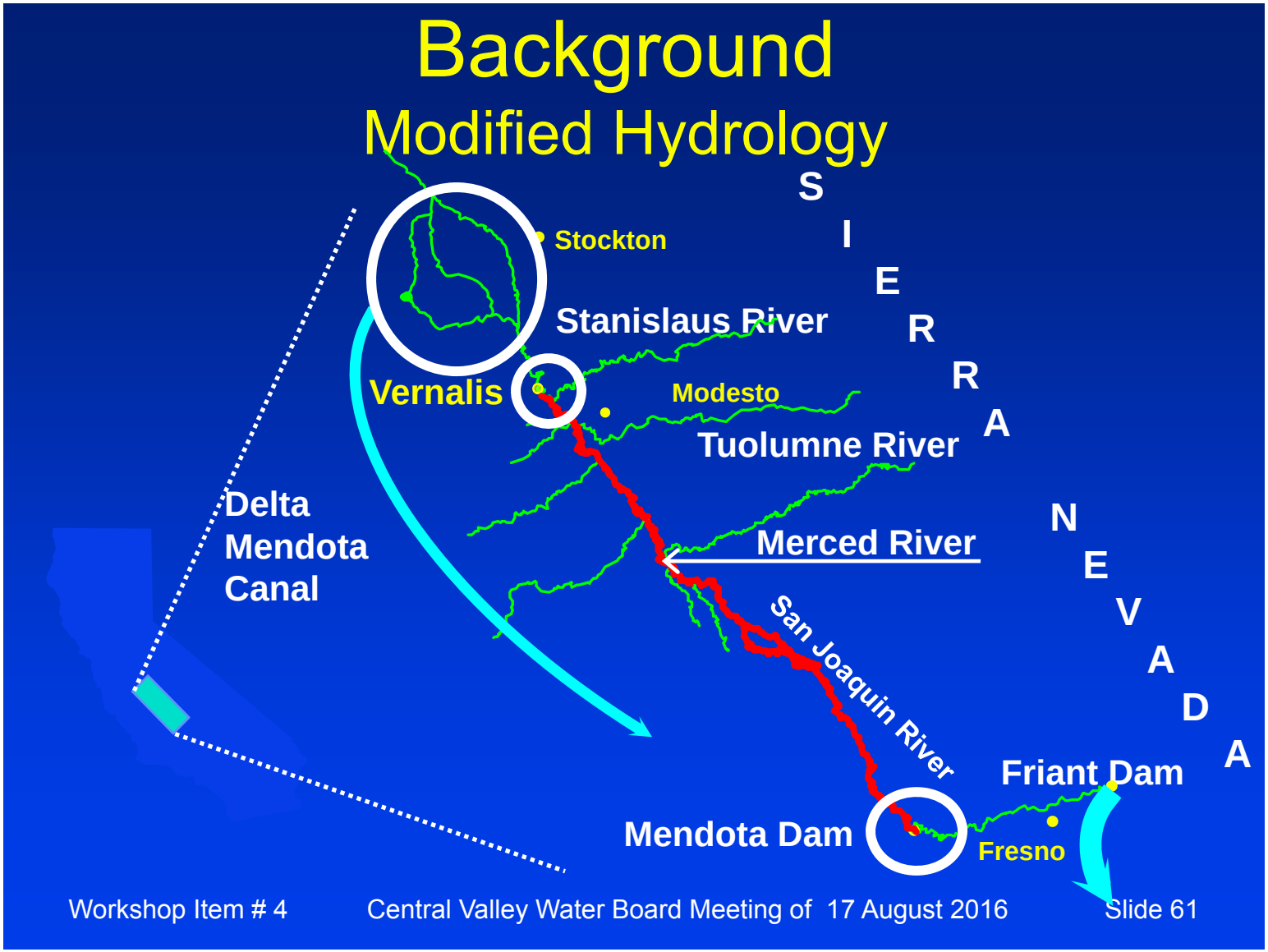


Table 6: New Melones Project Operation and River Characteristics: Planned minus Baseline (1,000 acre-feet)

	New Melones			Goodwin										
	New Melones Inflow	New Melones Storage	Tulloch Storage	OID & SSJID Canals	Total OID & SSJID	SEWD NM Water	CSJWCD NM Water	Instream Fish	Dissolved Oxygen	Vernalis Water Quality	Vernalis Flow Objective	Total Goodwin Release to River	Release above Minimum	NM Forecast Index
Avg	0			0	0	0	0	0	2	-8	4	0	3	
	WY	EOS	EOS	WY		M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	1	0	0	0	0	0	0	0	-3	2	0	1	0
1997	0	-3	0	0	0	0	0	0	0	0	3	0	-3	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	1	0	0	0	0	0	0	0	-1	0	-1	0	0
2000	0	-1	0	0	0	0	0	0	0	0	1	1	0	1
2001	0	6	0	0	0	0	0	0	1	-19	13	-5	0	-1
2002	0	9	0	0	0	0	0	0	0	-33	28	-5	0	4
2003	0	33	0	0	0	0	0	0	8	-56	24	-25	0	9
2004	0	32	0	0	0	0	0	0	21	-21	0	0	0	32
2005	0	31	0	0	0	0	0	0	0	0	0	0	0	31
2006	0	1	0	0	0	0	0	0	0	0	0	30	30	31
2007	0	-2	0	0	0	0	0	0	0	0	2	2	0	0
2008	0	-1	0	0	0	0	0	0	0	-3	2	-1	0	-2
2009	0	-3	0	0	0	0	0	0	0	-3	5	1	0	-1
2010	0	24	0	0	0	0	0	0	0	-15	-12	-27	0	-3
2011	0	24	0	0	0	0	0	0	0	0	0	24	24	24
2012	0	0	0	0	0	0	0	0	0	0	1	1	0	0
2013	0	-2	0	0	0	0	0	0	0	0	1	1	0	-1