COMPREHENSIVE (PHASE 2) REVIEW AND UPDATE TO THE BAY-DELTA PLAN
WORKSHOP 2: BAY-DELTA FISHERY RESOURCES

ADDITIONAL SCIENTIFIC INFORMATION RELATED TO SALMONIDS,

RECOMMENDED CHANGES TO THE BAY-DELTA WATER QUALITY CONTROL PLAN,

AND

RECOMMENDATIONS TO ADDRESS SCIENTIFIC UNCERTAINTY AND CHANGING CIRCUMSTANCES

PRESENTED BY:
RENE HENERY, PH.D
TROUT UNLIMITED

TROUT UNLIMITED

Key Points

(1) Adequate Sacramento inflows are critical to the health of the Delta and anadromous fish populations

(2) Benefits of inflows for anadromous fish include:

- Increased survival
- Improved outmigration
- Floodplain inundation
- Life history strategy diversification

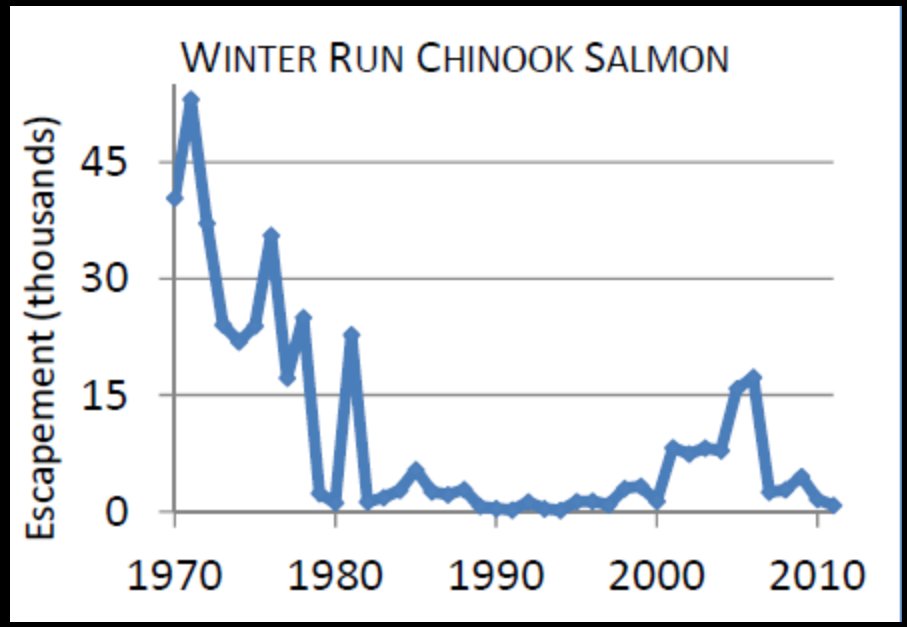
(3) Inflows must be developed with consideration for upstream habitat conditions (critical for fish and connected to Delta).

CA Salmonids in Rapid Decline

- Changes to historic salmon habitat have resulted in decreased salmon and steelhead stock.
- All native species, have declined and most at risk of extinction
  - 83% of California's freshwater fishes are extinct or at risk of becoming so
    - 16% increase since 1995 and a 21% increase since 1989. (Moyle et al 2011)
- If present trends continue, 25 (78%) of the 32 salmonid taxa native to California will likely be extinct or extirpated within the next century. (Katz et al 2012)
- Main cause of decline include:
  - Flow alteration
  - Loss of access to upstream rearing habitat
  - Loss of floodplain habitat

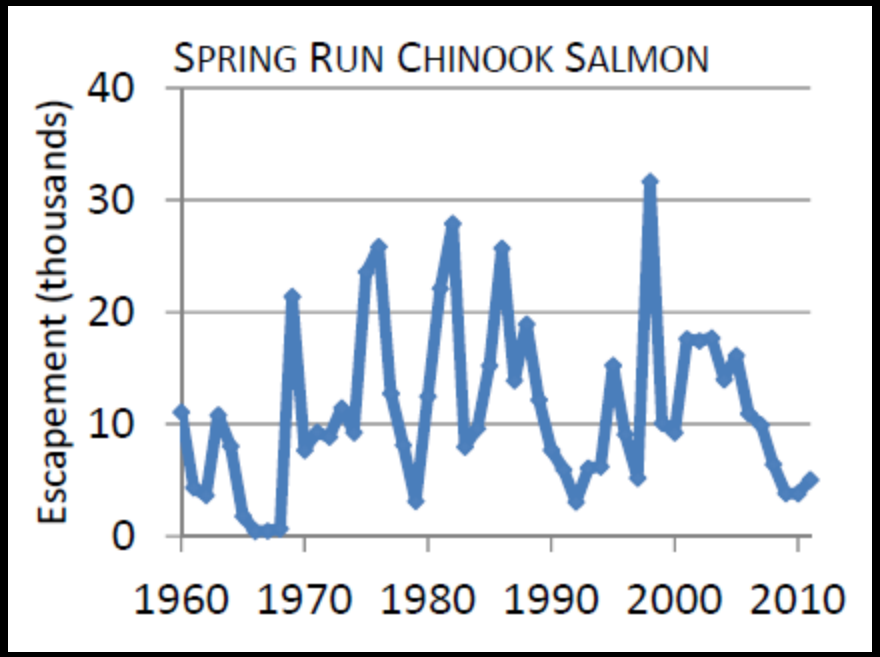
Winter and Spring Run Populations in Precarious State

- Adult winter run escapement in 2011 was only 824 Spawners (DFG 2012)
  - lowest level since 1994.
- Low 2011 escapement resulted from operations of Shasta Reservoir and dry conditions in 2008. (*NMFS 2011)*
  - low abundance occurred despite closure of the ocean fishery in 2008 and 2009, and very limited fishing season in 2010.
- Only 2 CWT winter run Chinook were caught in the 2010 ocean fishery from brood years 2004, 2005, 2006, 2007, and 2008. (Kormos et al 2012)



Winter and Spring Run Populations in Precarious State

- Spring Run geographic spawning range severely restricted
  - existing habitat vulnerable to climate change
- San Joaquin restoration effort critical to long term persistence of this species
- Delta flows critical for San Joaquin restoration success



New Findings Support Flow Restoration

Scientific literature since 2010:

- **Restoring floodplain connectivity** and **restoring flow regimes** in both the Delta and its watershed are the restoration actions below major dams **most likely to result in direct benefits** to salmon and other species by:
  - ameliorating flow and temperature
  - buffering effects of climate change
  - increasing habitat diversity and population resilience
  - supporting improved survival.

Importance of Inflows

- Altered flow regime, habitat loss, and migration barriers all significant **predictors for extirpation** of spring run Chinook salmon. (Zeug 2010)
- Increased flow can resulted in **decreased emigration time and increased survival** in juvenile salmon (Cavallo et al 2012)
- Factors associated with increased flows **positively influence migration rate** (Michel et al 2012)
- Flow impacts related to extent to which **losses** or gains during early developmental stages **can be compensated by increased growth or survival** later in juvenile life history. (Nislow and Armstrong 2011)
  - E.g. improved growth and survival on inundated floodplains
  - Improved survival through the delta with increased flows
- Management actions that influence only migration routing are less effective at creating increased survival than **actions affecting routing and route-specific survival** (Perry et al 2012)
- **Need to develop flow regimes for multiple life-history stages**, which can then serve as a basis for interim flow prescriptions and subsequent adaptive management.

Upstream Conditions are Critical

- **Temperature critical** to salmonid survival and success
- Objectives must allow for **continued upstream protections** critical for survival in those habitats
- **Proportional allocation** of releases to meet downstream criteria among all source streams is necessary to ensure the flow-related connectivity between the upstream and Delta enabling migratory species to complete their life cycles.
  - A disproportionate allocation can lead to adverse flow and temperature conditions below facilities

Revision and Refocus

- **Past approach =** enhance certain life history strategies over others;
- **Present need =** support multiple life history strategies.
- **How =** increased flows, increased habitat (floodplain) and more migratory options (also facilitated by more flow and floodplain).
- **Where =** Across the watershed – upstream to downstream and tributaries
  - Improved Delta flows are critical to the **habitat mosaic** (e.g. San Joaquin).

Recommendations

- Sacramento River Inflow and Delta Outflow Objectives: Increase winter/spring inflow and outflow objectives to improve migratory survival of juvenile salmonids
  - Releases from upstream sources should be made proportionally

- Floodplain Habitat Flow Objectives: Establish Sacramento River inflow and structural modifications objectives such that flows from the Sacramento River inundate floodplains for 15-120 days between December and May every year or twice in every three years.

- Migratory Cooridors: Establish objectives that provide adequate migratory corridors through the Delta for both juveniles and adults

- Maintain Adequate Upstream Temperature Conditions: Build on the CALSIM modeling done for BDCP Alternative 8 to ensure that both temp compliance and Delta flow objectives are met.

- Adaptive management: Develop and implement a robust adaptive management program tied to clearly defined biological outcome metrics that clearly define success.

Conclusion: There is Basis for Action

- New findings are consistent with previous indications
- There is strong scientific evidence for:
  - The benefits of increased flows
  - The immediate and critical needs of Central Valley salmon populations
- Increasing Delta outflow need not come at the expense of upstream reservoir storage