

Daily Hydrology and Fish Tracking Methods in the Central Valley and Bay-Delta

Recommendations for the SWRCB
Bay-Delta Workshop 3-Analytical Tools

Russ Brown, ICF International

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Daily flows and habitat conditions are needed to track daily effects on fish life-stages

- Water Accounting
- Runoff
- Storage
- Flood control
- Releases
- Temperatures
- Diversions
- Outflow
- Salinity
- Fish Tracking
- Spawning
- Egg incubation
- Rearing
- Movement
- Distribution
- Growth
- Predation
- Food

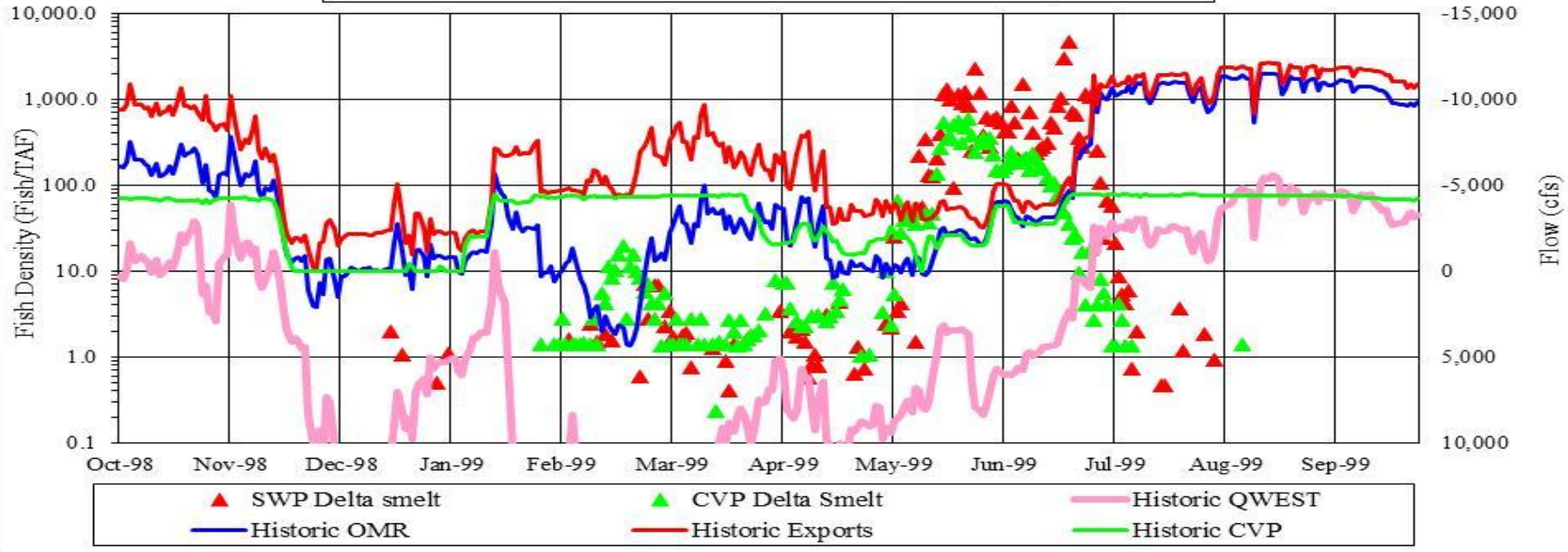
Basic relationships between flow and fish

- Delta outflow controls Delta salinity (EC)
- Entrainment = exports (taf) x fish density (fish/taf)
- Fish movement at Delta channel splits follows flow
- SJR flood flows lead to high splittail abundance
- River hydraulic habitat: flow = depth x width x velocity
- Delta outflow influences longfin smelt abundance
- Temperature warming = $f(-K/\text{flow})$
- Pulse flows trigger adult and juvenile fish movement
- Channel flows control eggs and larvae movement

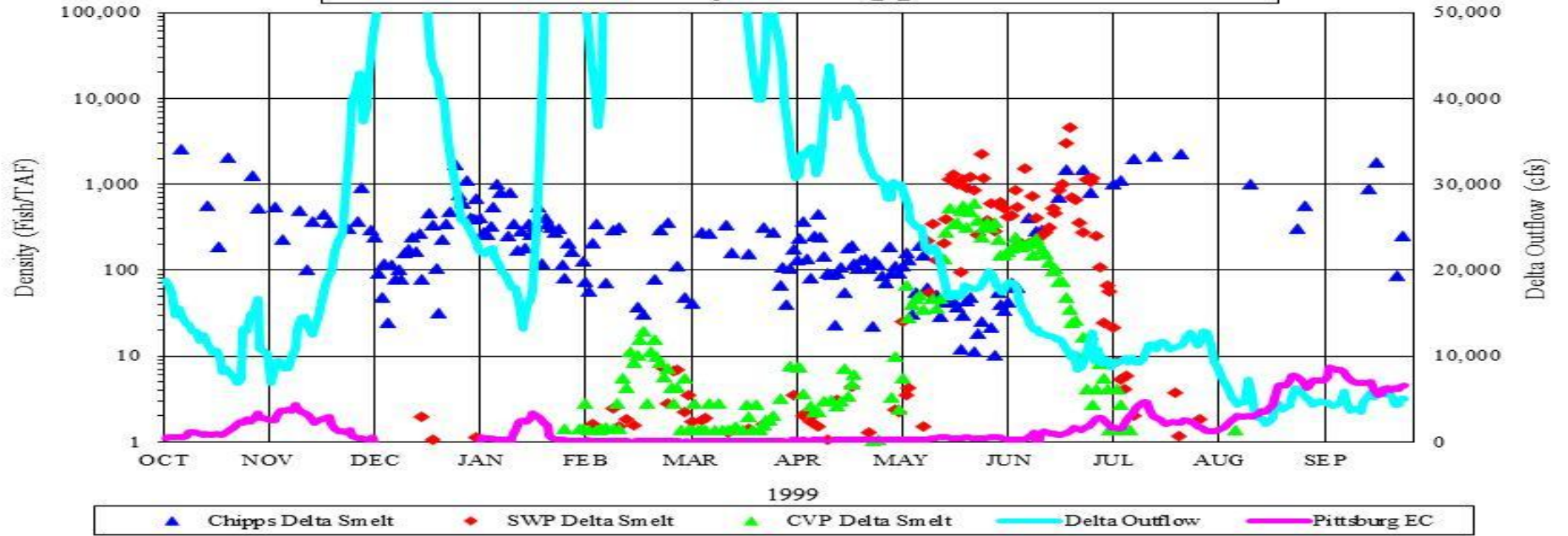
Examples of daily flow, water quality and fish evaluation methods (patterns)

- CVP and SWP Delta smelt salvage in WY 1999
- Delta daily inflows, outflow, salinity, exports and OMR adjustments in WY 2008
- Comparison of SJR Mossdale with CVP and SWP salvage in WY 2005 for Chinook and splittail
- Estimates of Stockton DWSC dissolved oxygen concentrations from daily flows, algae, and BOD

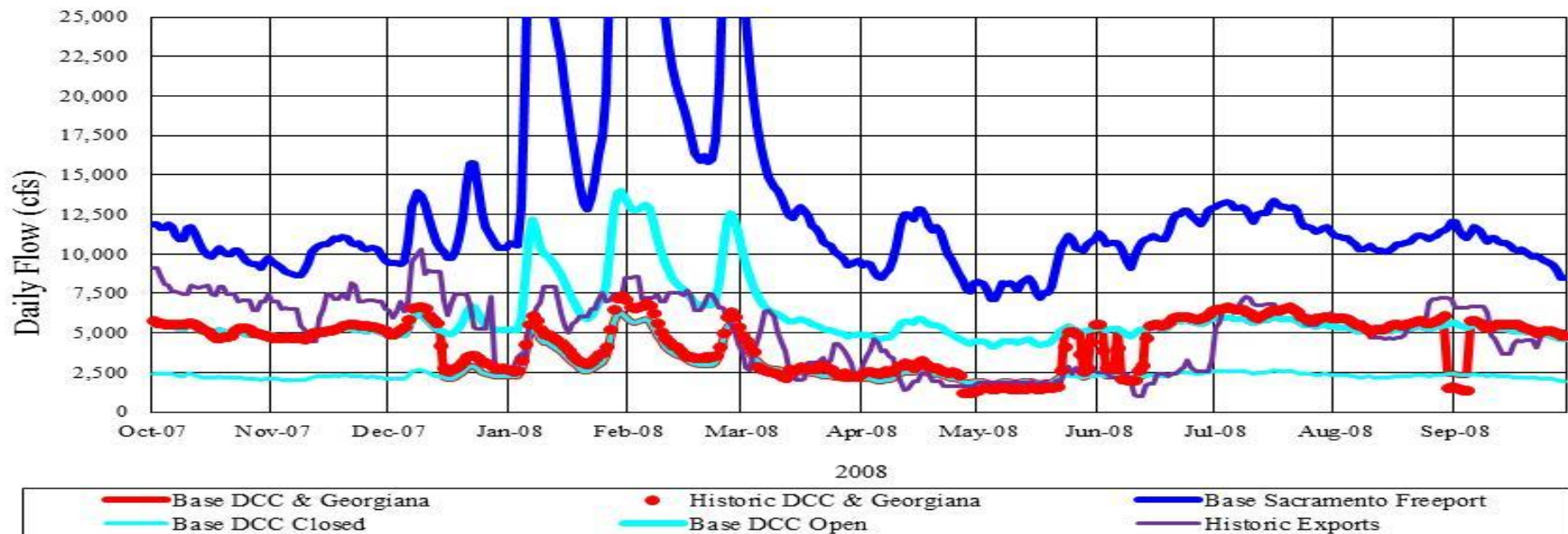
SWP/CVP Historical Delta Smelt Density Pattern



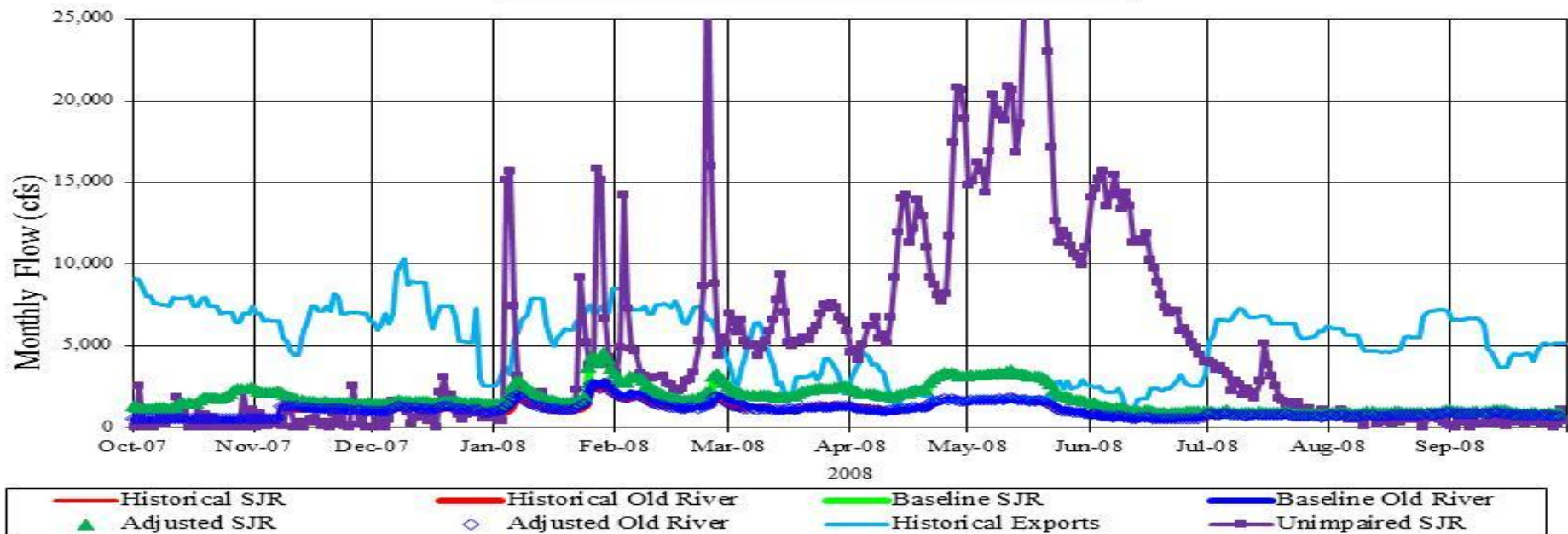
Delta Smelt Density at Chipps, SWP, and CVP



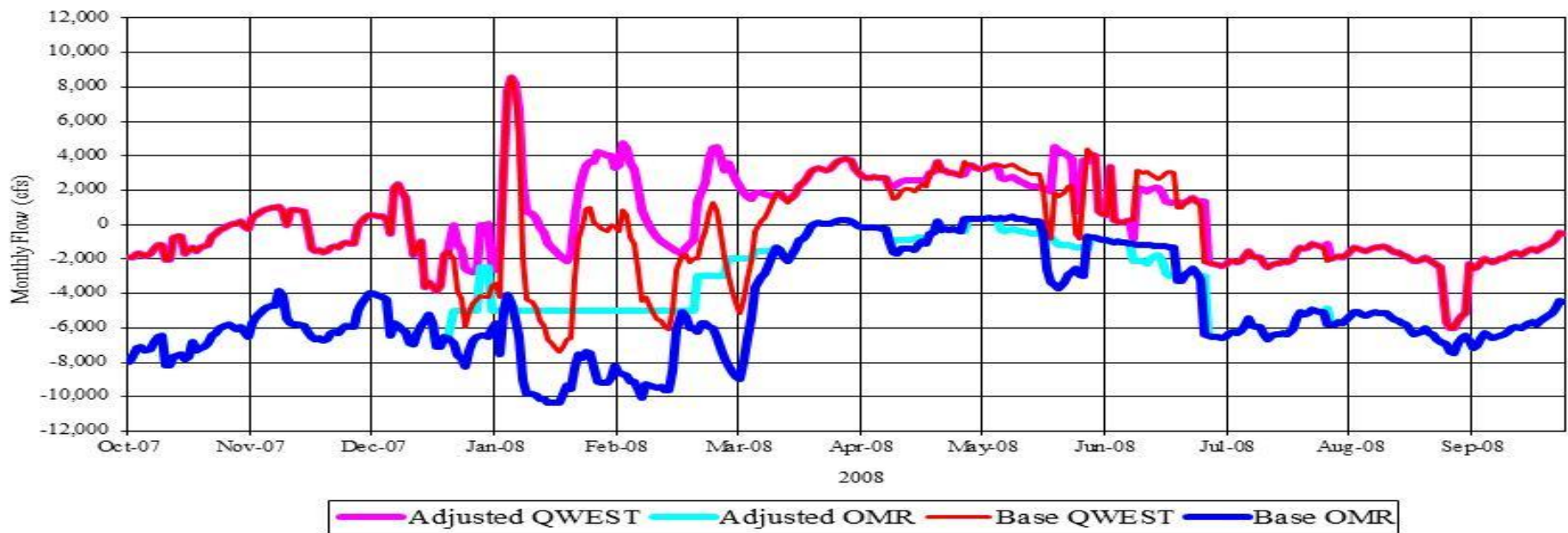
DCC & Georgiana Slough Flow



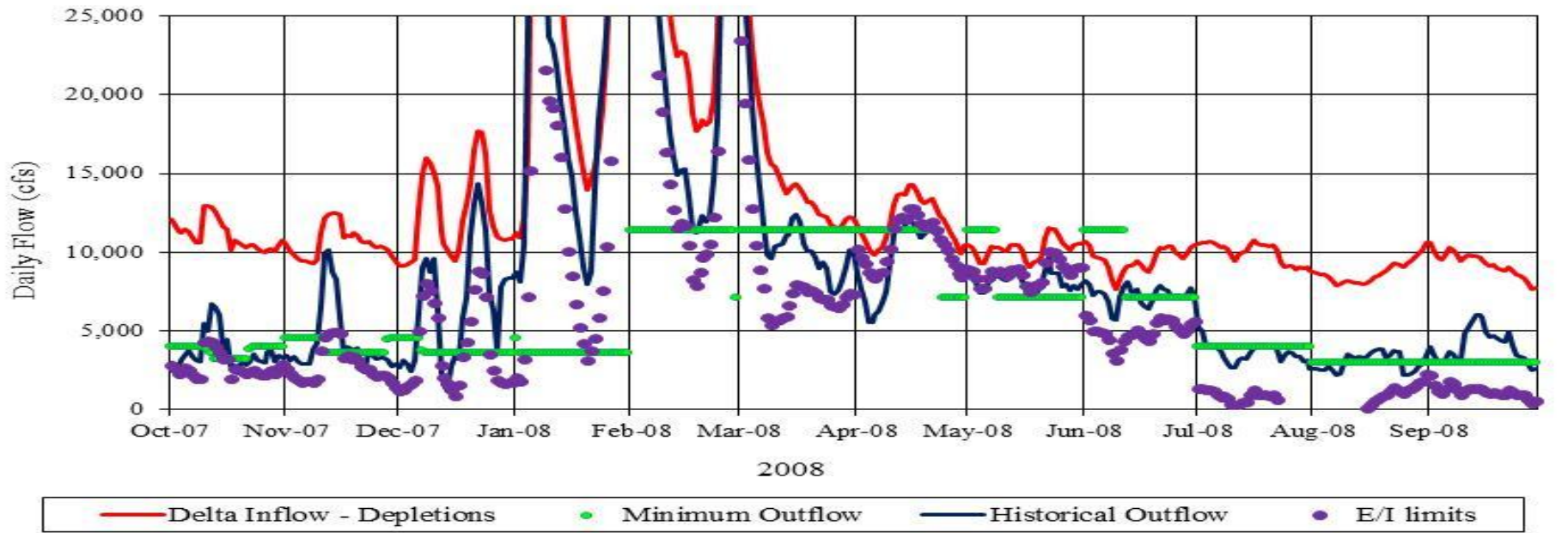
San Joaquin River Flow-- Baseline



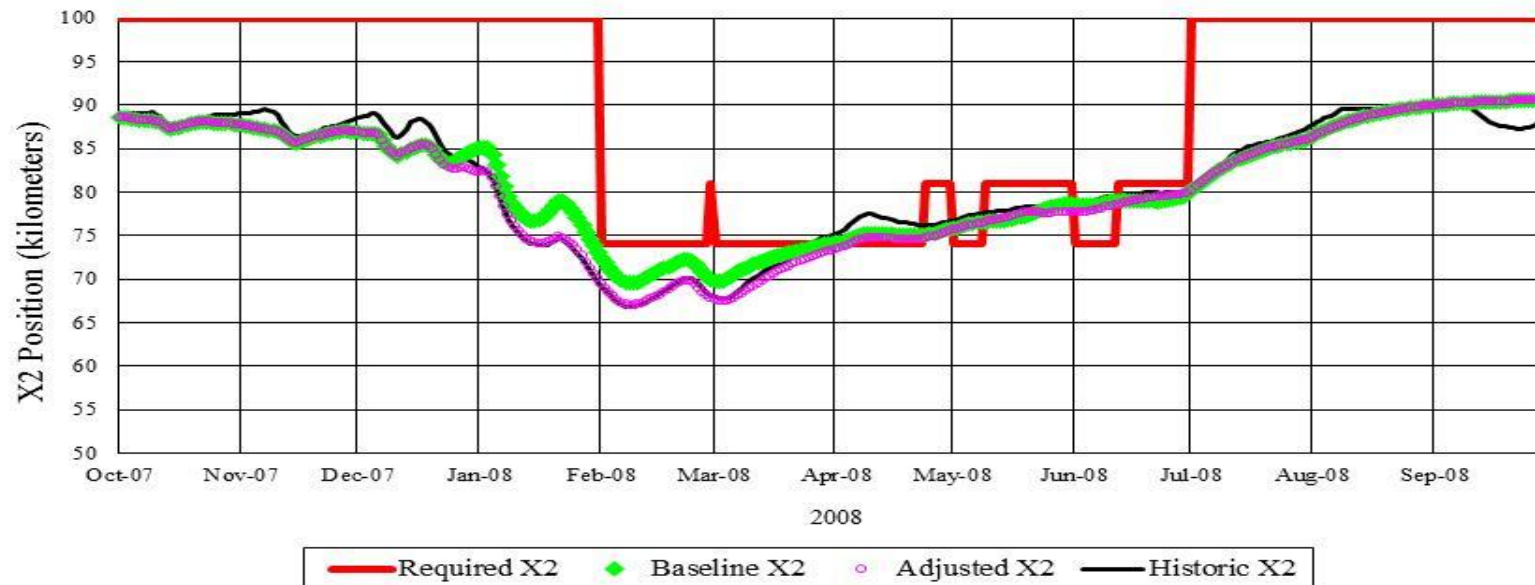
Base and Adjusted QWEST and OMR Flows



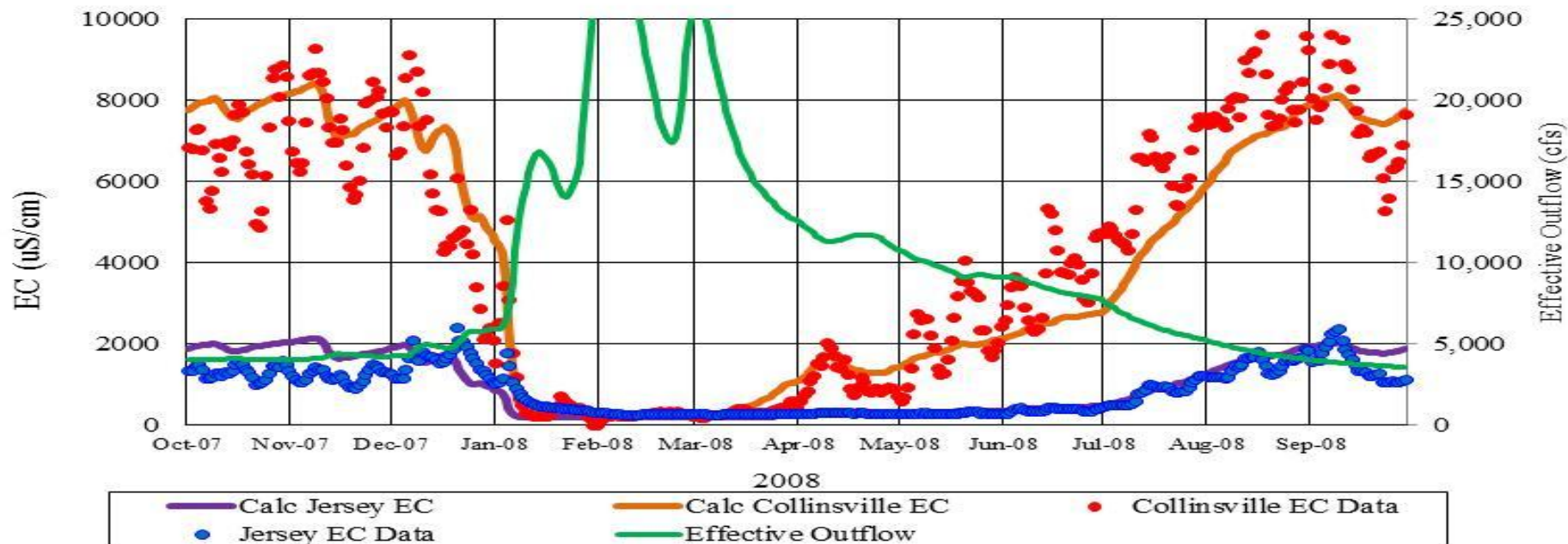
Delta Inflows and Required Outflows



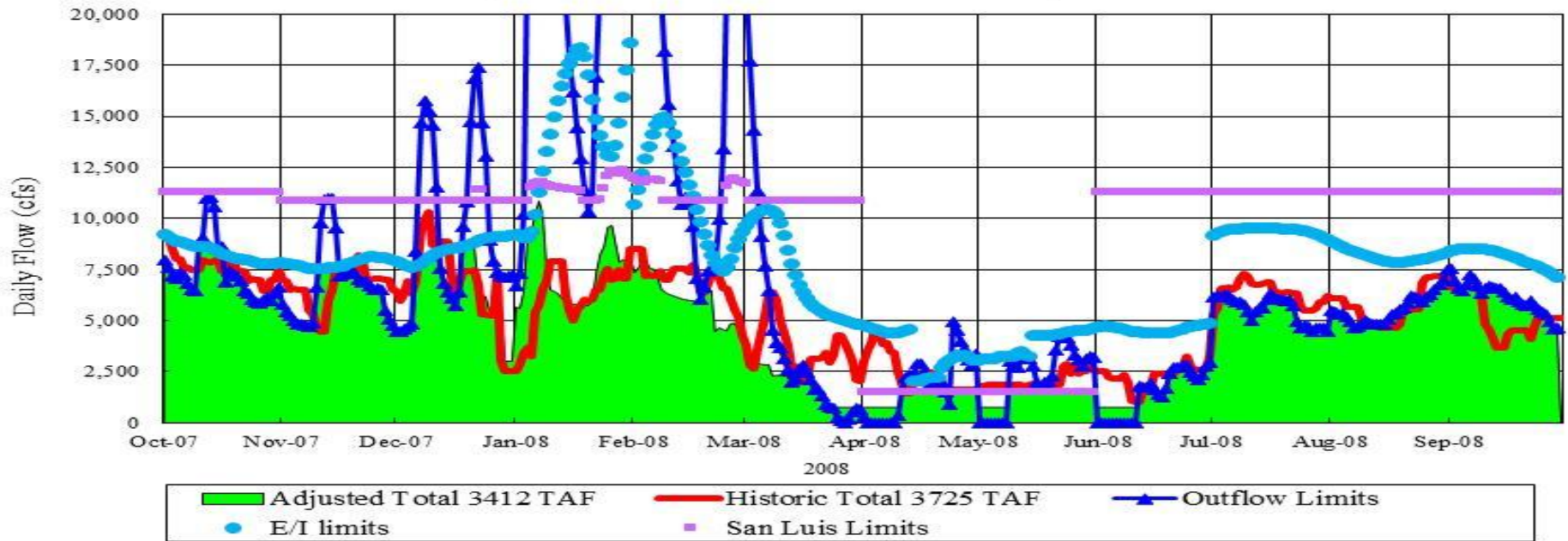
Delta X2 Position-- Baseline



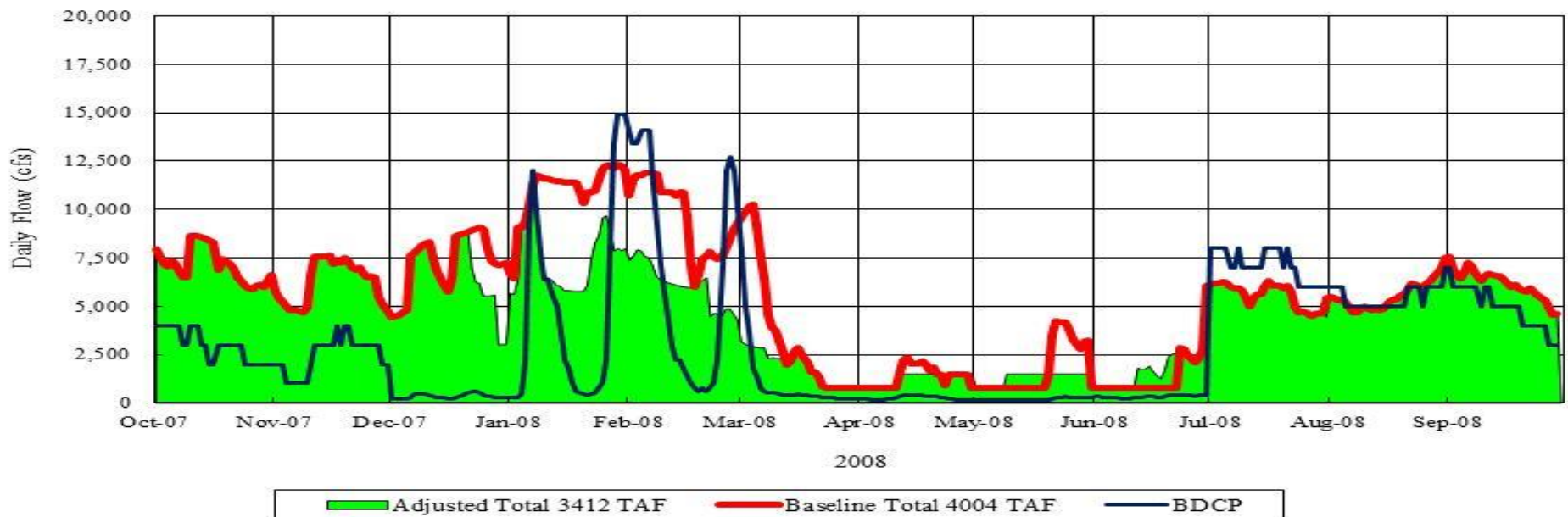
Historical Outflow and Calculated EC at Collinsville and Jersey Point



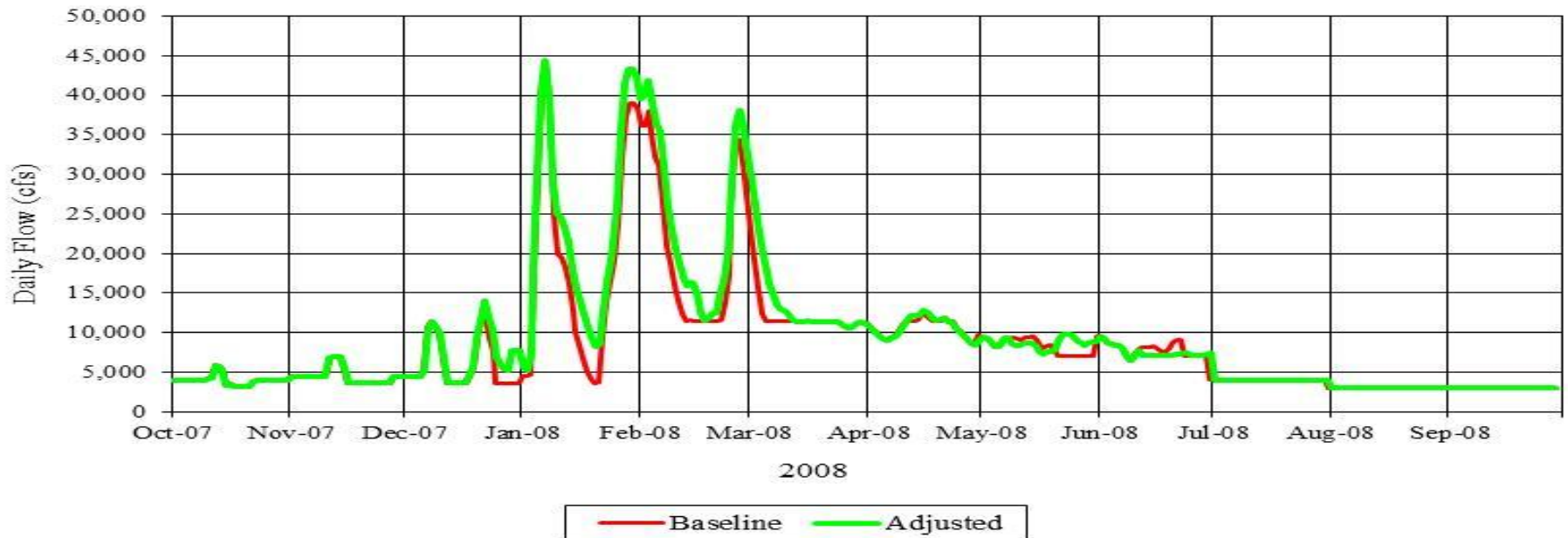
Adjusted & Historical Exports



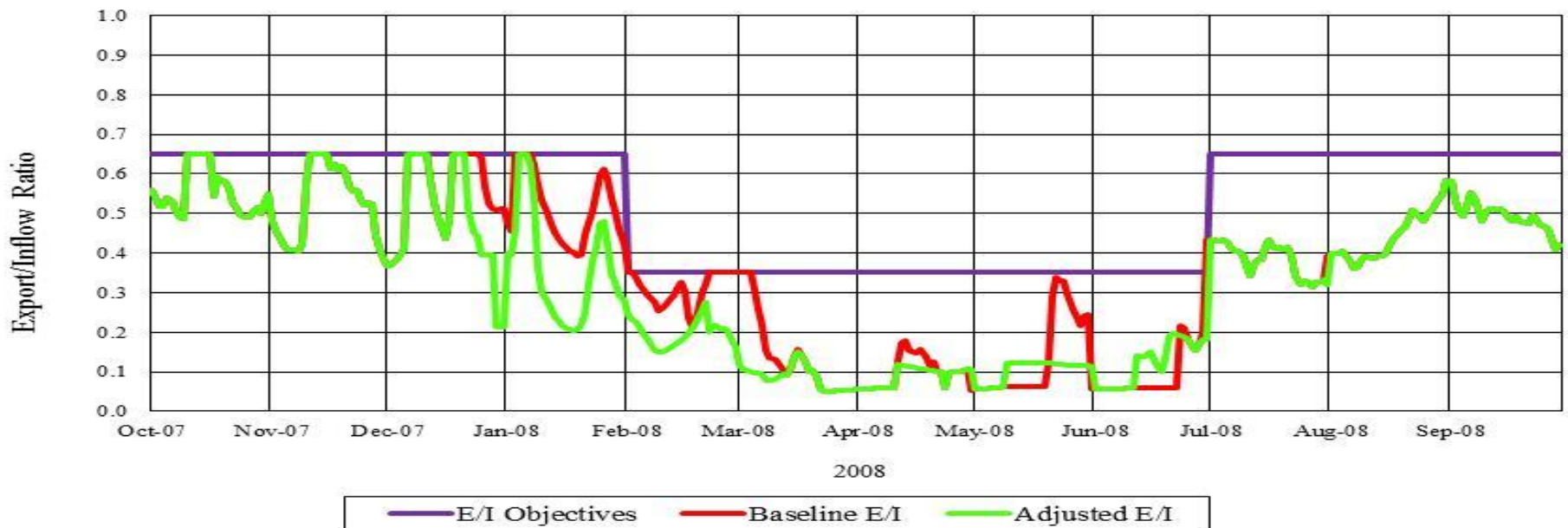
Adjusted and Baseline Exports --Baseline



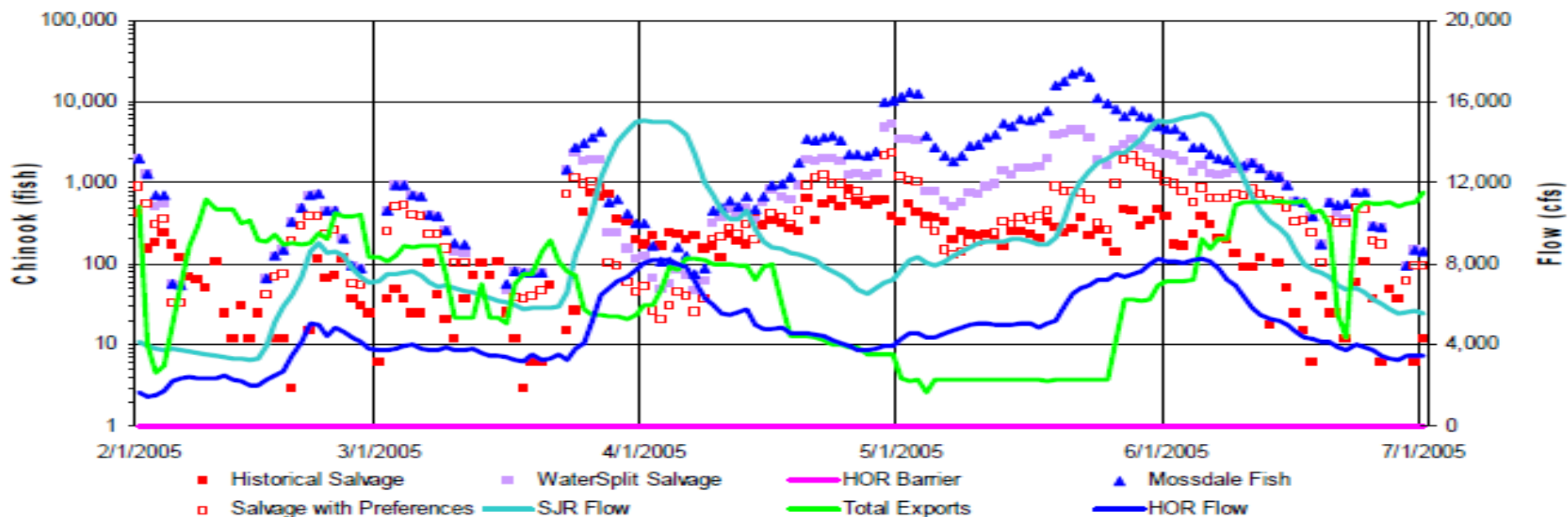
Delta Outflow Adjustments-- Baseline



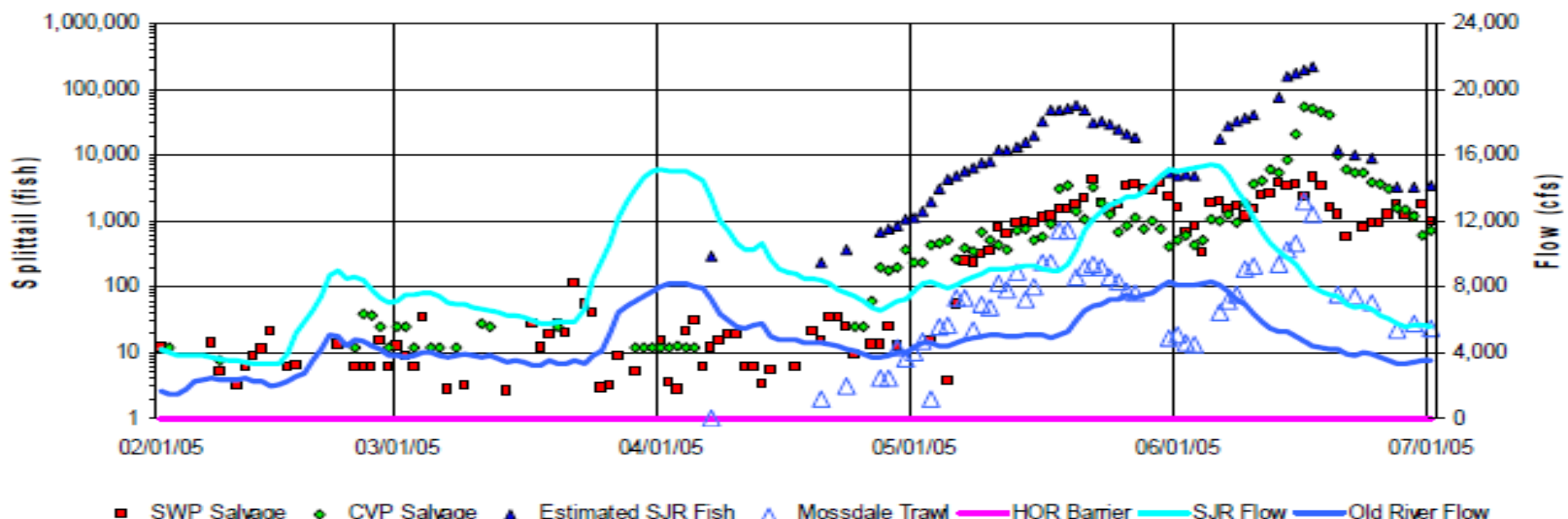
Baseline and Adjusted Export/Inflow Ratio



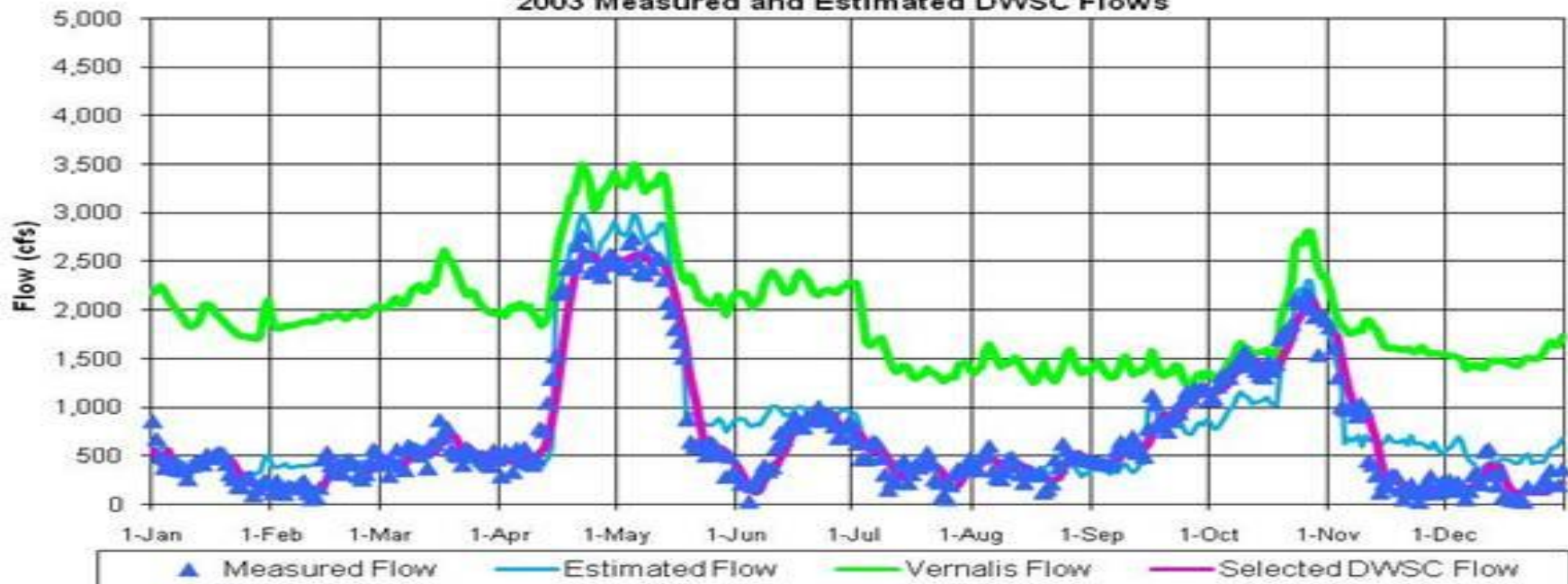
Predicted Salvage with HOR = 1 Exports = 1*CVP/HOR and Turner = 0.1



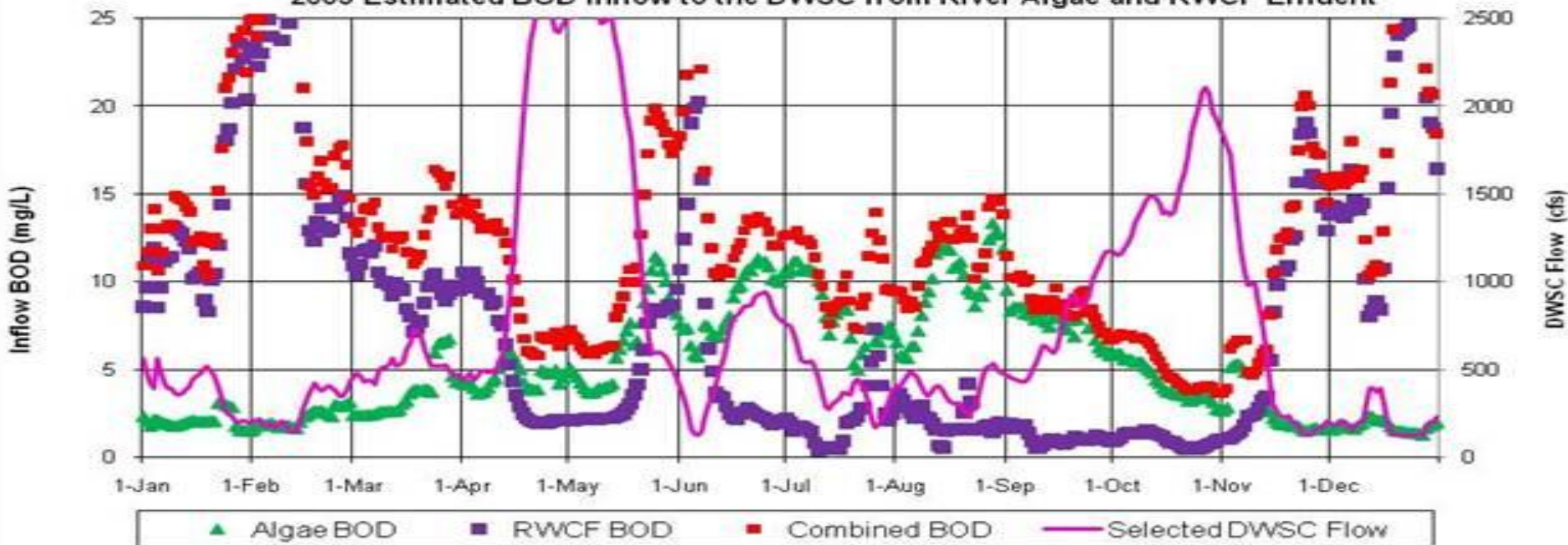
Mossdale Splittail and Salvage



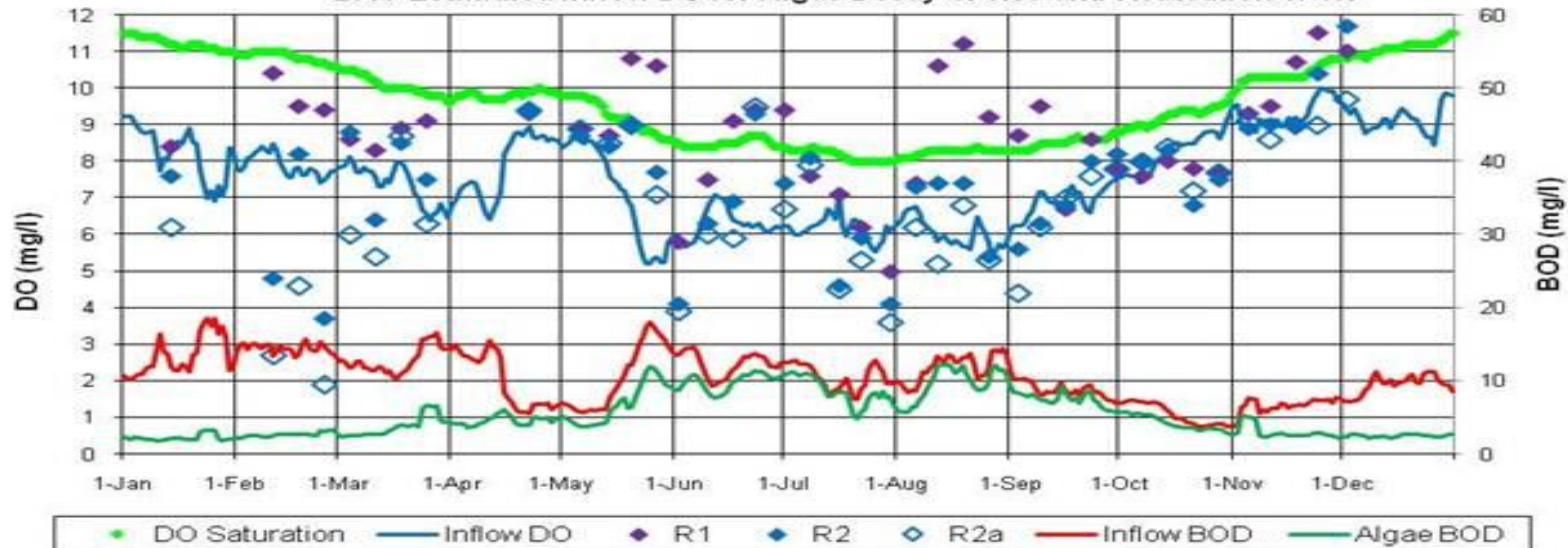
2003 Measured and Estimated DWSC Flows



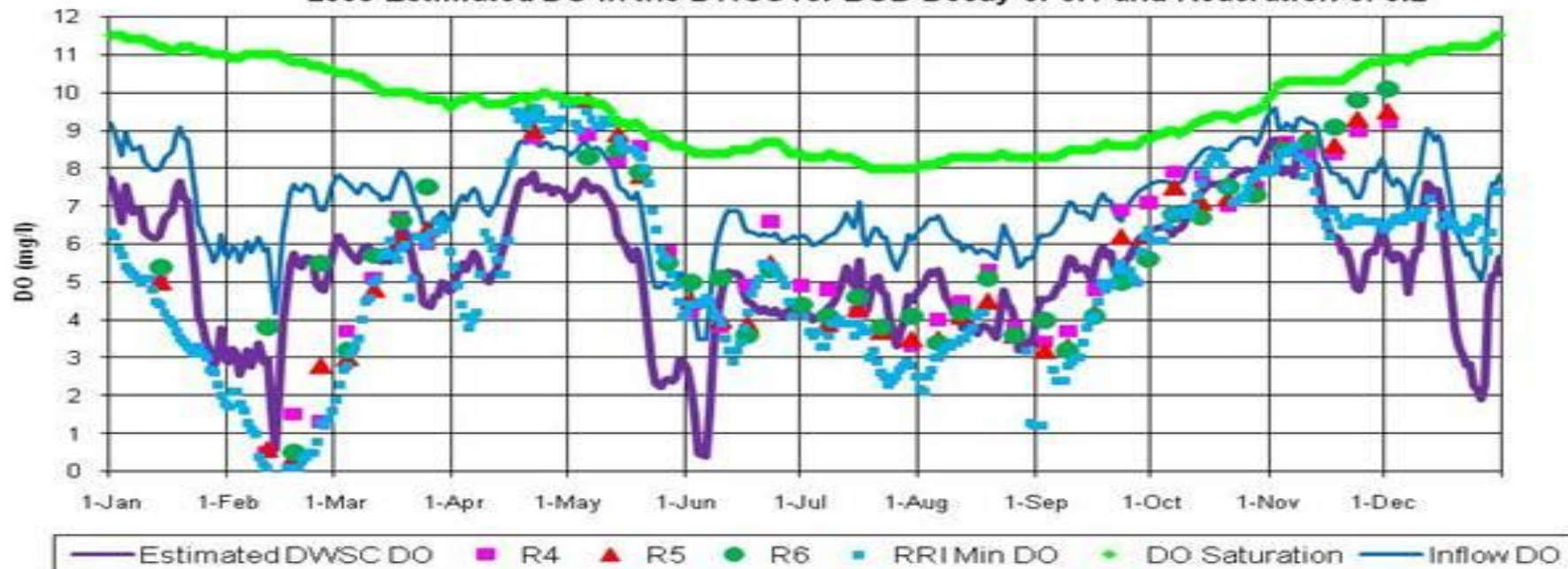
2003 Estimated BOD Inflow to the DWSC from River Algae and RWCF Effluent



2003 Estimated Inflow DO for Algae Decay of 0.05 and Reaeration of 0.5



2003 Estimated DO in the DWSC for BOD Decay of 0.1 and Reaeration of 0.2



Reasons to Compile, Organize and Evaluate Daily Historical Data

- 1) Provide an official organized inventory of flows, habitat conditions and fish data to identify flow-fish relationships and patterns.
- 2) Allow the comparison of daily flow, temperature and salinity data with daily reservoir and Delta objectives to identify effective changes in operations (rules).
- 3) Estimate adjustments in daily historical flow, habitat, and fish data to identify and evaluate likely benefits.
- 4) Provide a basis for SWRCB water accounting and fish tracking to achieve a reasonable balance of multiple beneficial uses and public trust values (documentation).