California Water Projects

- Central Valley Project
- State Water Project
- Local Water Projects
Trinity River Division

- Trinity Reservoir 2.4 MAF
- Avg Annual Inflow 1.3 MAF
- Trinity Powerplant 140 MW
- Carr Powerplant 184 MW
Trinity Authorized Purposes

- Power Generation
- Fish and Wildlife
- River Regulation
- Recreation
- Water Supply

DRAFT, Subject to Revision
Trinity Reservoir Functions

• Integrated with CVP Operation
• Normal operations provide flood control benefits
• Fish and Wildlife Requirements – Trinity River Main-stem Fishery Restoration Record of Decision (2000)
• Temperature Objectives – SWRCB WR 90-5
• Trans-basin Diversion – hydropower generation and water temperature management
Whiskeytown

- Whiskeytown Lake 240 TAF
- Spring Creek PP 200 MW
Whiskeytown ~ Operation Constraints

- Clear Creek Flows and Temperatures
- Sacramento River Operations

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Shasta Division

- Shasta Reservoir 4.5 MAF
- Avg Annual Inflow 5.4 MAF
- Shasta Powerplant 715 MW
Sacramento River ~ Operation Constraints

- Sacramento River Water Temperatures
- Coordinated Flood Operations

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American River Division

- Folsom Reservoir 1.0 MAF
- Avg Annual Inflow 2.6 MAF
- Folsom Powerplant 215 MW
American River ~ Operation Constraints

- Water Temperatures and Flows
- Flood Control

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East Side Division

- New Melones Reservoir 2.4 MAF
- Avg Annual Inflow 1 MAF
- New Melones PP 380 MW
East Side ~ Operation Constraints

- Vernalis Water Quality
- In-stream Fishery Flows
- Flood Control

DRAFT, Subject to Revision
The Sacramento-San Joaquin Delta

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Delta Division

- Jones Pumping Plant 4,600 cfs
- Delta Mendota Canal 4,600 cfs
- Intertie (DCI) 450 cfs
- Delta Cross Channel Gates
Delta ~ Operation Constraints

- Water Rights Decision 1641
- Biological Opinions
- Coordination with State Water Project

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San Luis Unit

- San Luis Reservoir 966 TAF (Federal Share)
- Giannelli Powerplant 424 MW
- Dos Amigos Pumping Plant 13,000 cfs
- O’Neill Pumping Plant 4,200 cfs
- Pacheco Pumping Plant 500
San Luis ~ Operation Constraints

- San Luis Low Point
- Two Foot Drawdown Per Day

DRAFT, Subject to Revision
Tracy Pumping Plant

Delta-Mendota Canal

B.F. Sisk (San Luis)

Delta-Mendota Canal

San Luis Canal

CVP: Western San Joaquin

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Friant Division

- Friant Reservoir 520 TAF
- Avg Annual Inflow 1.7 MAF
- Friant – Kern Canal
- Madera Canal
State Water Project

- Oroville 3.5 MAF
- Hyatt Powerplant  644 MW
- Banks Pumping Plant 11,000 cfs
- San Luis Reservoir  1062 TAF (State share)
- CA Aqueduct
Authorized Project Purposes

• Flood Control
• River Regulation
• Fish and Wildlife Needs
• Municipal & Agricultural Water Supplies
• Power Generation
• Recreation
Coordinating the Operations

- U. S. Fish and Wildlife Service
- National Marine Fisheries Service
- Western Area Power Administration
- U. S. Army Corps of Engineers
- State Water Resources Control Board
- State Department of Water Resources
- State Department of Fish and Wildlife
- Local Stakeholders
System Constraints

• Maximize contractual water supply deliveries given the constraints of the system:
  – Geographic
  – Hydrologic
  – Physical Capacity
  – Flood Control requirements
  – Environmental (i.e. water quality, outflow)
  – Contractual and Water Rights Requirements
  – Economic
  – Demand Patterns
Hydrologic Constraints

- Water supply greatest in the winter & spring.
- Demand peaks in the summer.
- Unfavorable hydrologic distribution pattern. (i.e. early snow melt, small snow pack)
- Multi-year Drought
Environmental

- Water Quality Standards
- Minimum River Flow Requirements
- Delta Outflow Requirements
- Water Temperature Management
Permits and Contractual Agreements

Key Operating Agreements and Standards

- Coordinated Operations Agreement
- Water Rights Decision 1641
- Biological Opinions
  - Winter-run & Spring-run Chinook Salmon
  - Central Valley steelhead
  - Delta Smelt
- San Joaquin River Agreement
- Central Valley Improvement Act
Geographic Constraints

Sacramento/San Joaquin Delta

Avg Annual Inflow in MAF (Billion Cu Meters)

- Sacramento: 21.2 (26.2)
- San Joaquin: 5.3
- Eastside Streams: 1.7
- Delta Precip: 1.4
- (1.1) 0.9

Sacramento/San Joaquin Delta (26.2)
What Constitutes Delta Control?

• The Delta controls when any change in the Delta requires a response from upstream reservoirs.
  – Typically under balanced conditions
  – Rarely, E/I conditions

• Delta does not typically control when:
  – Flood control operations are underway
  – During fishery related export reductions
  – When constraints on upstream reservoirs prevent adjustment of releases to achieve balanced conditions.
What Constrains Delta Operations?

- About 28 operational compliance points, with standards which vary by year type and date
  - Usually 1 to 5 dominate decisions at any given time
  - Flow, salinity (EC), CL-, Export/Inflow Ratio
- Largely a feedback driven system (gages) with poor predictability for EC (models project trends only)
- Fishery concerns
- South Delta water levels
- Upstream releases in dry years
Factors Affecting the Delta

- Tidal Cycles (Overwhelmingly a tidal environment)
- Atmospheric Pressure
- Wind Strength and Direction
- Antecedent Salinity Conditions (very strong persistence)
- Delta Inflow (Sac Valley accretion/depletion rates)
- Export Rates
- Delta Cross Channel Gate Position (water circulation patterns)
Key CVP-SWP Delta Compliance Management Tools

• Increase Delta Inflow (Response to seasonal or daily shifts in system depletions, EC, CL-, exports)
  • Shasta release 5 days away
  • Oroville release 3 days away
  • Folsom release 1 day away
  • After initial response, rebalance reservoirs

• Export Reductions (Response to Central/South Delta EC, CL-)
  • CVP export levels (single speed pumps, difficult to adjust)
  • SWP export levels (variable speed pumps, forebay)

• Delta Cross Channel Gates (water circulation effects)

• Combinations of all the above
• Delta operations and compliance with current standards are based upon an integrated system of upstream reservoirs and export facilities and continuous compliance monitoring.

• Delay in implementing a required reservoir release change or export reductions to meet Delta compliance usually results in a much larger and longer duration management action(s) being ultimately required.

• System-wide operations flexibility is a key management asset in the Delta environment.
Questions?