Restoration Goal Technical Feedback

San Joaquin River Restoration Program

September 22, 2009

CSU Stanislaus, Turlock, CA

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Agenda

- Introductions
- Program Background
- Monitoring and Management
  - Purpose and Objectives
  - Problem Statement
  - Conceptual Models and Assumptions
  - Hypotheses
  - Monitoring
    - Physical
    - Biological
  - Incorporation of Results
- Program Update
- Next Meeting

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Settlement Background

- 1988 – Lawsuit challenging renewal of the long-term Friant Division contracts
- 2004 – Federal Judge rules Reclamation violated Section 5937 of the Fish and Game Code
- 2005 – Settlement negotiations reinitiated to avoid remedy phase
- 2006 – Settlement Agreement signed and implementation begins
- 2009 – Federal legislation enacted

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Settlement Goals

- Restoration Goal
  - To restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.
- Water Management Goal
  - To reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.

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Context for Today

- Key SJRRP Components:
  - WY2010 Interim Flows EA/IS
  - Program EIS/EIR
  - Fish Management Plan / Fisheries Implementation Plan
  - Restoration Flow Guidelines
  - Site-Specific Projects from Paragraph 11
  - Potential Projects from Paragraph 12
  - Water Management Actions
- Today
  - Monitoring and Analysis for Operation under the SJRRP

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Monitoring and Management

Introduction

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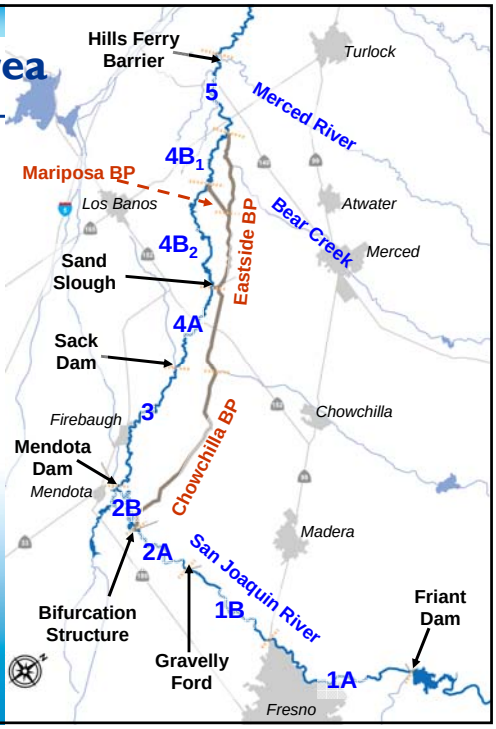
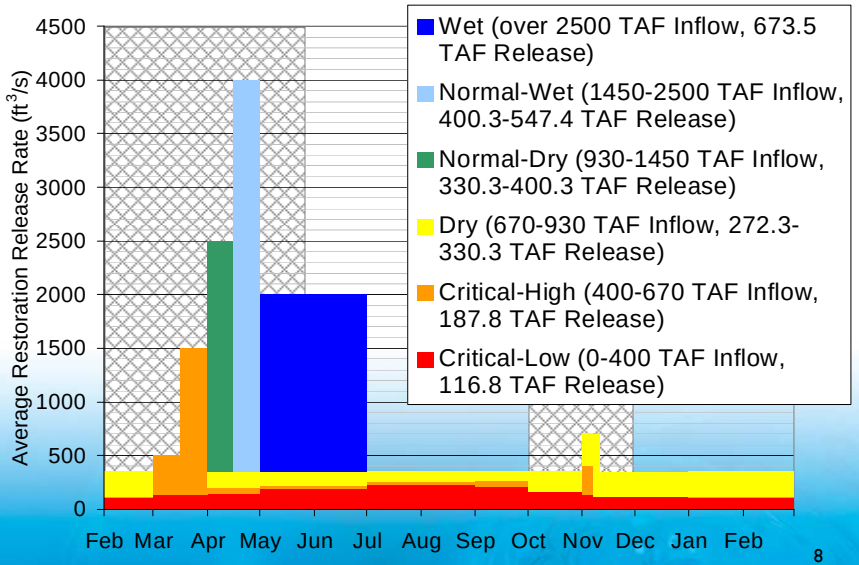
Restoration Area

- 150 miles of River
- Historically Different Reaches
- Water Supply Infrastructure
- Flood Control Bypasses
- Urban Areas
- Historically Disconnected Reaches



Restoration Releases at Friant Dam



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Roles and Responsibilities

- Implementing Agencies
  - Implement the Settlement
- Restoration Administrator
  - Makes specific recommendations on flow scheduling
- Reclamation
  - Operates Friant Dam consistent with Reclamation law and the Settlement
- Stakeholders and the public
  - Provides local knowledge, review, and suggestions

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Monitoring and Management Framework

- The SJRRP will develop an Annual Technical Report to:
  - Assemble information collected;
  - Communicate our understanding on the state of the science;
  - Communicate hypotheses and plans; and
  - Provide opportunities for comments.
- Regularly scheduled drafts and reporting provides snapshots on implementation data and planning.

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Annual Technical Report Outline

- Purpose and Objectives
- Problem Statements
- Conceptual Models and Assumptions
- Hypotheses
- Monitoring Data
- Modeling Data
- Synthesis
- Conclusions and Recommendations

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Monitoring and Management

Purpose and Objectives

The purpose and objectives provides an overview of general program needs requiring monitoring and management.

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PEIS/R Monitoring and Management Plans

- Flow: compliance stations
- Seepage: Legislated monitoring plan
- Capacity: stipulated constraint on flows
- Sediment: stipulated mobilization flows
- Vegetation: stipulated recruitment flows

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Additional Monitoring and Management Needs

- Fisheries
- Real-time Operations
- Site-Specific Study Questions
- Water Quality
- Recapture Quantities

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Monitoring and Management

Annual Problem Statements

The annual problem statement describes specific needs or areas of interest for the upcoming Restoration Year.

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Overall Interim Flow Program Objectives RA and TAC Perspective

- Water temperature management of Millerton storage to inform predictive tools for real-time operations
- Gravel pit influences on temperatures for site-specific study criteria
- Flow accretions/depletions below Gravelly Ford to test Settlement assumptions
- Surface water/groundwater interactions in Reach 2A, 4A and the Eastside Bypass to inform seepage management
- Flow routing and attenuation in Reaches 1-5
- Fine bedload (sand) transport thresholds and rates in Reach 1
- Flow-habitat relationships in Reach 1

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WY2010 Problem Statements (Fall)

- Problem Statements from the RA's Recommendations
- Highest Priority:
  - Seepage impacts in Reach 2
- Primary Priority:
  - Flow accretions/depletions in Reach 2A
  - Flow-water temperature relationships in Reach 1 and 2
- Secondary Priority:
  - Water temperature dynamics in the gravel mining pits, and the mainstream channel upstream and downstream of gravel mining pits
  - Fine sediment transport rates in Reach 1A
- Priority Not Specified:
  - Flow accretions and depletions

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WY2010 Problem Statements

PHYSICAL

- Hydrology
  - Flow Quantity and Timing
  - River Losses
  - Seepage/ Groundwater
- Hydraulics
  - Surface Water Elevation
- Geomorphology
  - Sediment

BIOLOGICAL

- Temperature
- Habitat
- Hills Ferry Barrier
- Passage

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Monitoring and Management

Conceptual Models and Assumptions

Conceptual models and assumptions describe how the SJRRP understands the behavior of the physical and biological system and existing operating rules or guidelines.

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Monitoring and Management

Hypotheses and Tests

Hypotheses describe areas of uncertainty, unknowns, and constraints where increased understanding may improve the ability to operate the SJRRP. Tests describe the approach to address key hypotheses.

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Hypotheses and Tests - Physical

- **Hydrology**
  - Assumptions regarding flow losses and returns in the SJR Settlement accurately depict riverine conditions at all hydrograph components.
  - Seepage will not adversely affect groundwater levels beneath adjacent lands.
  - The 1D unsteady-flow model predicts hydrograph translation times and attenuation with a reasonable degree of accuracy for purposes of managing restoration flow releases.
- **Hydraulics**
  - The 1D and 2D hydraulic models of the reach predict the water-surface elevations and channel hydraulic conditions with a reasonable degree of accuracy.

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Hypotheses and Tests - Physical

- **Geomorphology**
  - Water-surface elevations at high flows are lower than predicted by the existing rigid-boundary hydraulic model due to bed scour and/or the presence of bedforms
  - Interim and restoration flows will not adversely affect channel capacity and stability in Reach 2A due to bed aggradation or degradation
  - A sufficient supply of sand is available for entrainment in Reach 1 to maintain relative sediment transport equilibrium in Reach 2 for several years, but this supply will diminish over time, resulting in a degradational trend in Reach 2.
  - Incipient motion conditions occur at flows less than 3,500cfs at several riffle clusters in Reach 1A

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Hypotheses and Tests - Biological

Temperature

- Are instream temperatures adequate to support all life-history needs for spring and fall-run Chinook salmon through the entire restoration area?
- Are instream temperatures favorably affected by vegetation, subsurface flows, etc.?
- Are instream temperatures adversely affected by tributary and return flows, mining pits, etc.?

Habitat

- Can instream habitat can be modified and managed to support all life history requirements for Chinook salmon and other fish?

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Hypotheses and Tests - Biological

Hills Ferry Barrier

- How well does Hills Ferry protect Chinook salmon and steelhead from migration upstream of the Merced River confluence?
- What is the nature of fish that arrive at the barrier?

Passage

- Is fish passage adequate at all structures and are channel depths suitable for movement through the system?

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Monitoring and Management

Monitoring

Monitoring describes the location and methods for collecting measured data including spatial coverage, temporal frequency, equipment, and techniques.

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Monitoring – Physical Parameters

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Hypotheses and Tests - Physical

- **Flow Quantity and Timing (Hydrology)**
- **Water-surface Elevations, Channel Capacity and Other Hydraulic Conditions (Hydraulics)**
- **River Channel Response to Restoration Flows (Geomorphology)**

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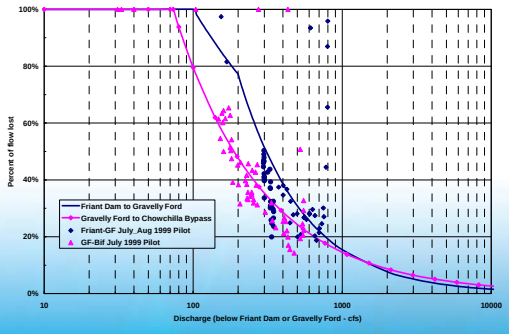
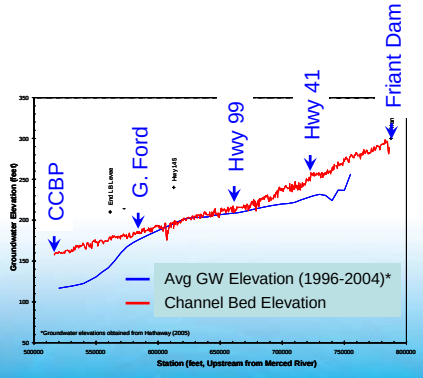
Hypotheses and Tests - Physical

- **Flow Quantity and Timing**
  - Assumptions regarding flow losses and returns in the SJR Settlement accurately depict riverine conditions at all hydrograph components.





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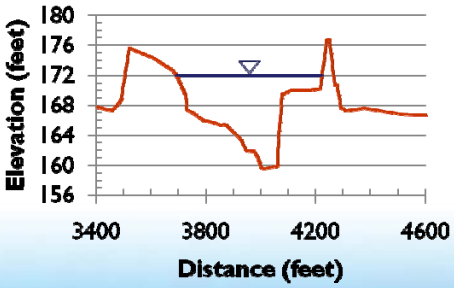
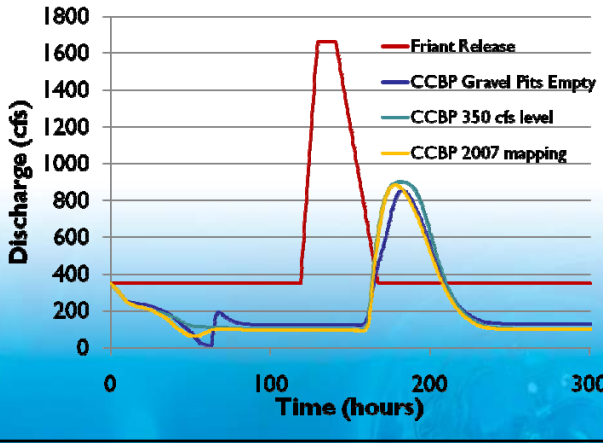
Hypotheses and Tests - Physical

- **Flow Quantity and Timing**
  - Seepage will not adversely affect groundwater levels beneath adjacent lands



Hypotheses and Tests - Physical

- **Flow Quantity and Timing**
  - The 1D unsteady-flow model predicts hydrograph translation times and attenuation with a reasonable degree of accuracy for purposes of managing restoration flow releases.



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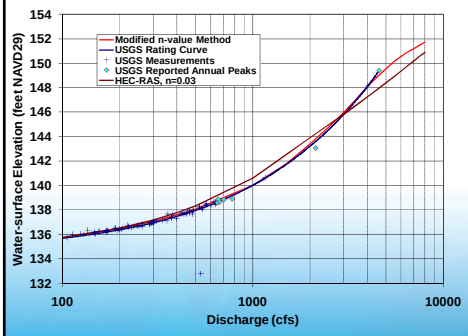
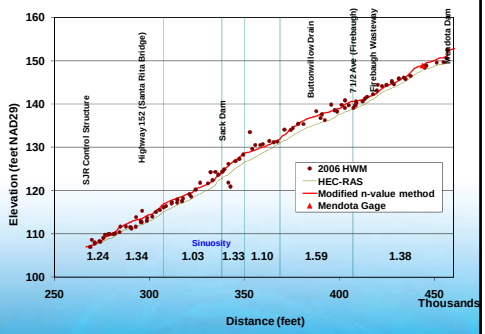
Hypotheses and Tests - Physical

- **Water-surface Elevations, Channel Capacity and Other Hydraulic Conditions**
  - The 1D and 2D hydraulic models of the reach predict the water-surface elevations and channel hydraulic conditions with a reasonable degree of accuracy





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Hypotheses and Tests - Physical

- **River Channel Response to Restoration Flows**
  - Water-surface elevations at high flows are lower than predicted by the existing rigid-boundary hydraulic model due to bed scour and/or the presence of bedforms
  - Interim and restoration flows will not adversely affect channel capacity and stability in Reach 2A due to bed aggradation or degradation
  - A sufficient supply of sand is available for entrainment in Reach 1 to maintain relative sediment transport equilibrium in Reach 2 for several years, but this supply will diminish over time, resulting in a degradational trend in Reach 2.

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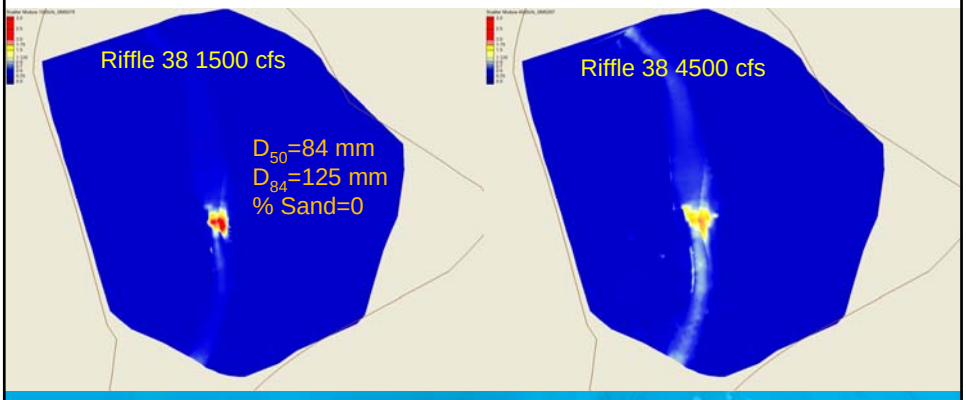
Hypotheses and Tests - Physical

- **River Channel Response to Restoration Flows**
  - Incipient motion conditions occur at flows less than 3,500cfs at several riffle clusters in Reach 1A,



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Flow Measurement - Gages

Hypothesis: The 1D unsteady-flow model predicts hydrograph translation times and attenuation with a reasonable degree of accuracy for purposes of managing restoration flow releases

What:
- Install new gages or upgrade existing ones

Why:
- Verify Settlement assumptions
- Comply with Paragraph 13(g)

RA/TAC:
- Recommendation #7 of Interim Flow Monitoring and Evaluation Recommendations Report

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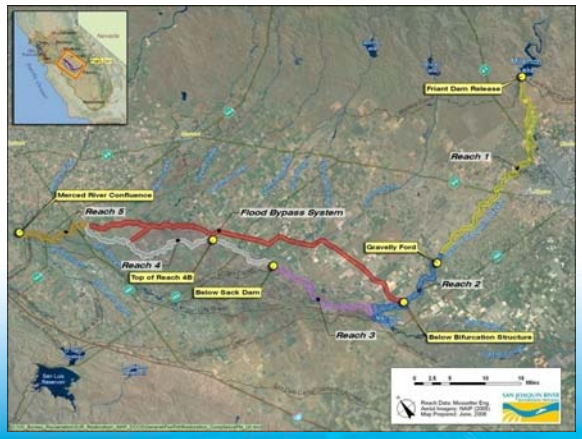
Flow Measurement - Gages

Hypothesis: The 1D unsteady-flow model predicts hydrograph translation times and attenuation with a reasonable degree of accuracy for purposes of managing restoration flow releases

Location	Agency	Status
Friant Dam	BOR	Operating
Gravelly Ford	BOR	Operating
Bifurcation Structure (Chowchilla Bypass)	BOR	Operating
Below Sack Dam	DWR	Pending
Reach 4B	DWR	Pending
Confluence (Hills Ferry)	USGS	Operating



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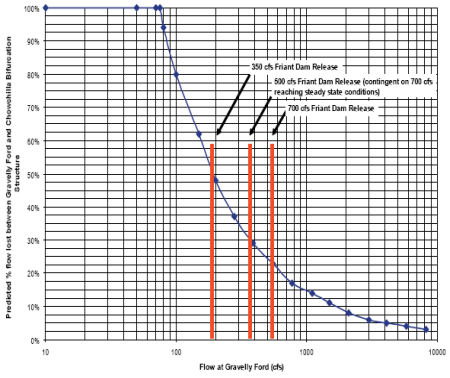
Flow Losses

Hypothesis: Assumptions regarding flow losses in the SJR Settlement are accurate

What:
- Perform synoptic flow measurements in the reach

Why:
- To verify assumptions in the Settlement and provide information for water management decisions

RA/TAC:
- Fall 2009 Interim Flow Recommendation
  - Flow accretions/depletions in Reach 2A



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Seepage Monitoring

Hypothesis: Seepage will not adversely affect groundwater levels beneath adjacent lands

What:
- Install groundwater monitoring wells at transects
- Install monitoring wells at key locations in the reach
- Develop seepage reporting network

Why:
- Verify Settlement assumptions
- Ensure compliance with the Program Legislation
- Address landowner concerns

RA/TAC:
- Fall 2009 Interim Flow Recommendation
  - Seepage impacts in Reach 2

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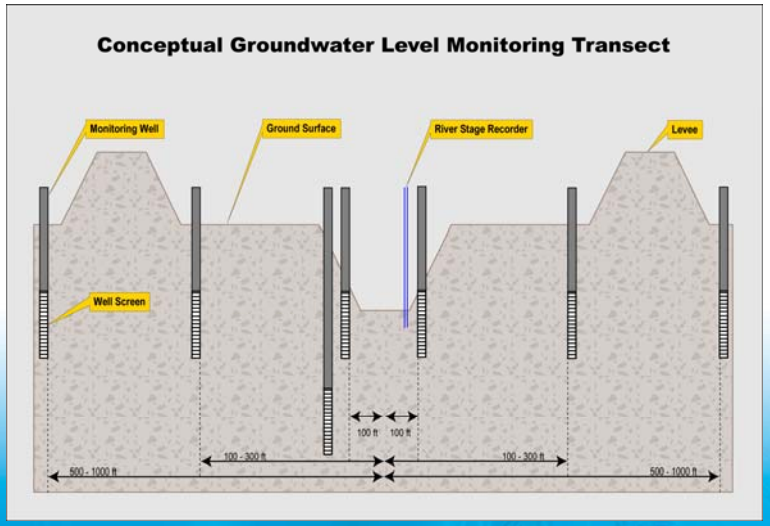
Seepage Monitoring

Hypothesis: Seepage will not adversely affect groundwater levels beneath adjacent lands



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Water Surface Elevations

Hypothesis: The 1D and 2D hydraulic models of the reach predict the water-surface elevations and channel hydraulic conditions with a reasonable degree of accuracy

What:
- Water surface elevation surveys every ½ mile and at key locations
- Flow measurements every 5 miles
- Install stage recorders at key locations

Why:
- Calibrate the 1D and 2D hydraulic models

RA/TAC:
- Recommendation #5 of Interim Flow Monitoring and Evaluation Recommendations Report

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River Channel Response – Sand Bed

Hypothesis 1: Interim and restoration flows will not adversely affect channel capacity and stability in Reach 2A due to bed aggradation or degradation

Hypothesis 2: Water-surface elevations at high flows are lower than predicted by the existing rigid-boundary hydraulic model due to bed scour and/or the presence of bedforms

What:
- Resurvey pilot study sections in Reach 2 for topo of 100' of channel from levee to levee
- Install scour chains at two of the sections and monitor flow, water elevations, and bed changes during event

Why:
- Determine if sand bed in reach changes significantly under interim flows
- Test whether water surface elevations are affected by sand movement

RA/TAC:
- Recommendation #28 of Interim Flow Monitoring and Evaluation Recommendations Report

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River Channel Response – Reach 1 Sand

Hypothesis: A sufficient supply of sand is available for entrainment in Reach 1 to maintain relative sediment transport equilibrium in Reach 2 for several years, but this supply will diminish over time, resulting in a degradational trend in Reach 2

What:

- Identify and map, through aerial photo review, model output review, and field inspections, sand sources in the channel, banks, overbank, and due to mining and tributaries throughout Reach 1

Why:

- Provide basis for longer term sand monitoring program to assess long range supply to lower reaches
- Provide data to help in creation of system-wide non-damaging capacity assessment
- Reach 2 stable channel design

RA/TAC:

- Fall 2009 Interim Flow Recommendation
  - Assess sand transport thresholds in Reach 1

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River Channel Response – Spawning Riffles

Hypothesis: Incipient motion conditions occur at flows less than 3,500cfs at several riffle clusters in Reach 1A

What:

- Establish 3 monitoring sections at 5 identified riffle clusters in the reach. Survey section and conduct pebble counts. Paint and log rocks in-situ and recover after event.

Why:

- Test gravel mobility threshold assumptions

RA/TAC:

- Recommendation #26 of Interim Flow Monitoring and Evaluation Recommendations Report

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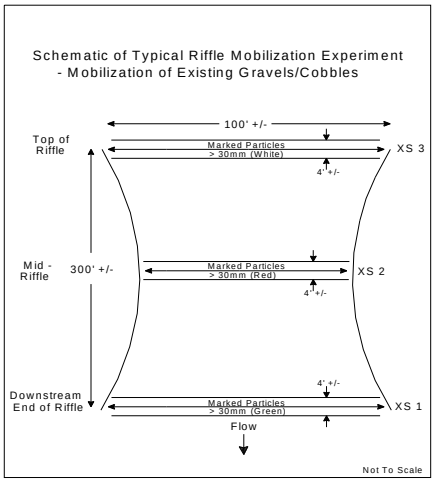
River Channel Response – Spawning Riffles

Hypothesis: Incipient motion conditions occur at flows less than 3,500cfs at several riffle clusters in Reach 1A



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Physical Monitoring

- Questions?

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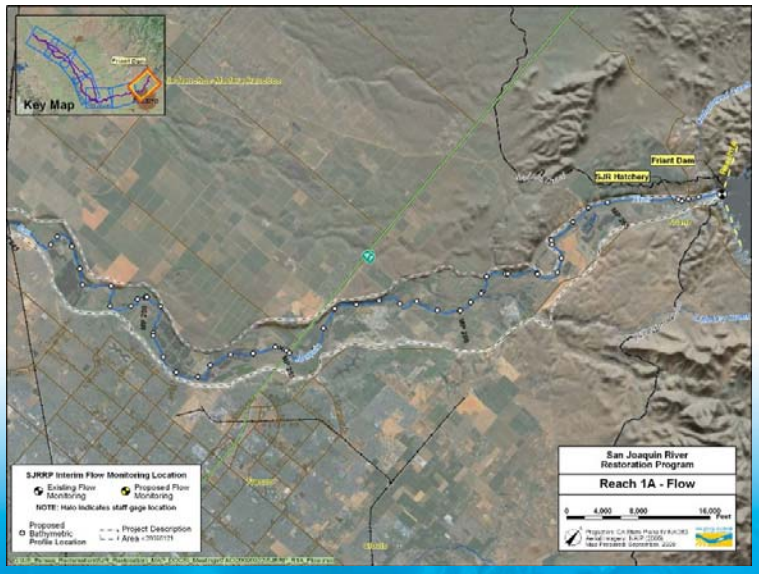
Physical Monitoring Locations – Reach 1



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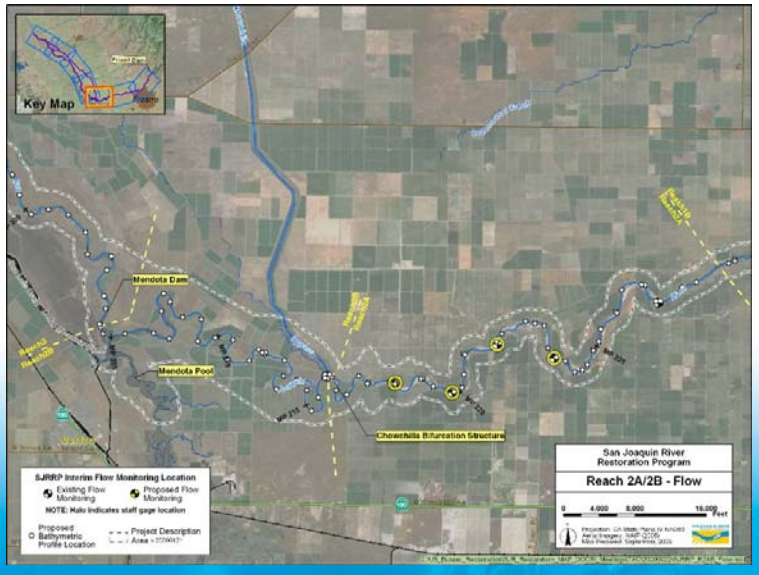
Physical Monitoring Locations – Reach 2



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Monitoring – Biological Parameters

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Monitoring – Biological Parameters

- Temperature
- Habitat
- Hills Ferry Barrier
- Passage

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Temperature

- Are instream temperatures adequate to support all life-history needs for spring and fall-run Chinook salmon through the entire restoration area?
- Are instream temperatures favorably affected by vegetation, subsurface flows, etc.?
- Are instream temperatures adversely affected by tributary and return flows, mining pits, etc.?

Objectives:

Measure instream temperatures as they relate to flow and other environmental conditions (including off-stream mining pit influence)

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Temperature

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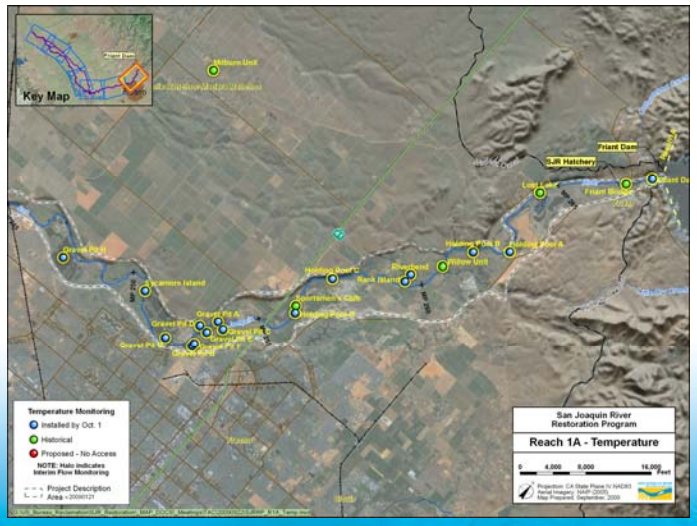
Temperature



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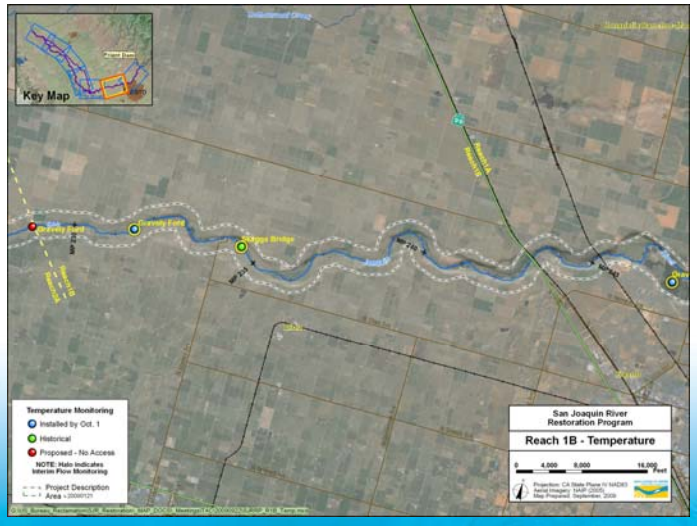

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SAN JOAQUIN RIVER
Key Map
Chowchilla
Mendota Pool
Mendota Dam
Mendota Pool
Chowchilla Bifurcation Structure
Temperature Monitoring
Installed by Oct. 1
Historical
Proposed - No Access
NOTE: Halo indicates Interim Flow Monitoring
Project Description
San Joaquin River Restoration Program
Reach 2A/2B - Temperature
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SAN JOAQUIN RIVER
Key Map
Chowchilla 2
Chowchilla
Berenda Slough
Mendota Dam
Lone Willow Slough
Sack Dam
Temperature Monitoring
Installed by Oct. 1
Historical
Proposed - No Access
NOTE: Halo indicates Interim Flow Monitoring
Project Description
San Joaquin River Restoration Program
Reach 3 - Temperature
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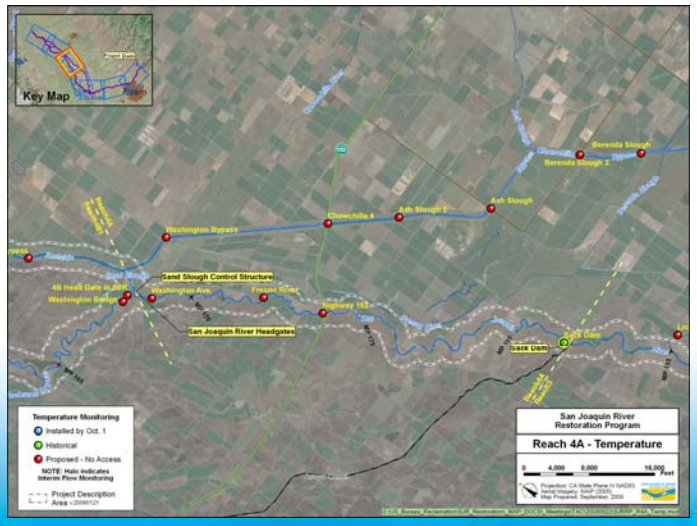
Key Map
Fresno
Berenda Slough
Berenda Slough 2
Ash Slough
Ash Slough 2
Chowchilla 4
Washington Bypass
Sand Slough Control Structure
Fresno River
Highway 152
San Joaquin River Headgates
Sack Dam
Temperature Monitoring
Installed by Oct. 1
Historical
Proposed - No Access
NOTE: Halo indicates Interim Flow Monitoring
Project Description
San Joaquin River Restoration Program
Reach 4A - Temperature

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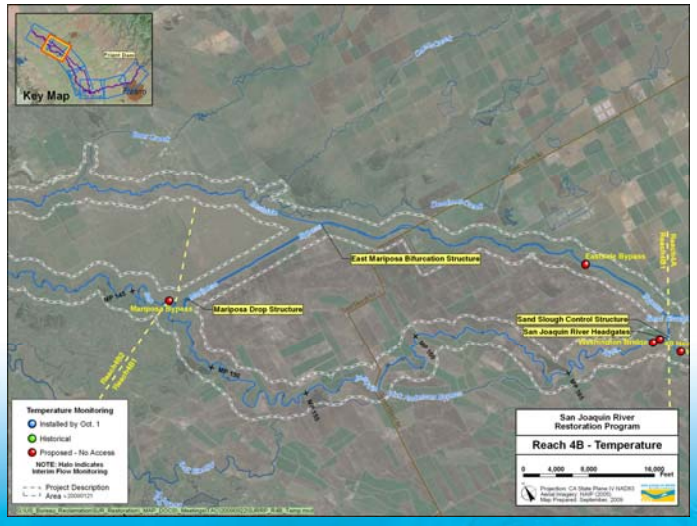
Key Map
Fresno
East Mariposa Bifurcation Structure
Mariposa Bypass
Mariposa Drop Structure
Sand Slough Control Structure
San Joaquin River Headgates
Temperature Monitoring
Installed by Oct. 1
Historical
Proposed - No Access
NOTE: Halo indicates Interim Flow Monitoring
Project Description
San Joaquin River Restoration Program
Reach 4B - Temperature

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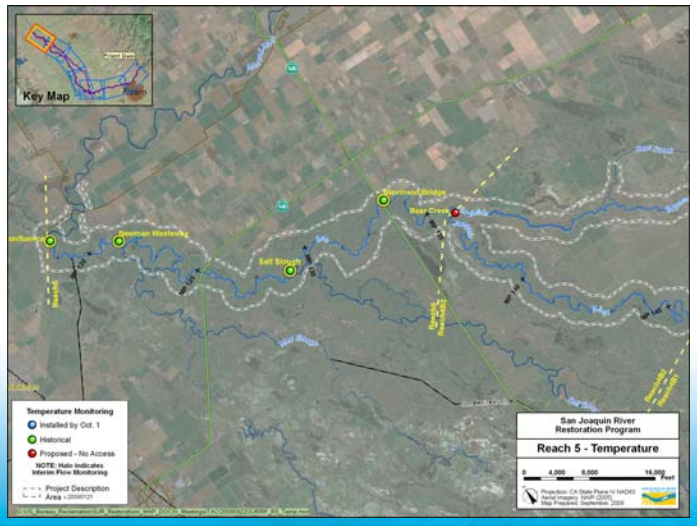

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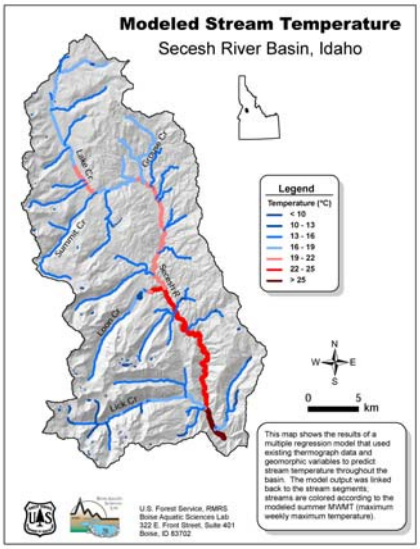
Temperature



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Temperature

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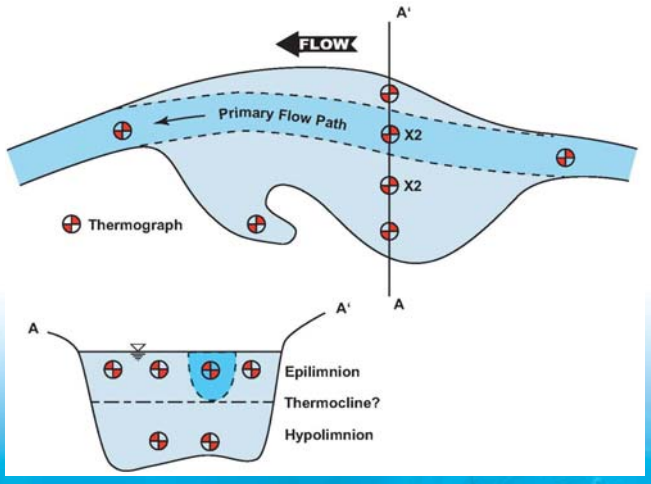
Temperature – Gravel Pits



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Habitat

- Can instream habitat can be modified and managed to support all life history requirements for Chinook salmon and other fish?

Objectives:

Inventory existing habitat, develop an understanding of how instream habitat responds to flows, document habitat changes through time and inform and measure success of habitat restoration actions

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Habitat

Macrohabitat – Measure spatial extent and distribution of habitat classification units

Microhabitat – Detailed measurements of physical characteristics for subsample units with monumented reference sites that will document responses to flow and specific changes through time

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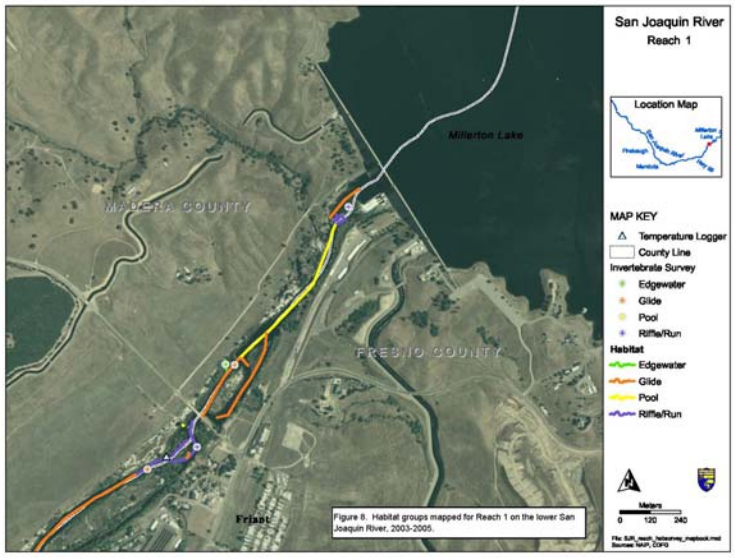
Habitat



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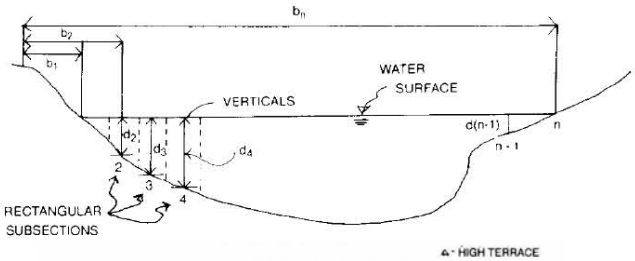
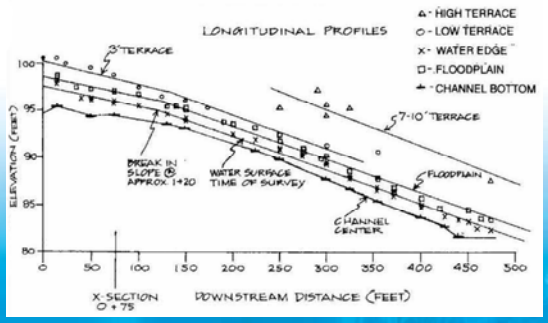
Habitat





Source: USDA, Stream Channel Reference Sites, 1994

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Habitat

- Discharge
- Substrate composition (embeddedness, silt/clay, sand, gravel, cobble, boulder, bedrock)
- Width/depth ratio
- Sinuosity
- Slope/gradient
- Canopy, bank composition and vegetation, shelter rating
- Air and water temperature
- pH, turbidity, conductivity, dissolved oxygen, salinity

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Hills Ferry Barrier

- How well does Hills Ferry protect Chinook salmon and steelhead from migration upstream of the Merced River confluence?
- What is the nature of fish that arrive at the barrier?

Objectives:

Evaluate effectiveness in preventing upstream passage of fish, provide opportunities for documenting fish arrival at the confluence and fish trapping for experimental purposes

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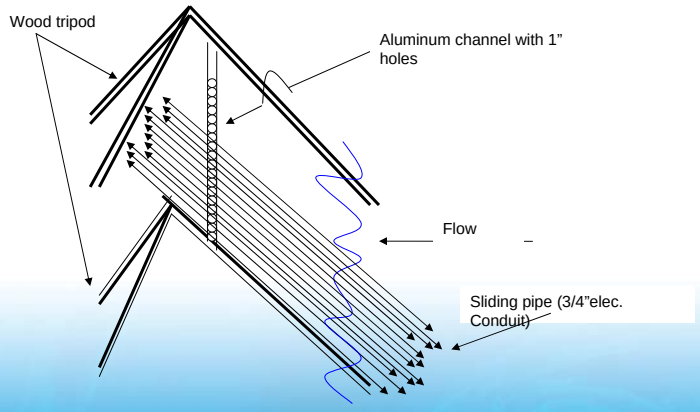
Hills Ferry Barrier



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Hills Ferry Barrier

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Hills Ferry Barrier

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Hills Ferry Barrier

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Hills Ferry Barrier

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Hills Ferry Barrier

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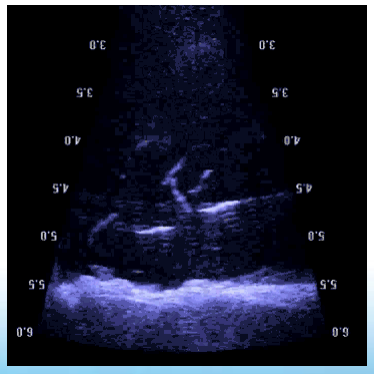
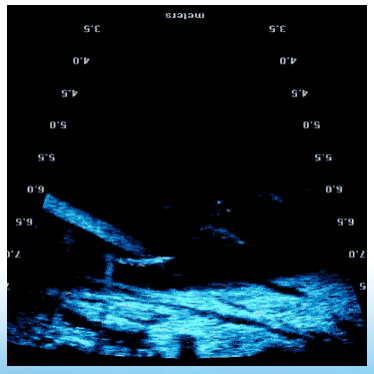
Hills Ferry Barrier





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Fish Passage

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Fish Passage

- Is fish passage adequate at all structures and are channel depths suitable for movement through the system?

Objectives:

To evaluate all structures within the project area that may inhibit fish passage including assuring active channel depths are sufficient for fish movement through the system and potential sources of entrainment and false migration

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Fish Passage

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Fish Passage

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Fish Passage

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Fish Passage

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Other Proposals

- Invertebrate Assessment
- Water Quality
- Fish Community Evaluation
- Reintroduction Strategies
- Recreation Impacts and Opportunities

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Monitoring and Management

… Incorporation of Results

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Sections for Incorporating Results

- Modeling Data
- Synthesis
- Conclusions and Recommendations
- Appendices…

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Appendices

- Monitoring
  - Surface water
  - Groundwater
  - Water Quality
  - Fisheries
  - Sediment
  - Vegetation
- Modeling…

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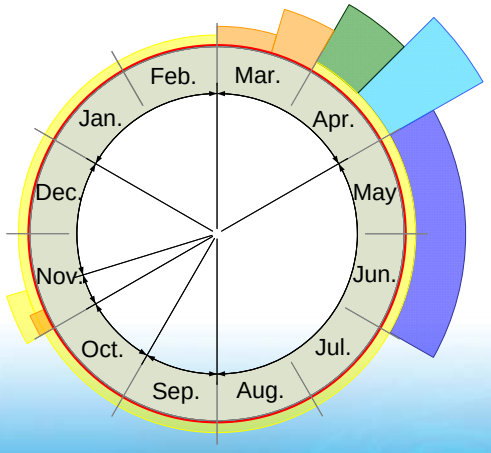
Proposed Reporting Timeline and Coordination



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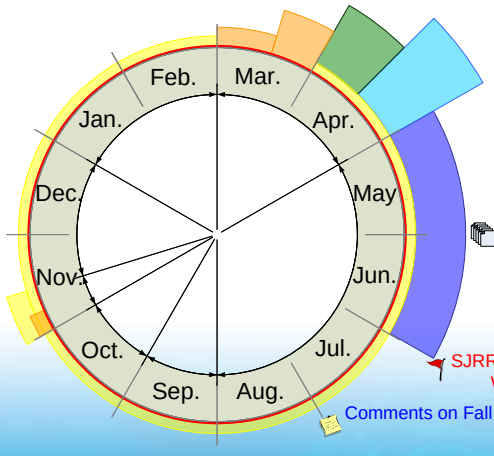
Proposed Reporting Timeline and Coordination



RA Fall and Winter Recommendation

SJRRP Draft Fall and Winter Plan

Comments on Fall and Winter Plan

SJRRP Final Fall and Winter Plan

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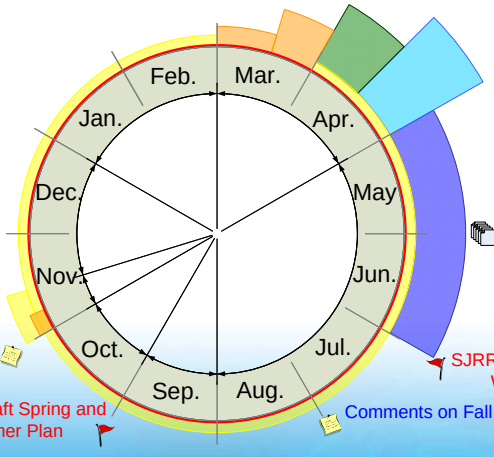
Proposed Reporting Timeline and Coordination



SJRRP Final Spring and Summer Plan

RA Fall and Winter Recommendation

Spring and Summer Plan Comments

SJRRP Draft Fall and Winter Plan

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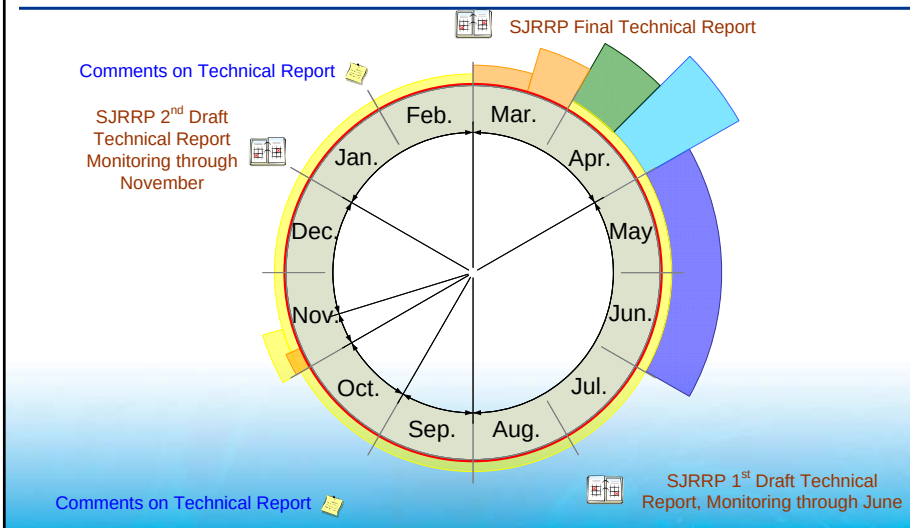
Proposed Reporting Timeline and Coordination



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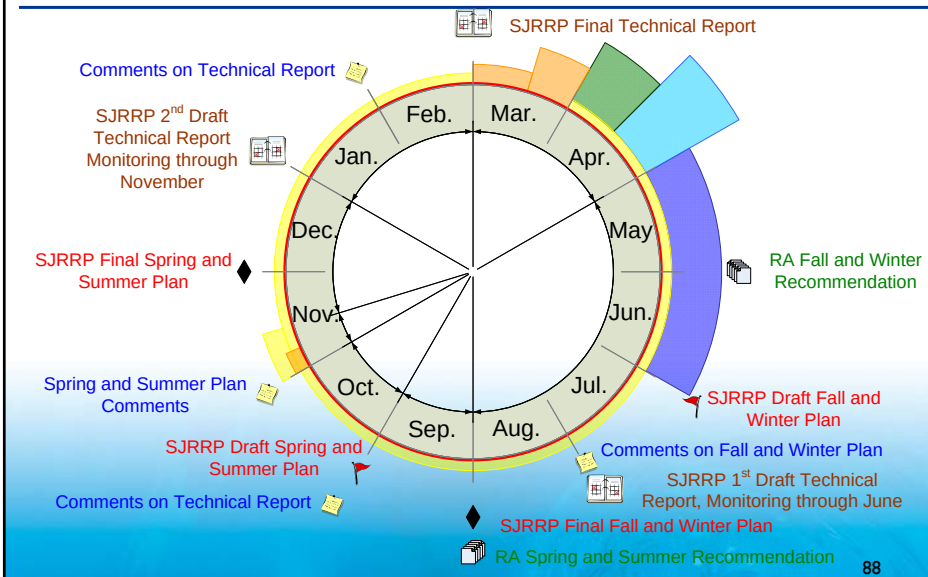
Proposed Reporting Timeline and Coordination



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Program Update and Next Meeting

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Program Update

- Reach 4B, Eastside Bypass and Mariposa Bypass Low-flow Channel and Structural Improvements
  - NOI / NOP published on Sept 9, 2009
  - Scoping Meetings
    - Wednesday, Sept 23 in Los Banos
    - Thursday, Sept 24 in Merced
  - Comments due Friday, Oct 9

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Program Update

- Interim Flows
  - Final EA/IS scheduled for release this week
  - On target for October 1 flow releases

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Next Meeting

- Late October/November
- Potential Future Meeting Topics
  - Modeling and Analysis Tools?
  - Process for implementing the site-specific projects?

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