EAST BAY MUNICIPAL UTILITY DISTRICT

WaterFix Impacts to Outmigrating Juvenile Mokelumne River Salmonids

Testimony Summary

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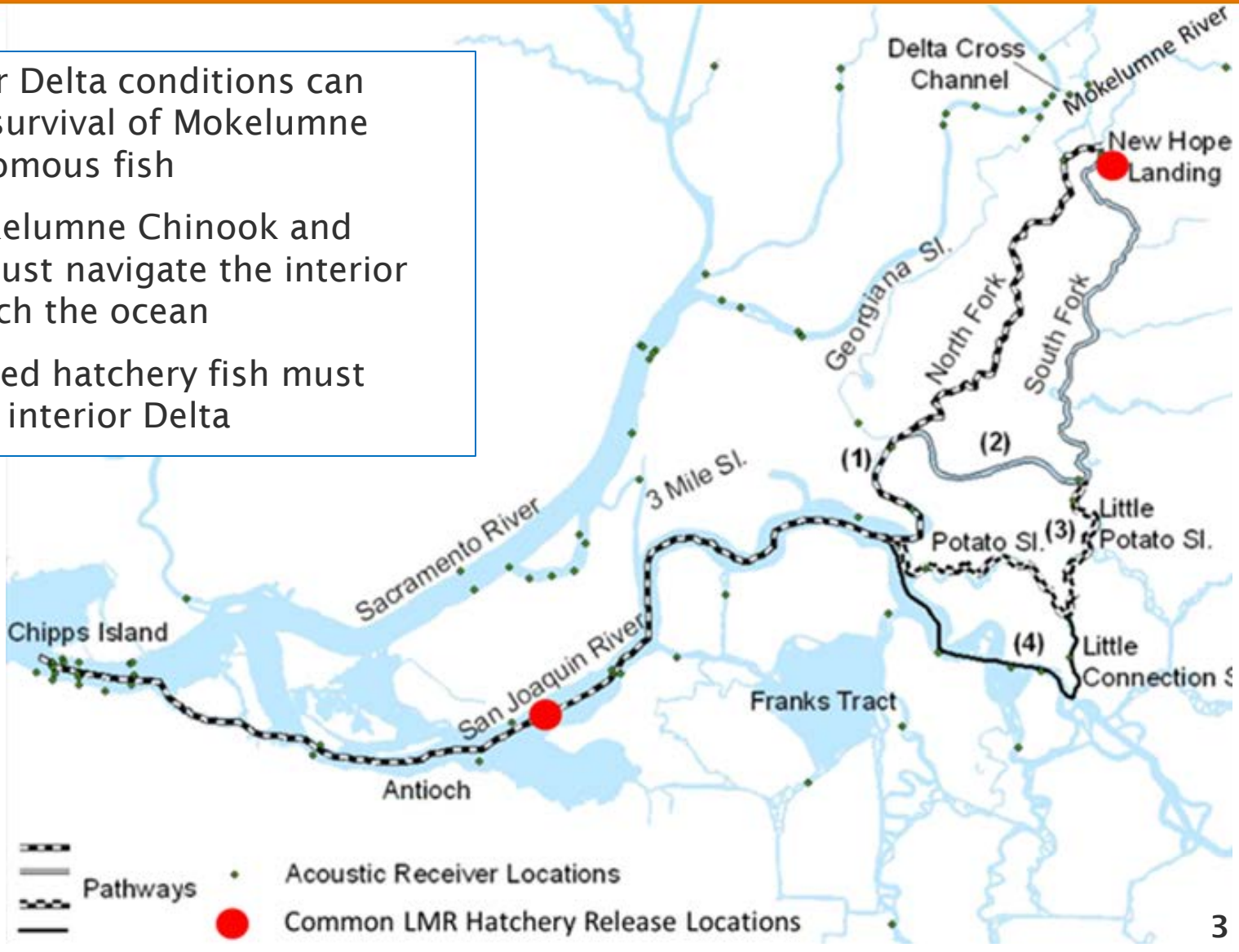
(EBMUD Exhibit 105)

Overview

- Existing South Delta diversions cause mortality impacts to outmigrating juvenile Mokelumne River fall run Chinook and C.V. steelhead:
  - Entrainment in export pumps
  - Increased time in hostile interior Delta environment
- Petitioners' WaterFix modeling demonstrates South Delta diversions could *increase* during Spring migration, worsening these impacts
- Any approval should be conditioned to protect Mokelumne River salmonids

Mokelumne River migration

- Poor interior Delta conditions can impact the survival of Mokelumne River anadromous fish
- Natural Mokelumne Chinook and steelhead must navigate the interior Delta to reach the ocean
- Some released hatchery fish must traverse the interior Delta



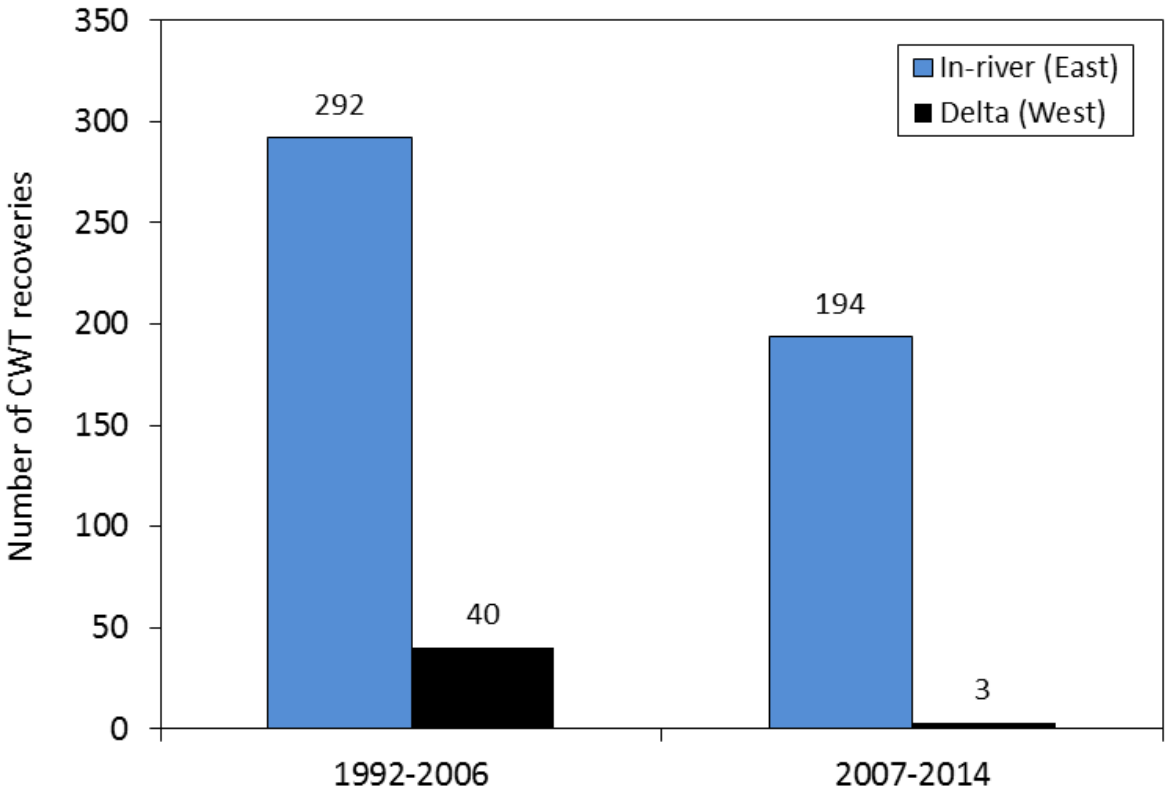
Entrainment

Evidence of entrainment of Mokelumne Chinook and steelhead in South Delta pumps at current diversion levels:

- Observed salvage of "tagged" Mokelumne hatchery fish of known Mokelumne origin
- Timing, size, and number of migrating Mokelumne Chinook and steelhead correlate with losses at South Delta export pumps

Entrainment: direct evidence

Coded wire tagged juvenile Mokelumne River hatchery Chinook are entrained in the South Delta pumps.



Most entrained juvenile Chinook were released in the interior Delta or farther upstream — even after a 2007 decision to release most Chinook west of interior Delta

Fish released west of the interior Delta are much less vulnerable to entrainment

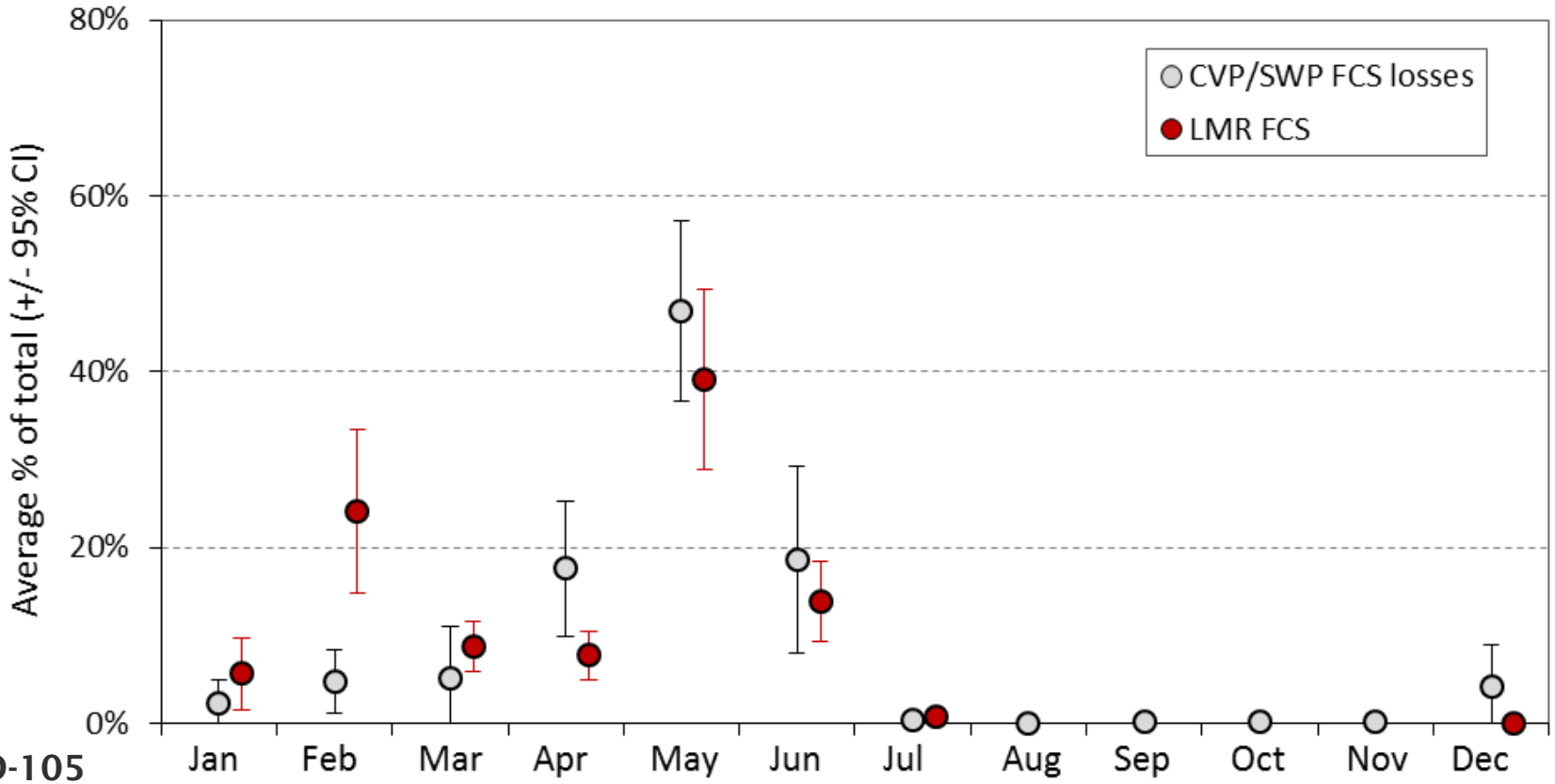
Entrainment: direct evidence

Coded wire tagged juvenile Mokelumne River hatchery steelhead are also entrained in the South Delta pumps.

- Coded wire tagged Mokelumne hatchery steelhead were experimentally released east of the Delta in 2004-2006
- Tagged steelhead were entrained at the South Delta export pumps 6 to 58 days after release

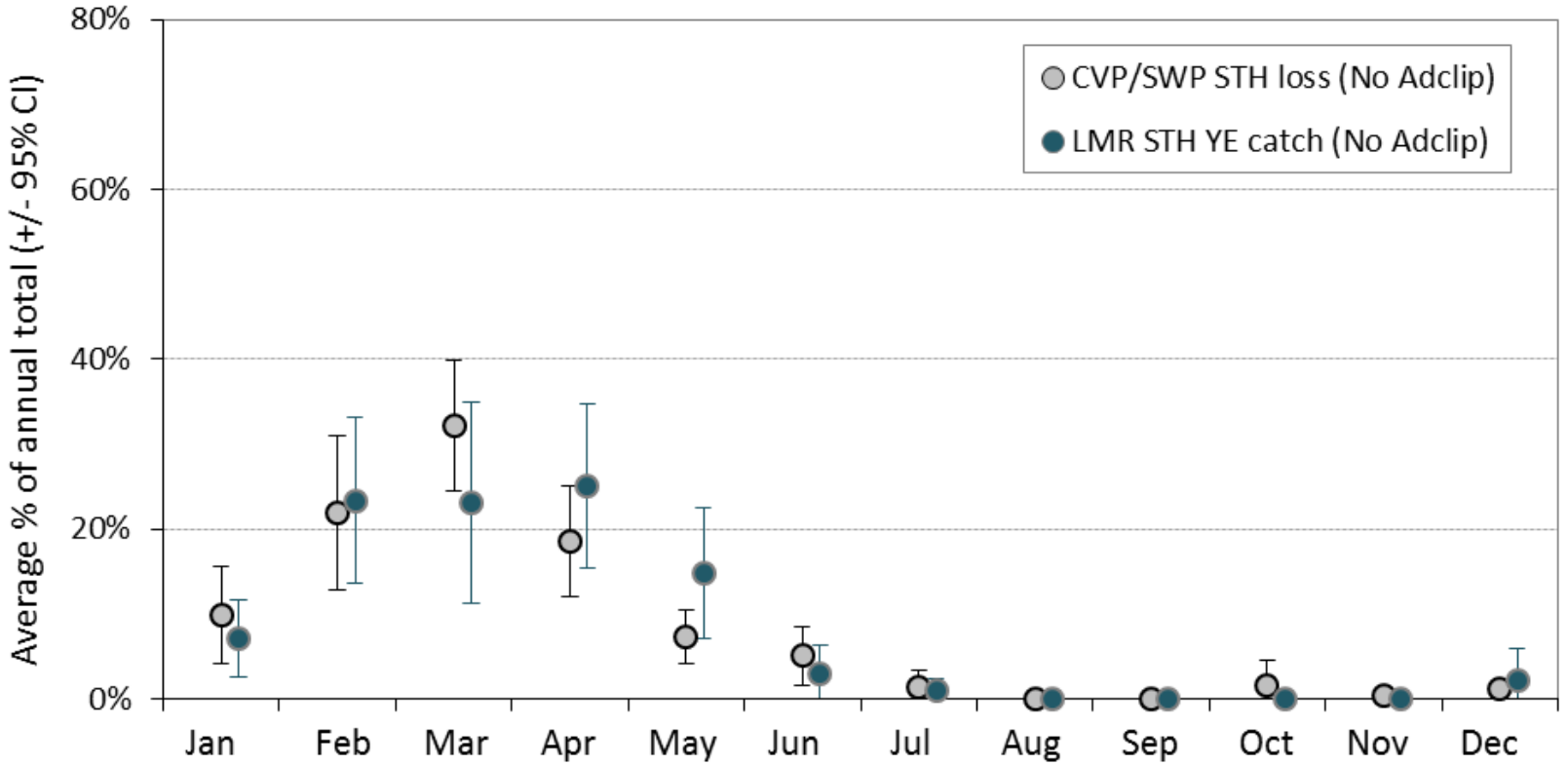
Entrainment: indirect evidence

Timing of natural Mokelumne juvenile Chinook outmigration is closely related to timing of salvage at the South Delta Facilities



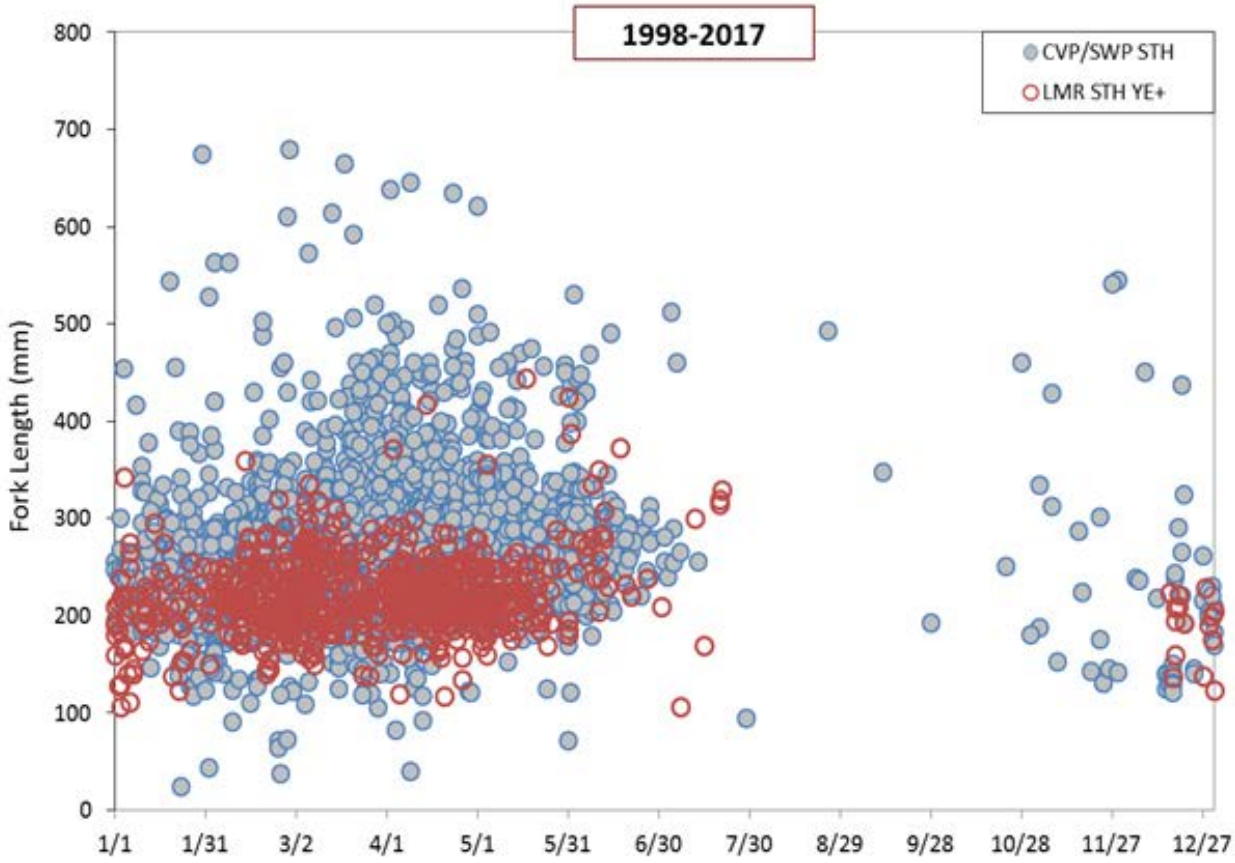
Entrainment: indirect evidence

Mokelumne natural steelhead migration timing coincides with timing of steelhead losses at South Delta pumps



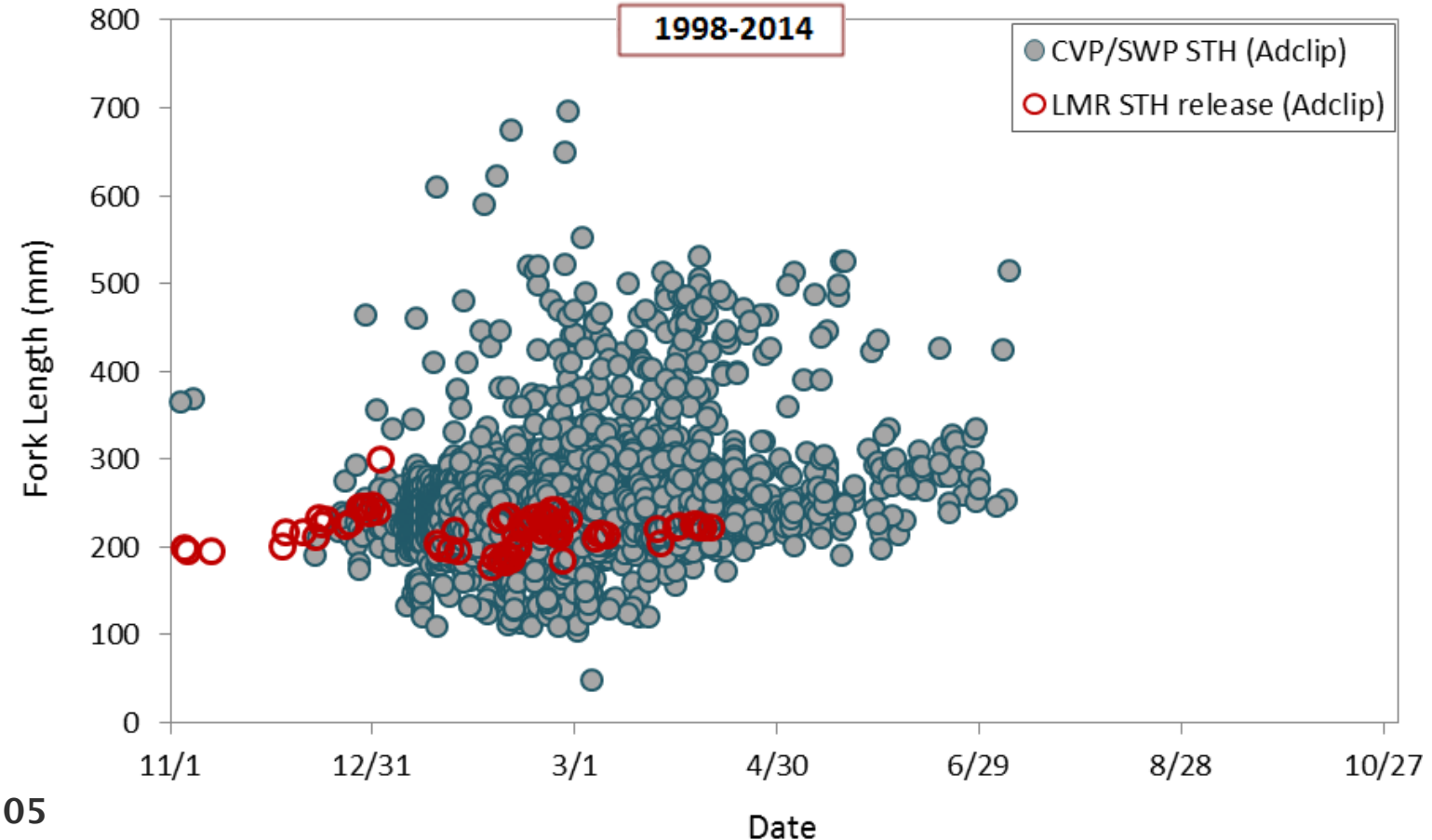
Entrainment: indirect evidence

Fork length data overlaps for natural Mokelumne steelhead and steelhead salvaged at the South Delta Facilities



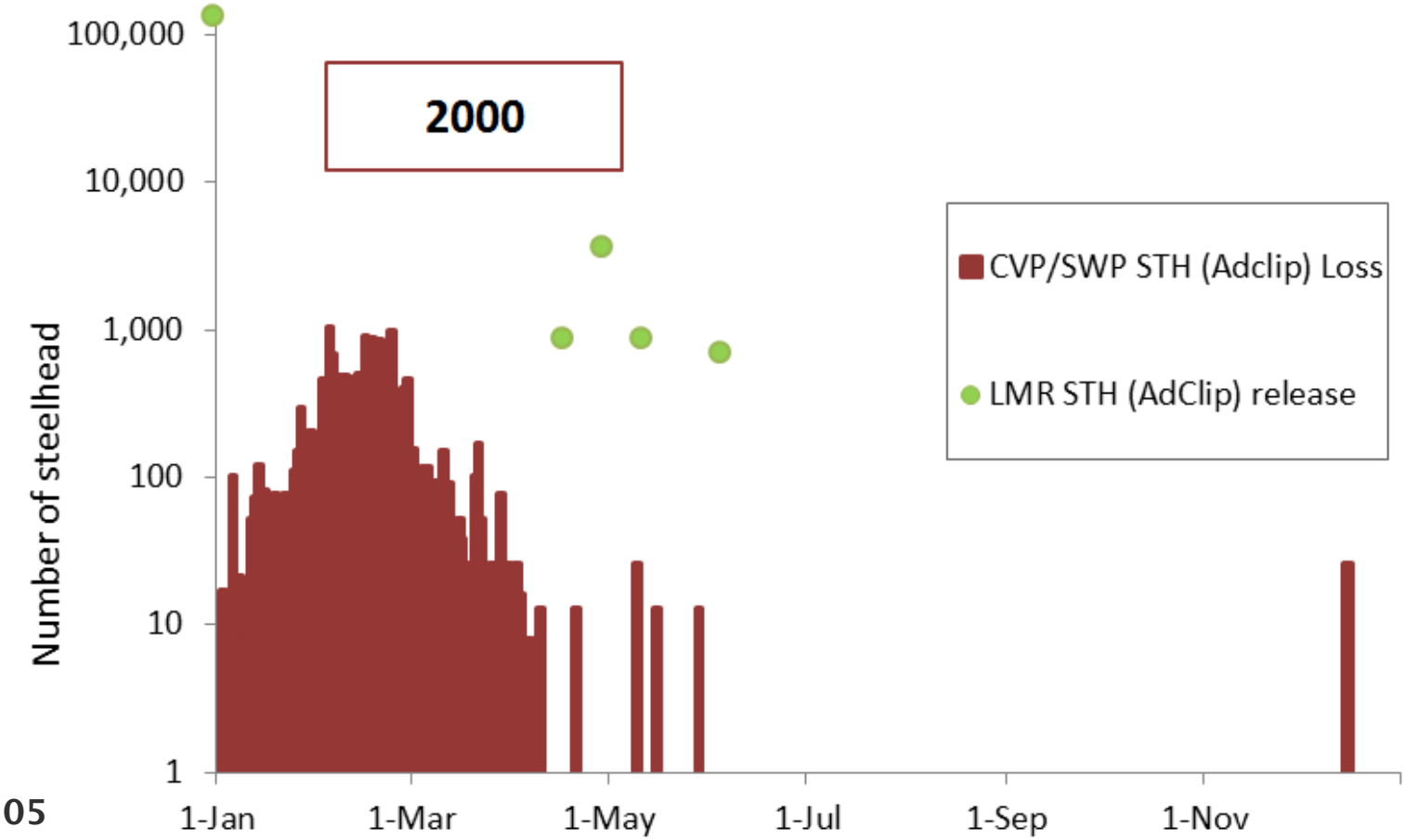
Entrainment: indirect evidence

Fork length data also overlaps for Mokelumne hatchery steelhead and salvaged steelhead at South Delta Facilities



Entrainment: indirect evidence

Timing and magnitude of Mokelumne hatchery steelhead releases are well-correlated with estimated steelhead losses at South Delta export pumps



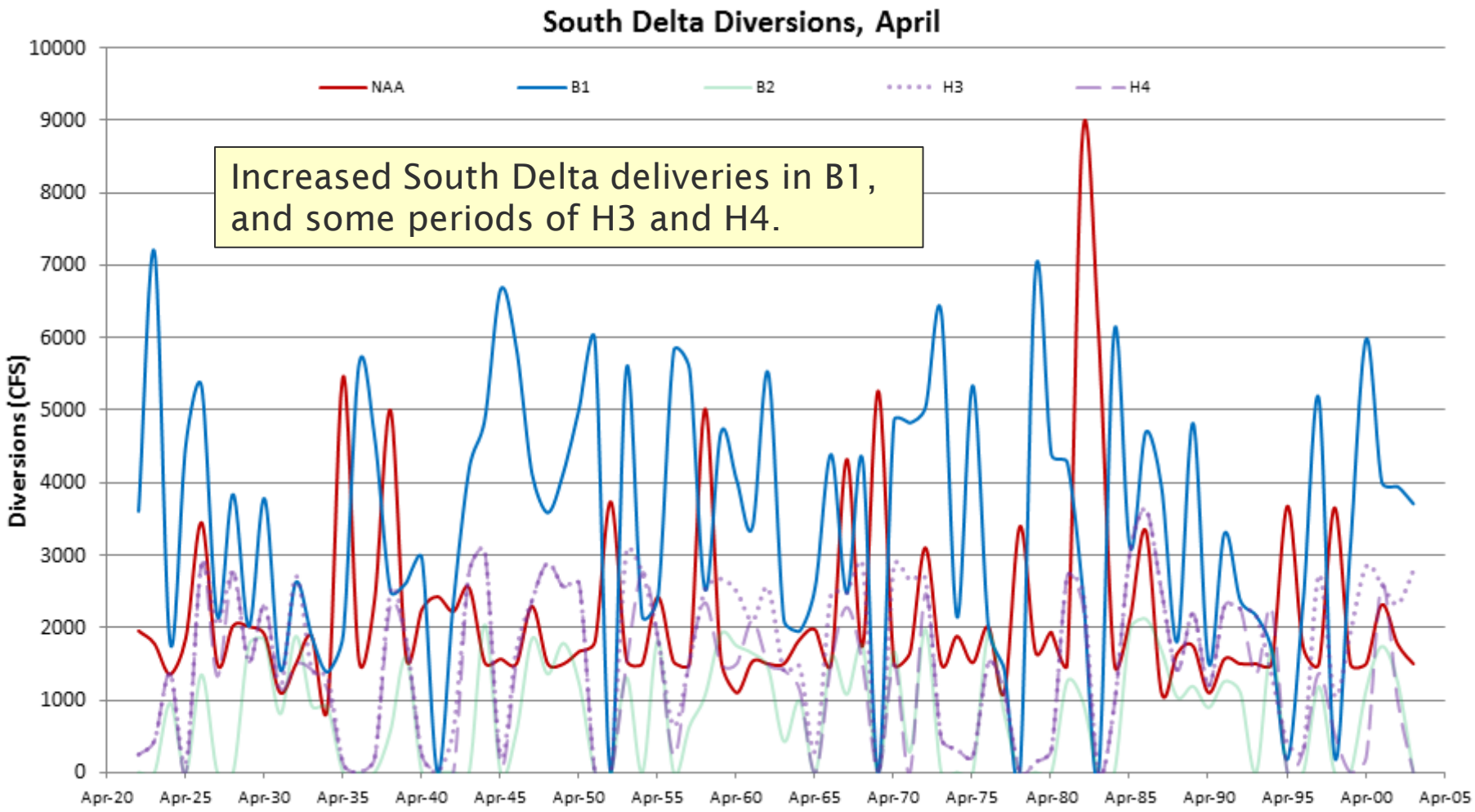
Delayed migration and mortality

- Delayed migration is an additional impact to salmonids of South Delta diversions
- South Delta diversions may alter channel velocity and directionality of flow, increasing travel time through the interior Delta
- Longer travel time increases juvenile salmonids' exposure to predators, poor water quality conditions, and unscreened Delta diversions

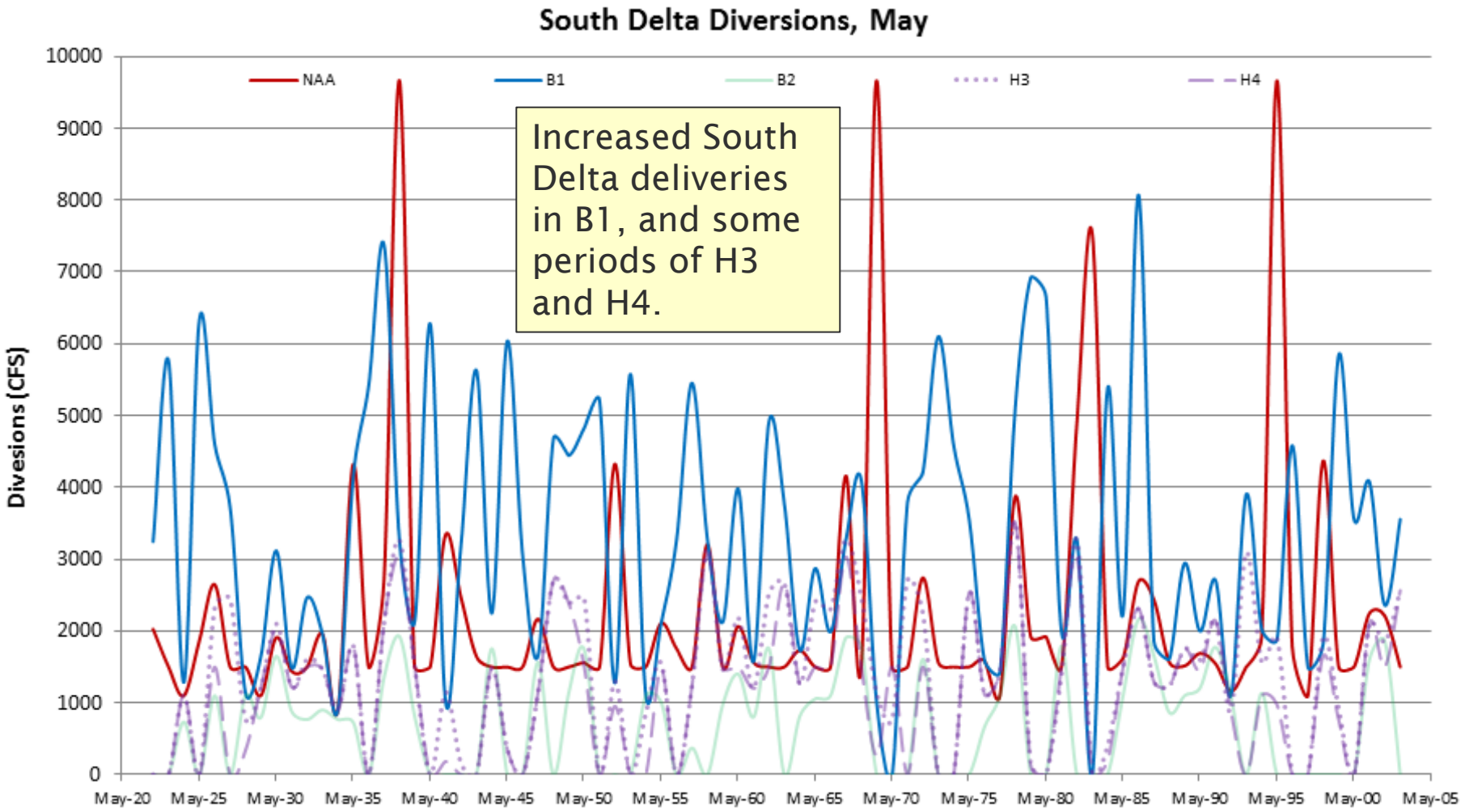
Potential increase in South Delta diversions

- Petitioners' model output data was reviewed to identify South Delta diversions in critical salmonid outmigration window (March–June)
- April/May period shows increased South Delta diversions in the B1, H3, and H4 scenarios
  - Most pervasive under B1
  - But also increases under H3 and H4
- March and June show no increase

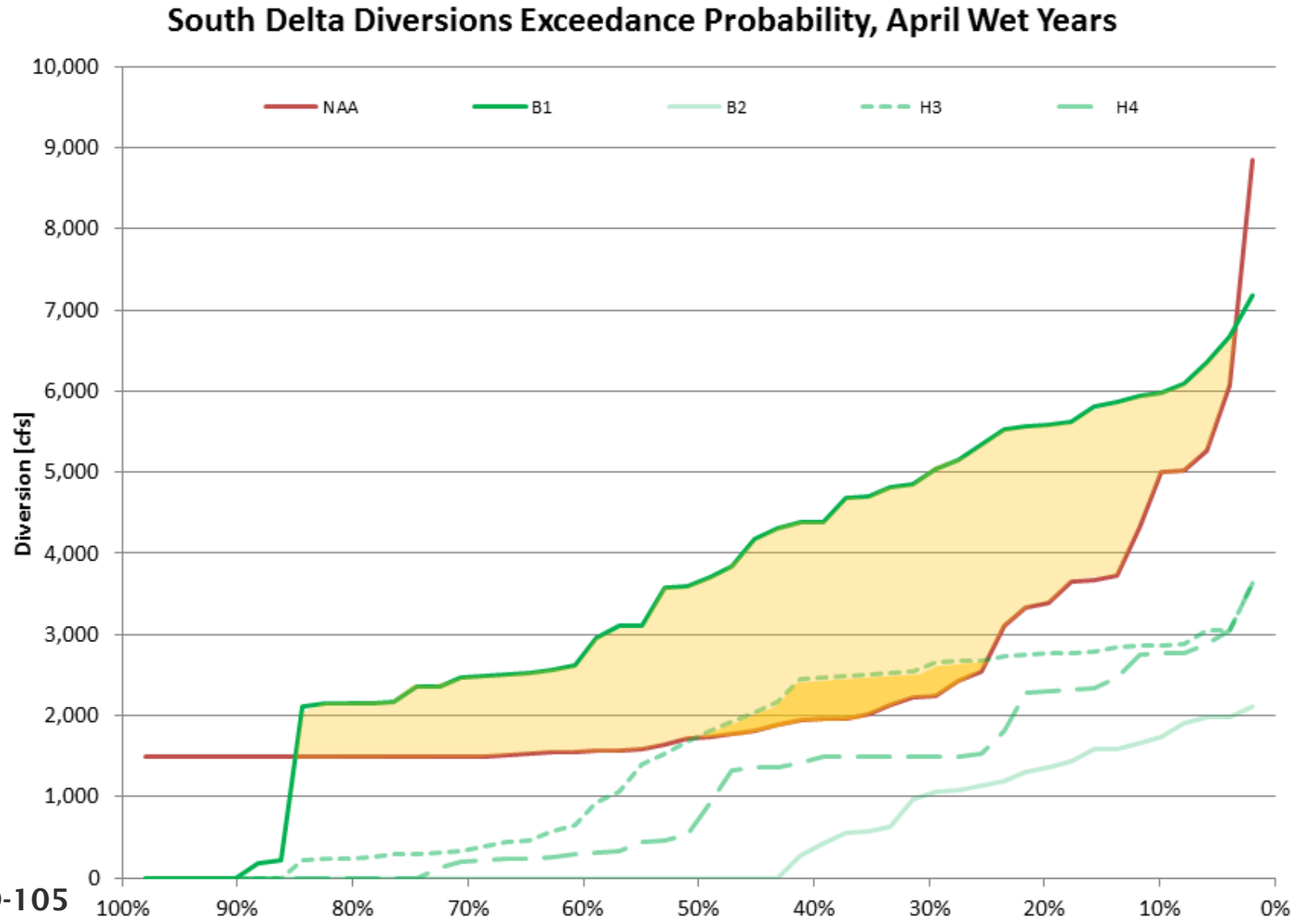
Potential increase in South Delta diversions



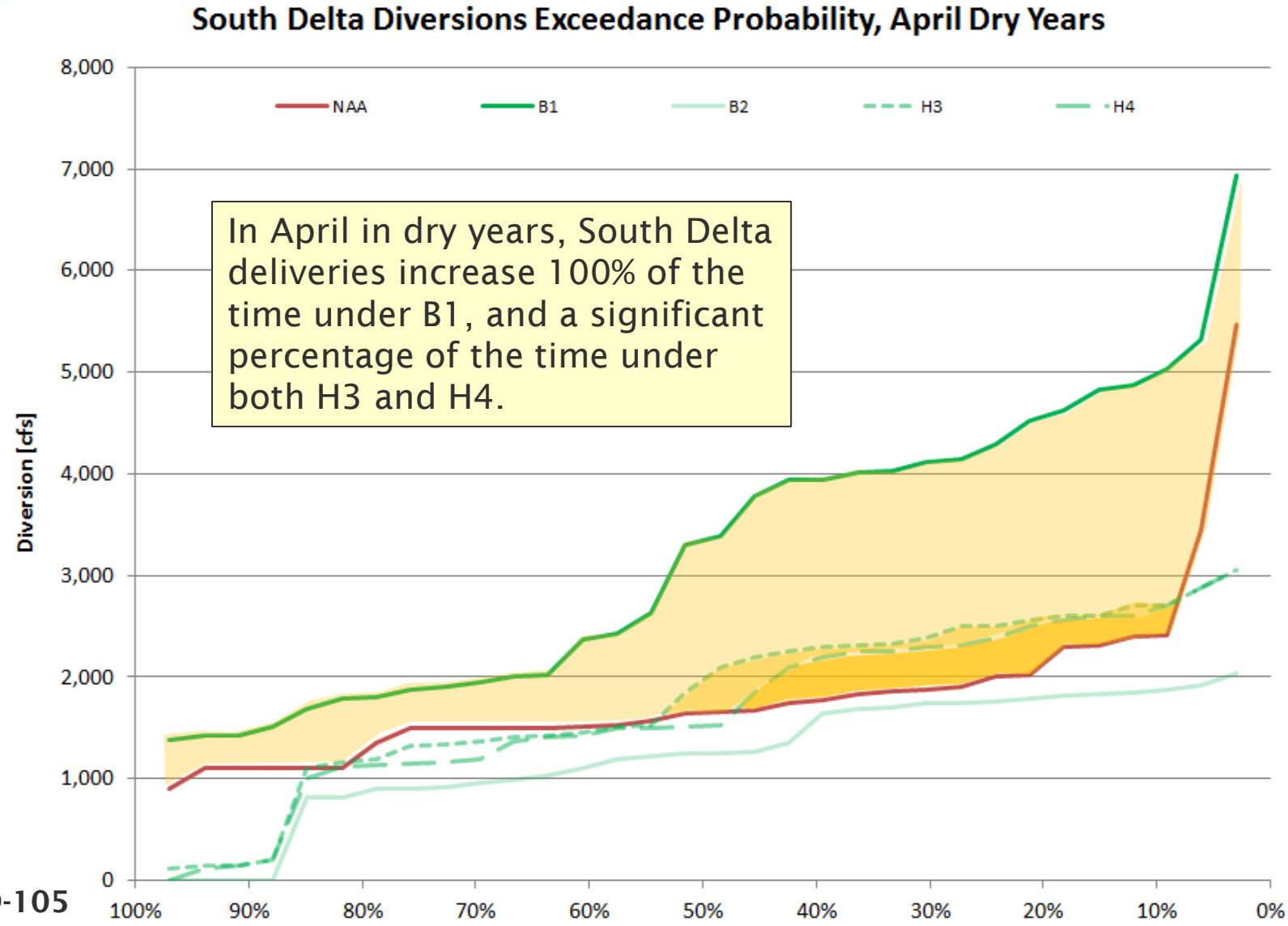
Potential increase in South Delta diversions



Potential increase in South Delta diversions



Potential increase in South Delta diversions



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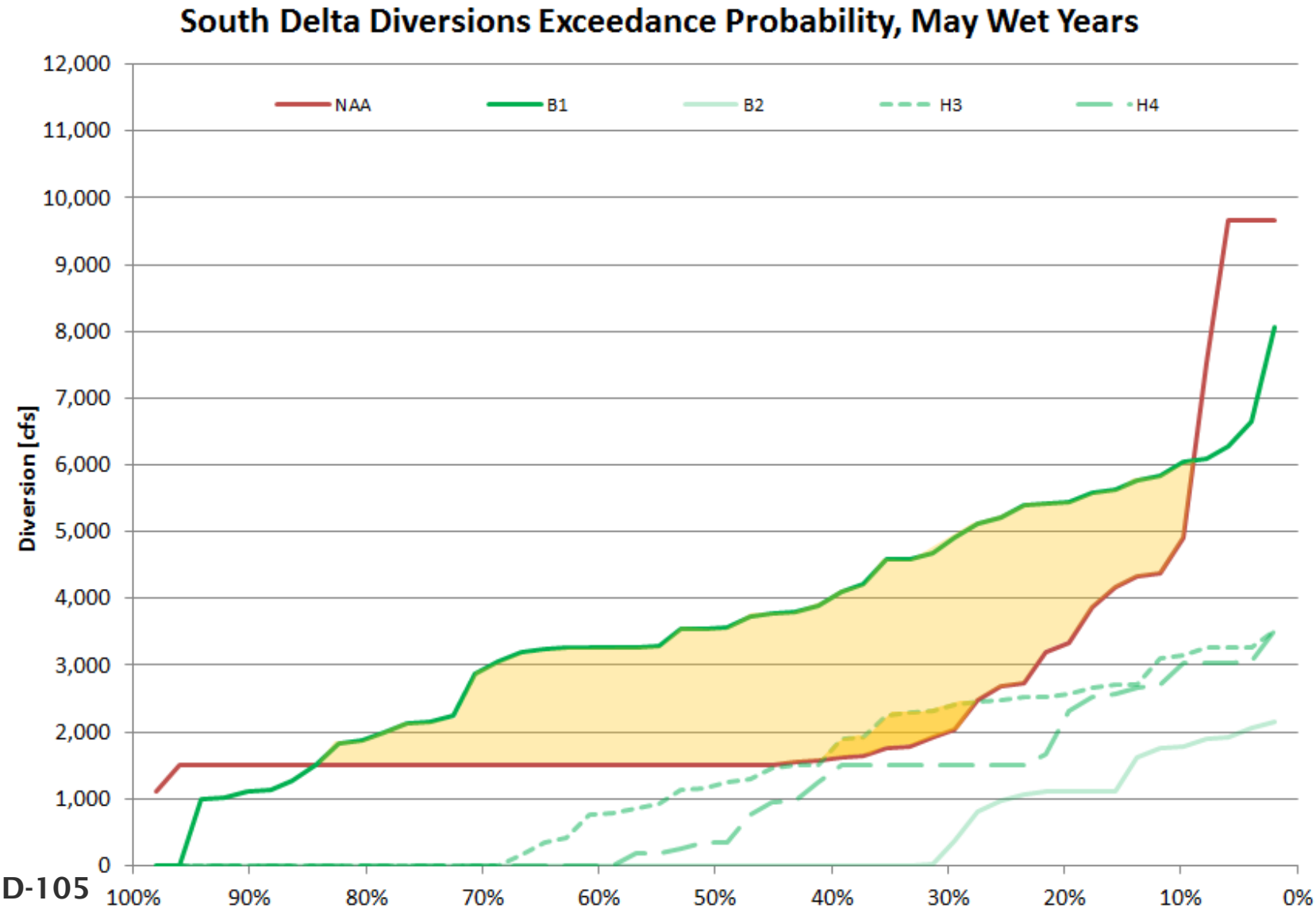
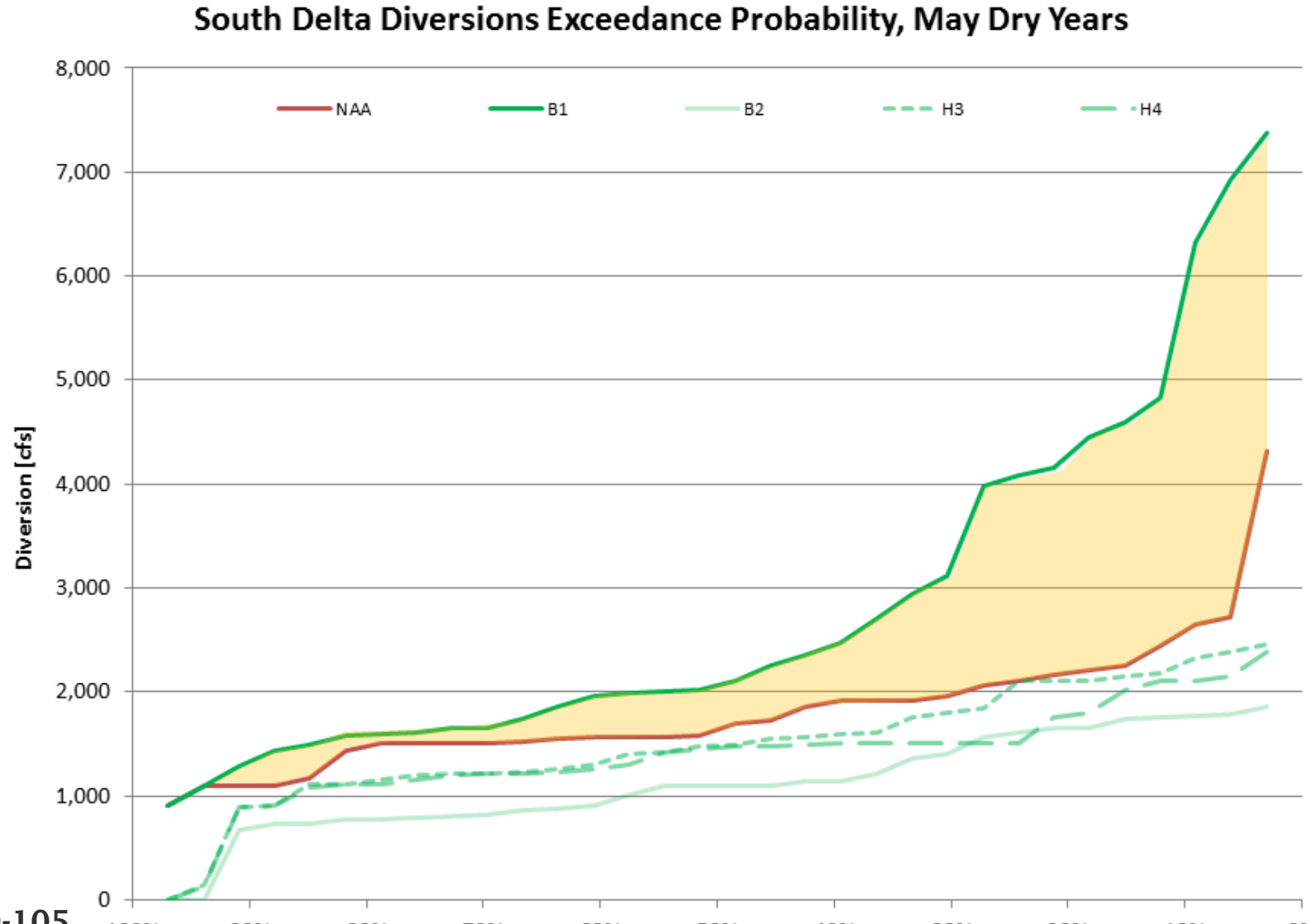


Potential increase in South Delta diversions

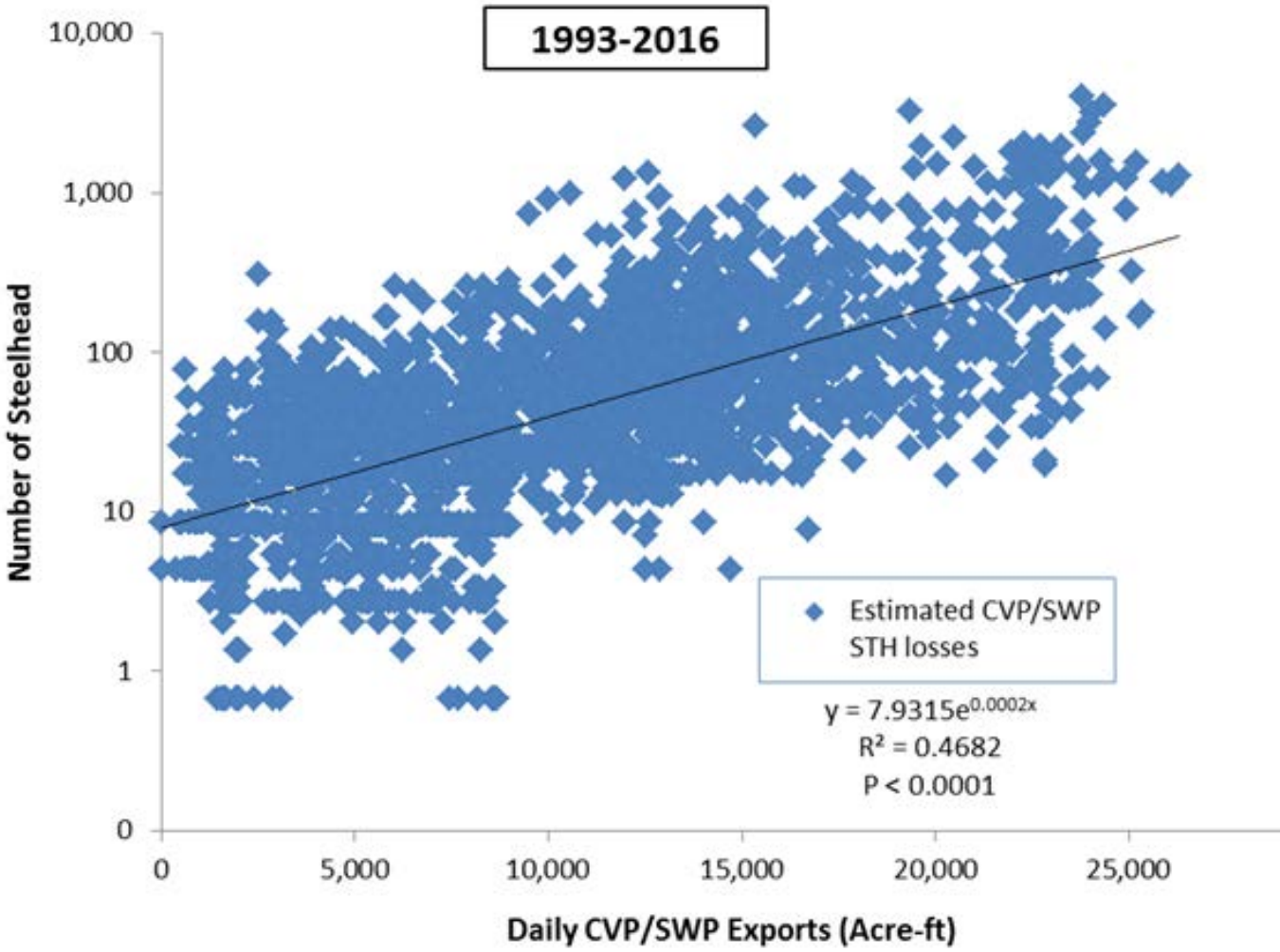


Potential increase in South Delta diversions

- Petitioners' modeling shows increased South Delta diversions may occur in April & May
- An increase at that time would likely harm Mokelumne juvenile salmonids
- Evidence shows that any increase in South Delta pumping rates can be expected to increase losses at the South Delta pumps

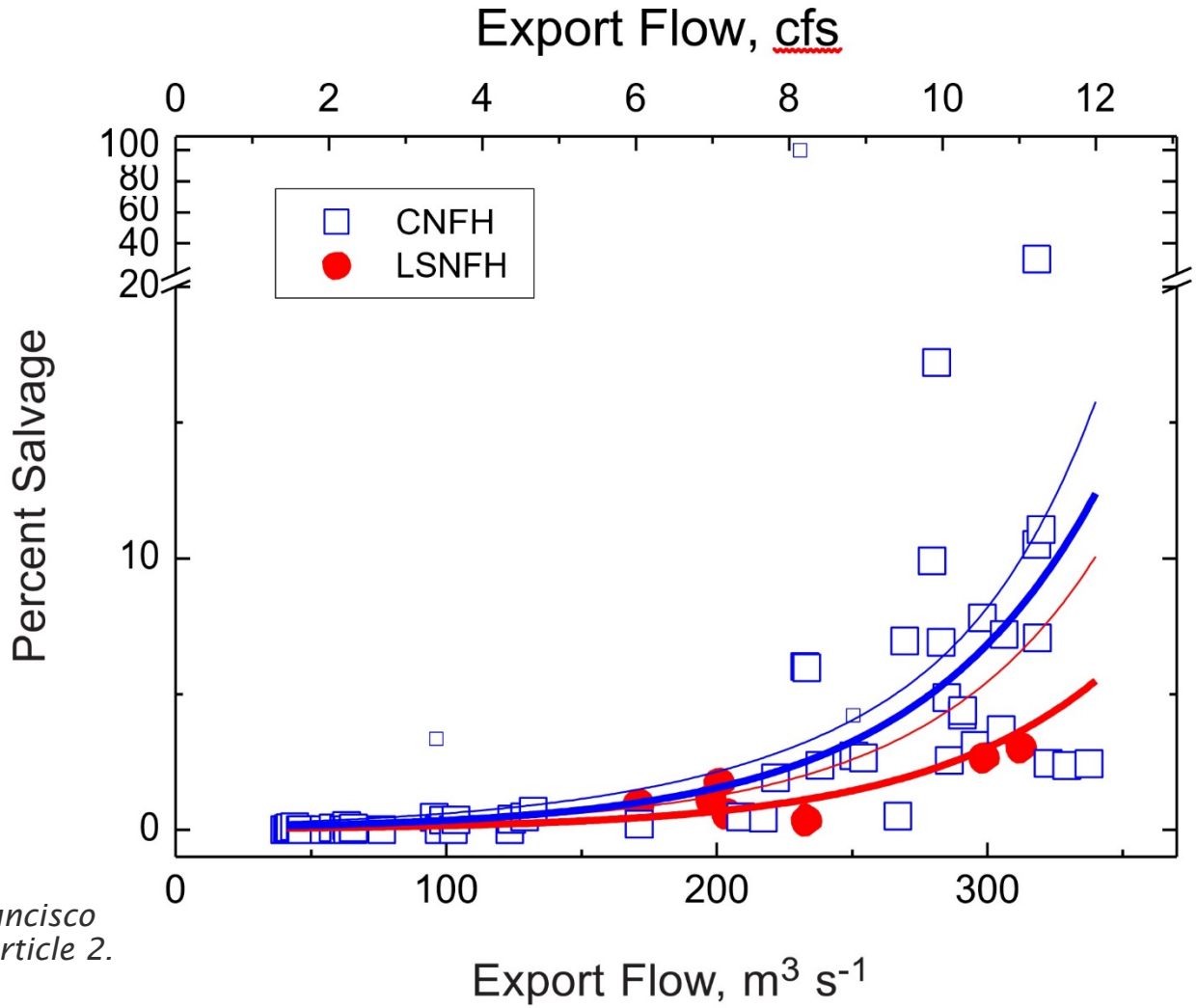
Correlation – South Delta exports & salmonid losses

Steelhead



Correlation – South Delta exports & salmonid losses

Chinook



Source: Kimmerer, W.J. 2008. San Francisco Estuary and Watershed Science 6(2): article 2.

Proposed mitigating conditions

1. Convert April & May OMR flow standards in WaterFix BiOp into enforceable water rights conditions

2. Fund and implement trap-and-barge and tag-and-monitor studies to improve ability to adaptively manage WaterFix fishery impacts