San Joaquin River Restoration Program

Restoration Goals TFG Meeting

Reach 2B Update

April 28, 2010

Agenda

1. Introductions
2. Program Restoration Goal Context
3. Program Update
   a) Interim Flows
   b) EIS/EIR
4. Mendota Pool Bypass/Reach 2B Project
   a) Existing Conditions Review
   b) Schedule & Upcoming Milestones
   c) Initial Options
      i. Objective and Focus Explanation
      ii. Floodplain Options
      iii. Pool Bypass Options
      iv. Pool Bifurcation Structure Options
   d) Analytical Tools for Alts. Evaluation
      i. Objective and Focus Explanation
      ii. Fisheries
      iii. Geomorphology
      iv. Groundwater

Program Restoration Goal Context

- Settlement Restoration Goal
  - Restore and maintain fish populations in good condition in the main stem 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
  - Foundation of all of the site-specific projects
  - Focus is currently on spring-run and fall-run Chinook salmon and Central Valley steelhead
    - Likely surrogates for other native species
  - Each site-specific project contributes to meeting the fundamental life-history needs of these species

Program Update

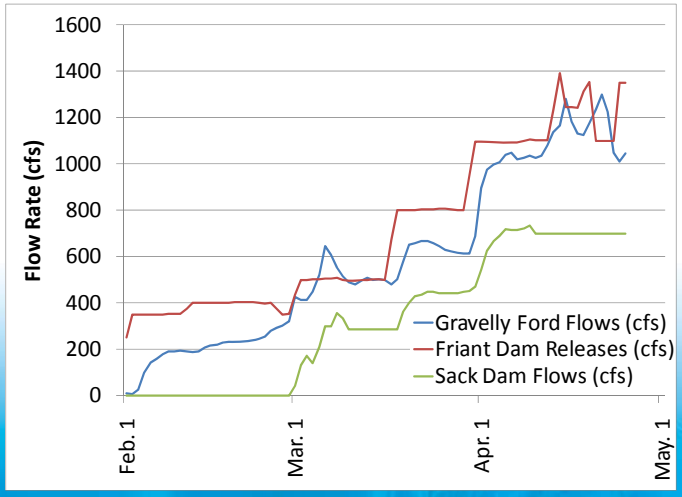
Program EIS/R

- Draft PEIS/R under preparation
  - Public Release targeted for June 2010
  - 60-day comment period
  - Public hearings (dates/locations to be determined)
  - Final PEIS/R
    - Late 2010
  - Record of Decision
    - Early 2011

Check the website at www.restoresjr.net for updates.

Program Update

Interim Flows



Reach 2B Update

Mendota Pool Bypass & Reach 2B Improvements

a) Existing Conditions Review
b) Schedule & Upcoming Milestones
c) Initial Options
   i. Objective and Focus Explanation
   ii. Floodplain Options
   iii. Pool Bypass Options
   iv. Pool Bifurcation Structure Options
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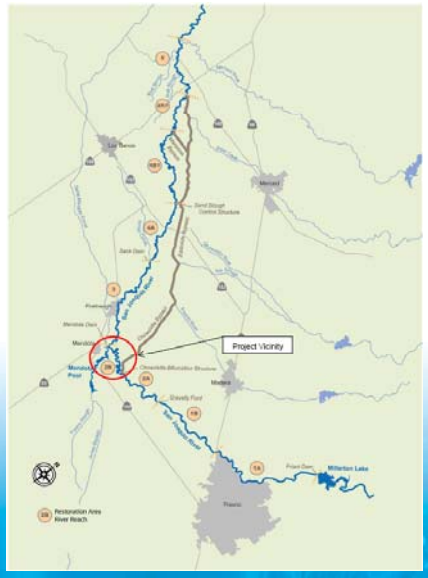
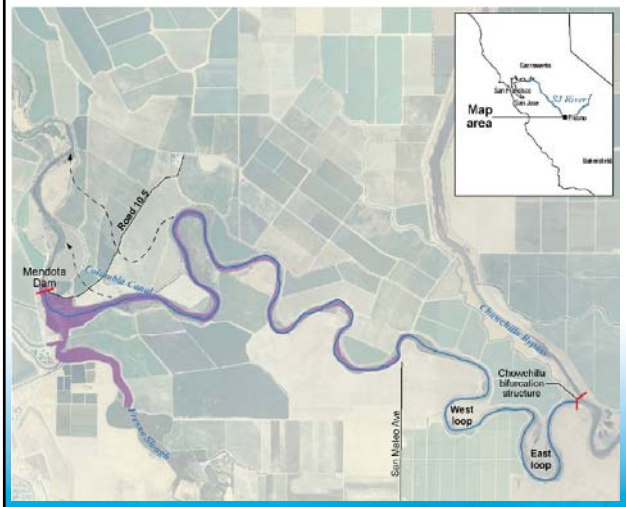
Existing Conditions Review

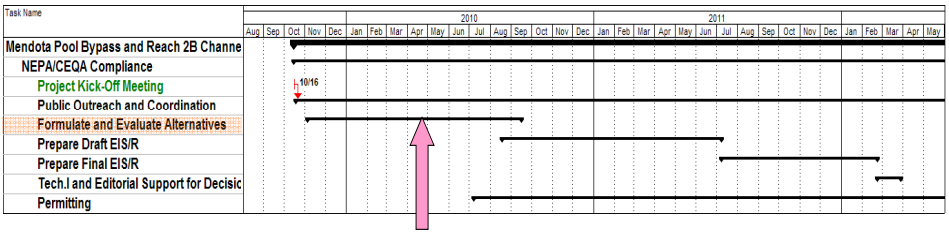


Existing Conditions Review



1. Project Extents (Phase 1)
   - Upstream Chowchilla Bifurcation Structure
   - D'stream Bypass Connection
2. Ex. Structures
   - Chowchilla Bifurcation
   - San Mateo Crossing
   - Mendota Dam
   - Water Supply Infrastructure
3. Ex. Conditions
   - Limited capacity (1,300 cfs – 2,500 cfs)
   - Primarily dry upstream
   - Pool backup to San Mateo Ave.
   - Shallow Groundwater
4. Settlement Req.
   - Channel/Floodplain capacity up to 4,500 cfs
   - Pool Bypass
   - Floodplain & related riparian habitat

Schedule & Upcoming Milestones



- Initial Options TM complete
- Data Needs TM complete
- Field Surveys to start in May
- Refinement to Initial Alternatives ongoing
- Evaluation of Initial Alternatives – projected for summer 2010
- Alternatives Evaluation TM – projected for fall 2010

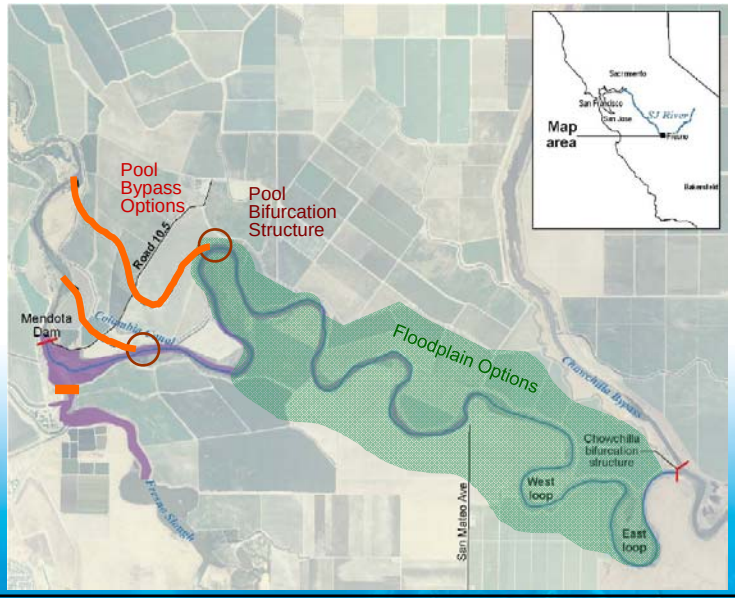
Reach 2B Public Documents can be downloaded here:
http://www.restoresjr.net/activities/site_specific/MPB/index.html

Initial Options

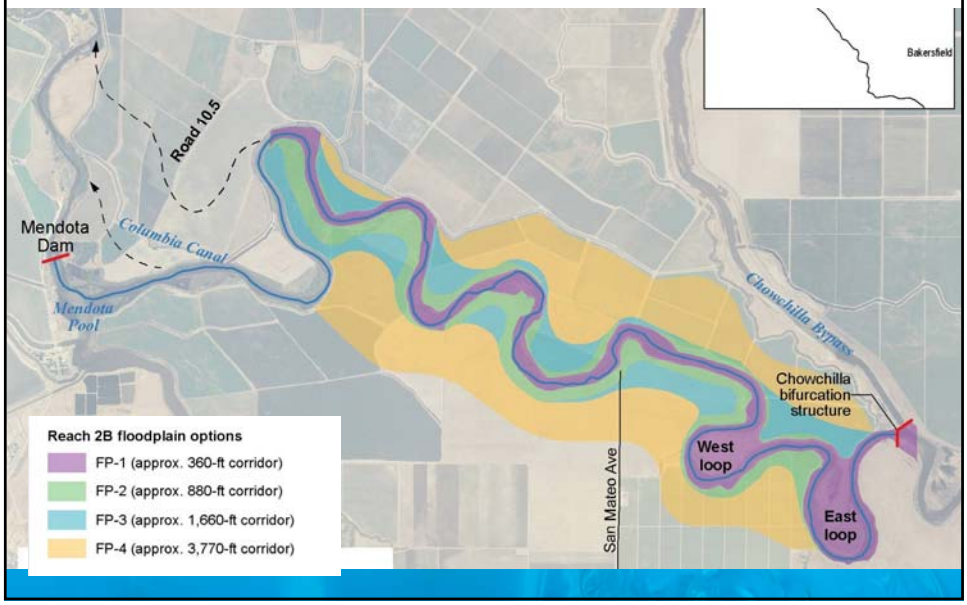
Initial Options

» Objective & Focus
» Floodplain Options
» Mendota Pool Bypass Options
» Pool Bifurcation Structure Challenges

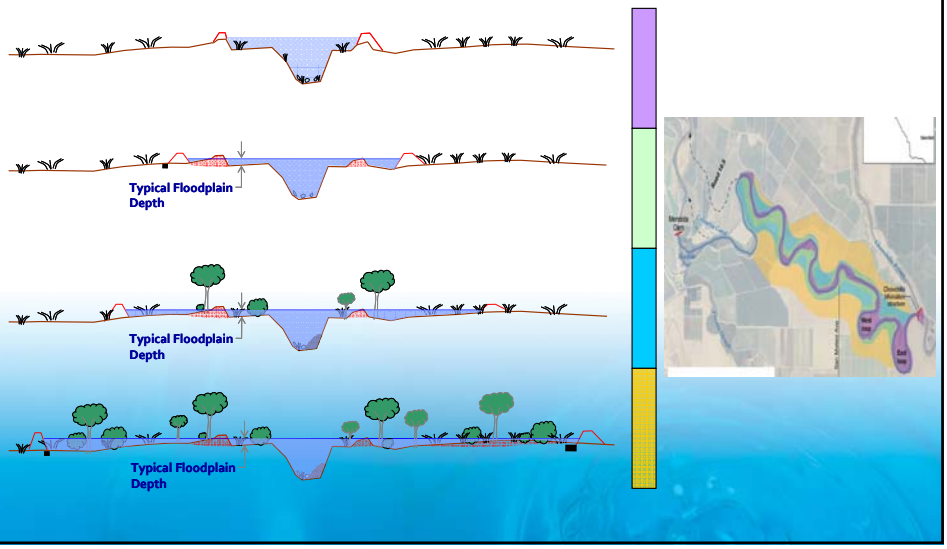
Initial Options - Focus



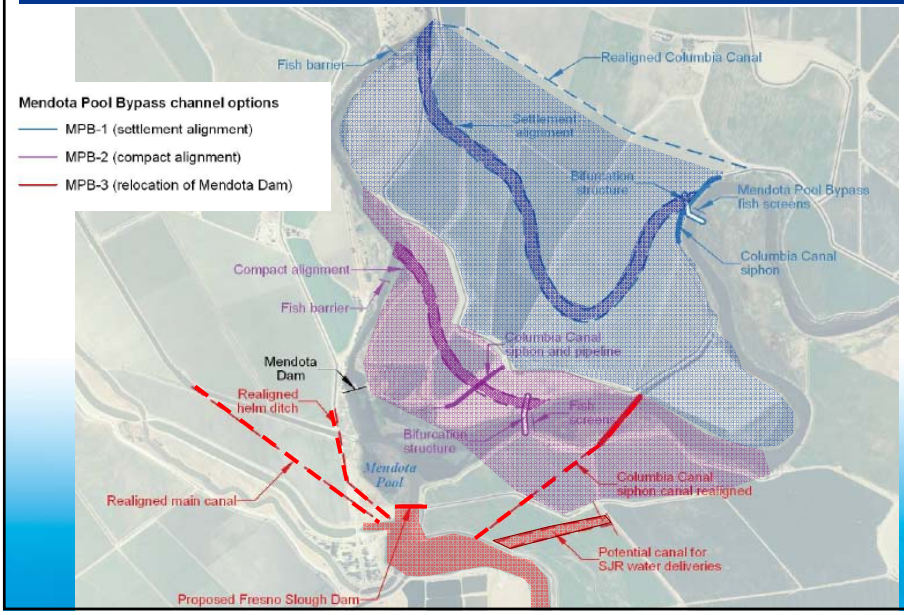
Initial Options - Floodplain



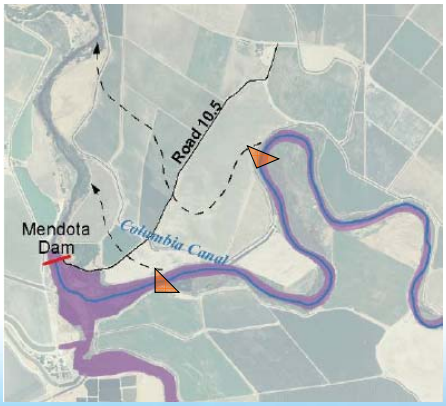
Initial Options - Floodplain



Initial Options – Pool Bypass



Initial Options – Pool Bifurcation Structure



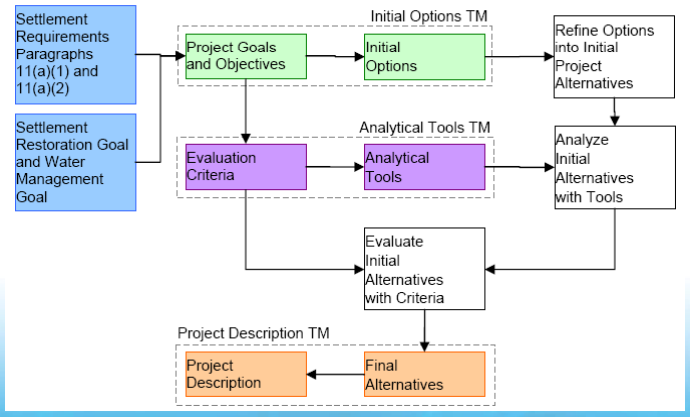
- Objectives:
  - Convey 4,500 cfs to Bypass
  - Ability to divert 2,500 cfs to Pool
  - Direct fish to Bypass
  - Minimize fish entrainment (screening)
- Challenges
  - Flow split evaluation
  - Screen design flow (% of capacity)
  - Screen overtopping issues
  - % Survival through Pool

Analytical Tools for Alts. Evaluation

Analytical Tools for Alts. Evaluation

- » Objective & Focus
- » Fish Passage and Habitat
- » Geomorphology
- » Groundwater

Analytical Tools for Alts. Evaluation – Process



Analytical Tools for Alts. Evaluation - Objective

- Analytical tools needed to
  - evaluate the initial alternatives
  - formulate a final set of alternatives, and
  - evaluate those alternatives in the EIS/R
- Tools should assess:
  - relative ability of the alternatives to meet the Project's purpose and need, goals and objectives;
  - the physical, economic, and environmental effects of the alternatives; and
  - the fisheries impacts and benefits of each alternative

Analytical Tools for Alts. Evaluation

Fish Passage and Habitat

» Approach

» Evaluation Criteria

» Tools to Quantify Criteria

Fish Passage and Habitat

Approach

- Objectives:
  - Address migration and habitat use goals of the Reach 2B Project
  - Compare passage and habitat conditions between initial alternatives using specific criteria
- Evaluate initial alternatives based upon:
  - Fish passage conditions
    - Within San Joaquin River channel
    - At artificial structures
      - Mendota Pool Bypass drop structures
      - San Mateo Ave crossing
      - Chowchilla and Mendota Pool bifurcation structures
  - Rearing habitat conditions for spring- and fall-Chinook, CV steelhead and other native fishes
    - In-channel rearing habitat
    - Floodplain rearing habitat

Fish Passage and Habitat

Passage Evaluation Criteria

- In San Joaquin River channel
  - Passage velocity: percent of range of flows meeting passage criteria
  - Passage depth: length and width of channel meeting depth passage criteria
  - Temperature: # of days of suitable water temperature
- At artificial structures
  - Minimum fish passage requirements (NMFS 2008)
  - Evaluate structure ability to meet jump, velocity, depth, and entrance and exit conditions
  - Total number of structures fish must pass

Fish Passage and Habitat

Passage Criteria Thresholds

Spring-run Chinook Salmon

Life Stage	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Adult Migration						D: 0.8 ft (min) V: 8 f/s (max) T: 64 ˚F (max)						
Juvenile out migration				D: 0.7-3.6 ft (range) V: 0.3-2.0 f/s (range) T: 64 ˚F (max)								

Fall-run Chinook Salmon

Life Stage	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Adult Migration	D: 0.8 ft (min) V: 8 f/s (max) T: 64 ˚F (max)											
Juvenile out-migration				D: 0.7-3.6 ft (range) V: 0.3-2.0 f/s (range) T: 64 ˚F (max)								

Fish Passage and Habitat

Rearing Habitat Evaluation Criteria

- In-channel rearing
  - Channel dimension: width and depth
  - Habitat features: pools and bars
  - Length of bordering riparian vegetation
- Floodplain rearing
  - Depth: area within specified range
  - Floodplain area: width per channel length
  - Inundation duration and periodicity (# floods/yr)
  - Potential for floodplain features: ponds, secondary channels, vegetation types

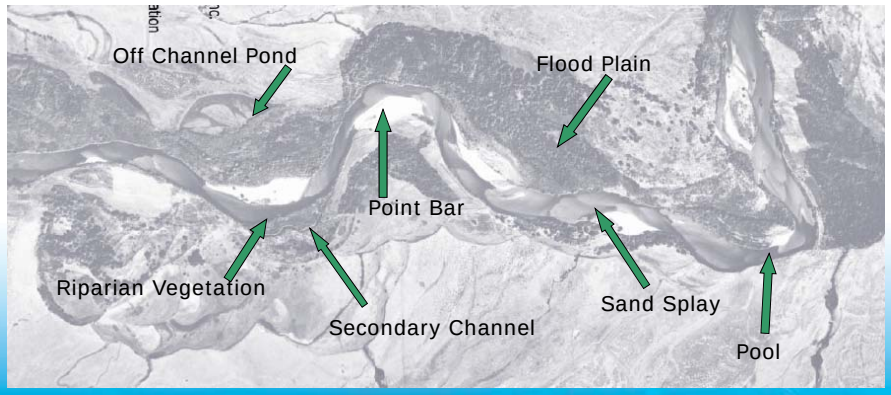
Fish Passage and Habitat

Rearing Habitat Evaluation

- In-channel rearing
  - Physical habitat criteria from literature (depth, velocity, temperature)
  - Qualitative evaluation of channel condition using literature description/values compared to expected habitat conditions
- Floodplain rearing
  - Physical habitat criteria from literature (depth, velocity, temperature)
  - Area of frequently activated floodplain
    - Smallest flood pulse that initiates beneficial ecological processes (Williams et al. 2009)
    - River stage that occurs 2/3 years, 7 day duration, mid-March to mid-May
  - Qualitative evaluation based upon
    - Area of potentially beneficial floodplain features
    - Area of inundated riparian vegetation and vegetation types

Fish Passage and Habitat

Example aquatic habitat features from 1937 aerial photograph, downstream end of Reach 2A



Fish Passage and Habitat

Analytical Tools for Criteria Quantification

- Tool Descriptions:
  - HEC-RAS with daily flow data
  - SRH1-DV: vegetation model
  - HEC-5Q: Temperature model
  - Geomorphic analyses

Fish Passage and Habitat

Analytical Tools for Criteria Quantification

- Fish passage:
  - In-channel
    - HEC-RAS
      - Flow depth and velocity at cross-sections
      - Length of channel meeting depth and velocity criteria
    - HEC-5Q: water temperature during migration
  - Structures
    - HEC-RAS
      - Flow depth and velocity at structure
    - NMFS (2008) criteria
    - Ground surveys and literature review: # of structures along migration route

Fish Passage and Habitat

Analytical Tools for Criteria Quantification

- Rearing habitat:
  - In-channel
    - HEC-RAS: channel width and depth
    - SRH-1DV: length of vegetated bank
    - Geomorphic analyses: potential habitat
  - Floodplain
    - HEC-RAS and daily flow data: acreage by depth, inundation duration and periodicity
    - SRH-1DV: acreage of vegetation types
    - LiDAR & Geomorph analyses: area of floodplain features

Fish Passage and Habitat

Summary

Criteria	Metric	Tools
Passage conditions in the channel	Length of proposed channel	HEC-RAS
Water temperature during migration	Days meeting criteria during migration periods	HEC-5Q
Passage conditions at structures	Jump height, velocity, depth of flow	Fish passage criteria
Number of artificial structures in migratory path	Number of structures in migratory path	
In-channel habitat including riparian habitat	Pool: bars, average width and depth of active channel, average depth of flow, length of banks with woody riparian vegetation	HEC-RAS, geomorphic analyses, SRH-1DV
Floodplain inundation depth, area, duration and periodicity	Floodplain acreage by depth range	HEC-RAS, daily flow data, frequency duration curves
	Floodplain inundation duration	
	Floodplain inundation periodicity (average number of events per year, period between events)	
Floodplain habitat based on floodplain features	Acreage of different features	SRH-1DV, geomorphic analyses
	Acreage of riparian types	SRH-1DV

Analytical Tools for Alts. Evaluation

Geomorphology

» Approach

» Evaluation Criteria

» Tools to Quantify Criteria

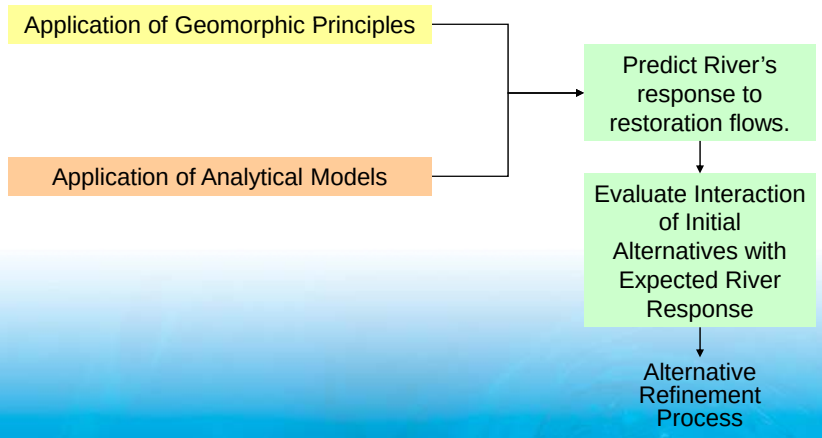
Geomorphology

General Approach

- What is the Expected Response of the River to Restoration Flows?
- How do the Initial Alternatives Interact with Expected River's Response?
- Refine the initial alternatives such that long-term channel stability is encouraged and the required habitat features are supported

Geomorphology

General Approach



Geomorphology

Approach

- Apply Geomorphic Principles
  - Analog
    - Historical aerials
    - River's response to Interim flows
  - Empirical
    - Geomorphically significant flows and the most effective discharge
    - Active channel width, equilibrium slope and depth
    - Planform geometry
    - Bed forms
- Predict the Expected Future Stable Channel Configuration
  - Including range of variance

Geomorphology

Approach

- Perform Analytical Assessment
  - Evaluate sediment continuity:
    - Predict river's response to sediment load from Reach 2A
  - Evaluate meander development and lateral migration tendencies
  - Evaluate meander cutoff potential
  - Evaluate erosion potential of outer banks at meander bend
- Evaluate Long-Term Stability
  - Incorporates vegetation growth

Geomorphology

Approach

- Predict River's response to Restoration Flows
  - Combine results from geomorphic and analytical assessment
- Overlay initial alternatives
  - With proposed structures
- Evaluate how the initial alternatives interact with the expected River's response
  - Allow or inhibit geomorphic process
  - Allow or inhibit fish habitat features

Geomorphology

Evaluation Criteria

- Potential to reach a stable channel configuration in dynamic equilibrium
- Potential to accommodate meander migration
- Potential for pool/bar formation
- Potential to develop floodplain topographic features

Geomorphology

Analytical Tools for Criteria Quantification

- Geomorphic Tools
  - Effective discharge
  - Analog data
  - Empirical relationships
- Analytical Tools
  - HEC-RAS
  - SRH-1D
  - SRH-1DV
  - Bank stability equations

Geomorphology

Summary

Criteria	Metric	Tools
Potential to reach a stable channel configuration in dynamic equilibrium	Qualitative scale from 1 to 10	▪ Flow duration curve ▪ HEC-RAS ▪ SRH-1D ▪ Geomorphic principals ▪ Bank stability indices
Potential to accommodate meander migration	Qualitative scale from 1 to 10	▪ Flow duration curve ▪ HEC-RAS ▪ SRH-1D ▪ Geomorphic principals ▪ Bank stability indices
Potential for pool/bar formation	Qualitative scale from 1 to 10	▪ Flow duration curve ▪ HEC-RAS ▪ SRH-1D ▪ Geomorphic principals ▪ Bank stability indices
Potential to develop floodplain features	Qualitative scale from 1 to 10	▪ Geomorphic principals ▪ HEC-RAS

Analytical Tools for Alts. Evaluation

Groundwater

» Approach

» Evaluation Criteria

» Tools to Quantify Criteria

Groundwater

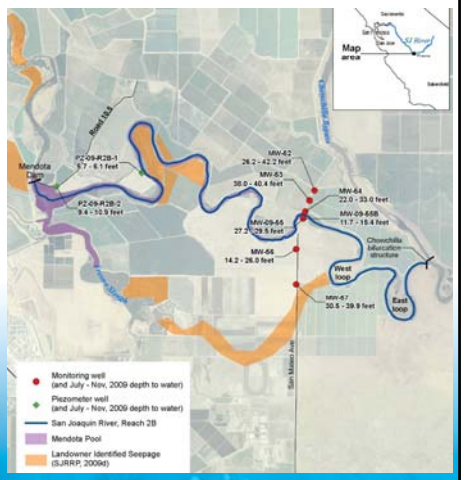
Approach & Evaluation Criteria

- Approach (Draft Seepage Management Plan 12/09)
  - Issues
    - Water logging of crops
      - Draft thresholds in Seepage Mgmt Plan (depth to water that would impact crops)
      - Reach 2B is losing reach
      - Mendota Pool portion may have less seepage if pool is drained
    - Root Zone Salinity (thresholds established, but doesn't require modeling)
    - Levee Instability (design criteria)
  - Mitigation: measures are identified in SMP for post-construction problems
- Evaluation Criteria - Impacts
  - Acres of waterlogging (indicator of root zone salinity)

Groundwater

Analytical Tools

- Data/Tools to Support Alts Evaluation
  - Preliminary USGS CVHM output (MODFLOW)
  - HEC-RAS input/output
  - Topography (LiDAR/Bathymetry)
  - GW level data (monitoring wells)
  - Well drilling lithologic and construction logs (USGS)
  - Land Use



Groundwater

Summary

Criteria	Metric	Tools
Acres of Waterlogging	acres	▪ Preliminary USGS CVHM output (MODFLOW) ▪ HEC-RAS input/output

Wrap Up & Questions