

Revised Fish Agency Scenarios for BDCP Operations Development

November 14, 2012

NGO Meeting

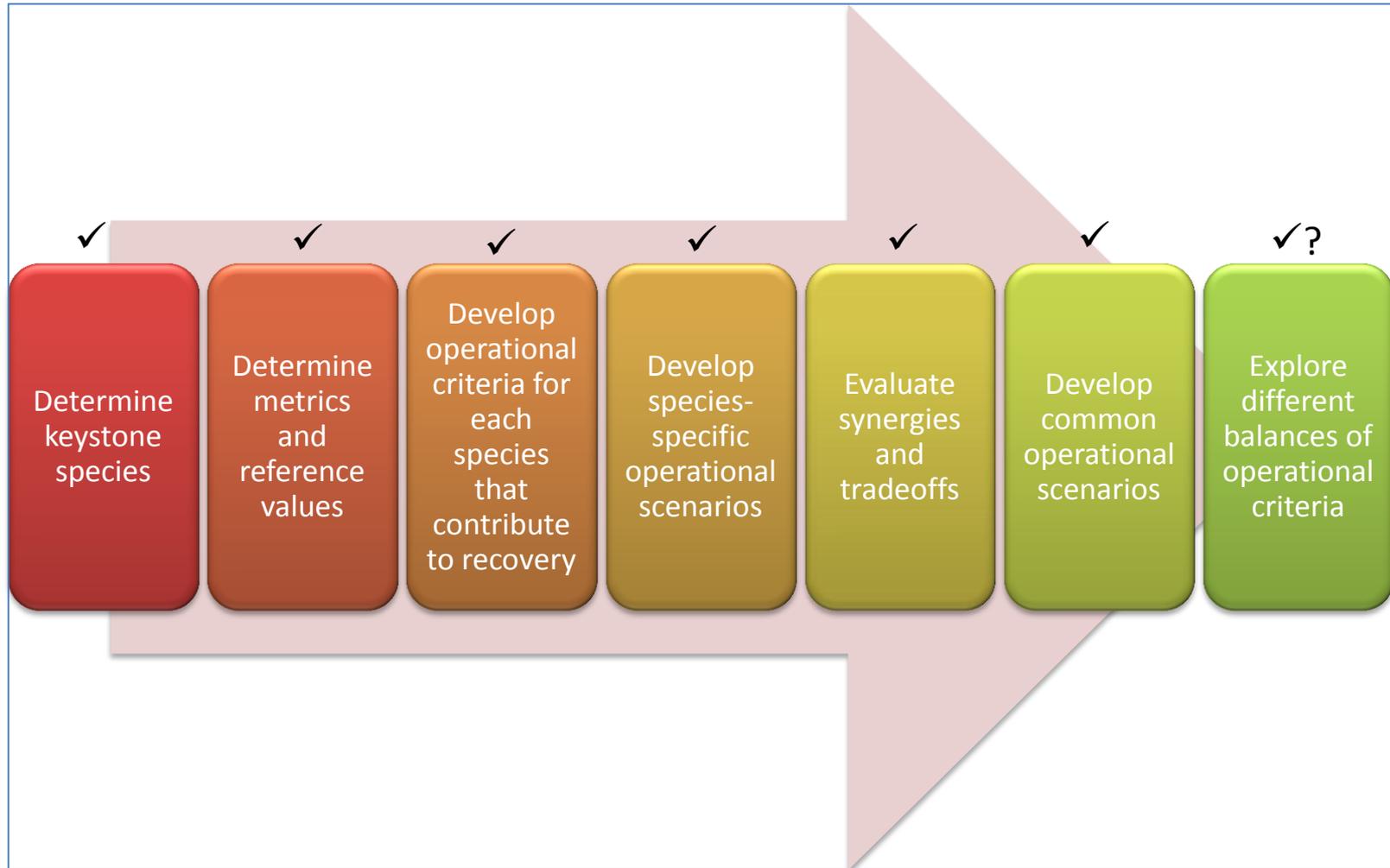
History of Fish Agency Combined Species Evaluations

- During April-May 2012 Fish Agencies developed water operations that were intended to recover each of the covered fish species
- Combined species operational scenarios were developed to assess ability and impacts of achieving water operation metrics related to biological objectives
- Modeling of these scenarios led to Combined Species 5 (CS5) assumptions for subsequent consideration
- Assumes only water operations (CM1) are used to meet permitting criteria.
- Did not include consideration of water supply or other resource considerations, other than health and safety.

Initial CS5 (May 2012) Analysis Overview

- Goals of analysis
 - Determine the operational parameters and metrics for the main species that drive operations
 - Identify synergies and tradeoffs amongst species operational targets
 - Develop scenarios that integrate operational targets for all species that contribute to recovery
 - Identify areas of uncertainty and explore the sensitivity of water operations to these parameters
- Started analyses based on Jan 2010 proposed operations and added CS5 criteria
- All analyses performed with Early Long-Term assumptions (climate and sea level change, demand growth)

Analytical Approach



7 Keystone Species Selected for Analysis

- Species for which significant effect on operational parameters may be expected
- 7 keystone species considered in analysis
 - Delta smelt
 - Longfin smelt
 - Winter run chinook
 - Spring run chinook
 - Fall and late-fall run chinook
 - San Joaquin salmonids
 - White and green sturgeon

Key Operational Parameters Considered

- ***Shasta April and September storage*** targets to develop and manage the available cold water pool
- ***Keswick release targets*** to provide flows necessary for temperature control and enhancing ecosystem
- ***Old and Middle River flows*** along with the ***Head of Old River Barrier*** operations to protect against entrainment risk
- ***Delta outflow and X2*** criteria to enhance the suitable habitat availability
- ***North delta diversion bypass flows*** to reduce the risk of increased reverse flows on Sacramento River downstream of Georgiana Slough and increase migration flows

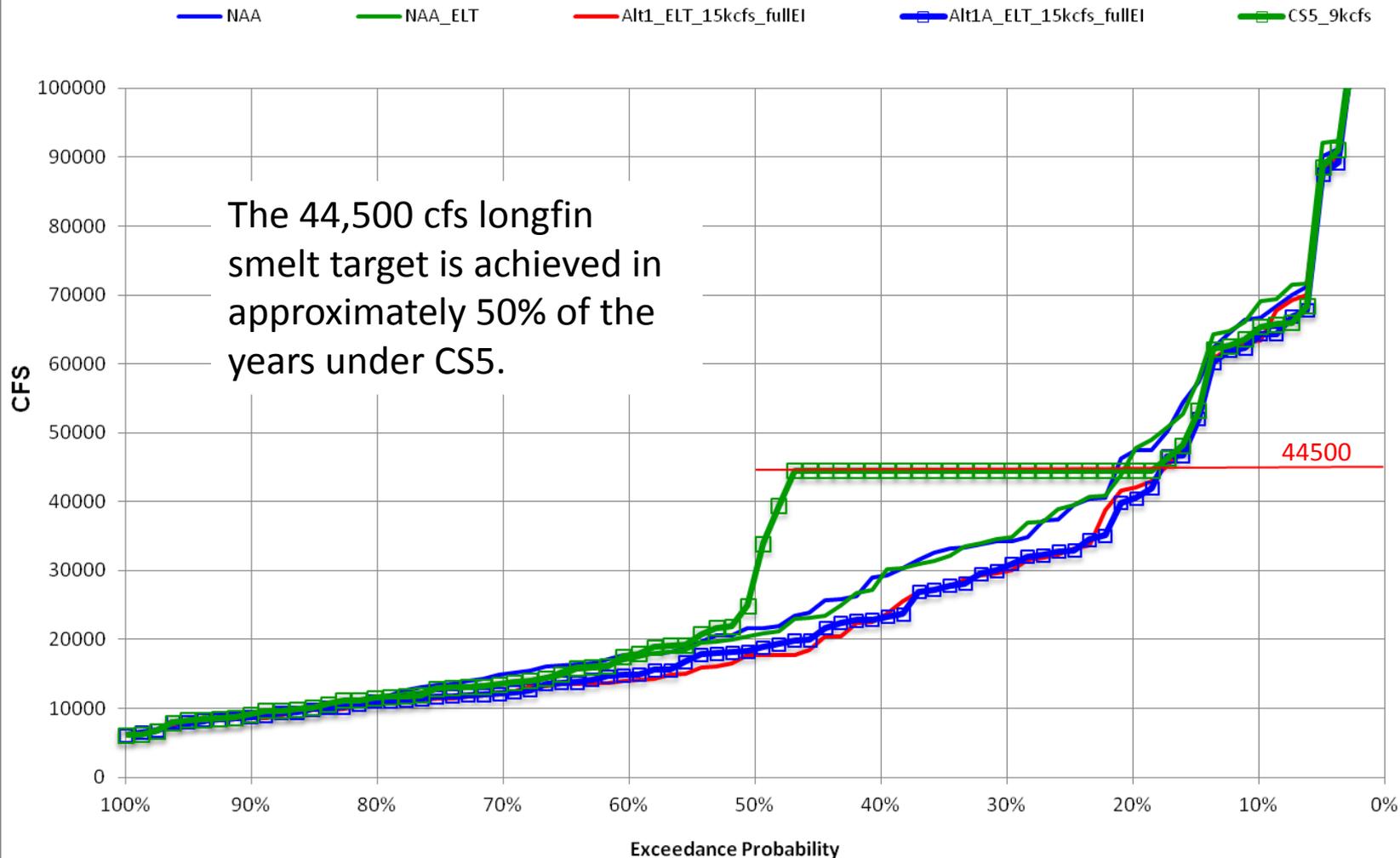
Main Findings from Initial (May 2012) Analyses

- Objectives that could be achieved through export curtailments and re-operation
 - North delta bypass flows
 - Old and Middle River flows
 - Head of Old River Barrier operations
 - Summer and fall outflow/X2
- Objectives that require significant integrated operations and potential transference of impacts to other tributaries
 - Shasta storage targets were achieved by shifting quantity and timing of contributions from Trinity and Oroville
 - Spring outflow targets were achieved by higher releases and lower storage in Trinity, Oroville, and Folsom
- Delta water exports and upstream re-operations were required to achieve the CS5 water operations objectives
- Potential for substantial effects on Trinity, Oroville, and Folsom Reservoirs and associated downstream flows during some months

Spring Delta Outflow (Mar-May)

Results Exceedance Probability

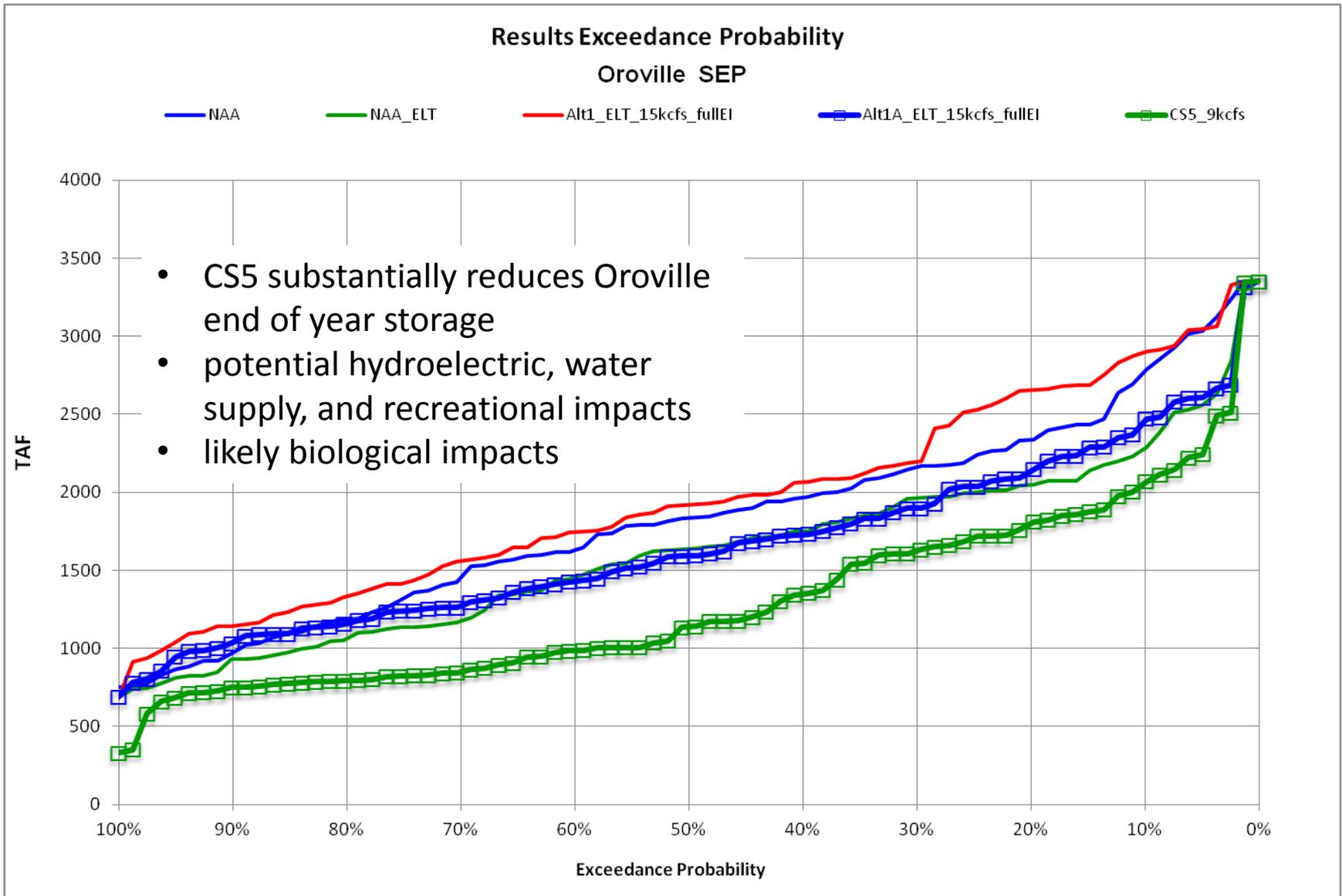
Delta Outflow MAR-MAY period average



The 44,500 cfs longfin smelt target is achieved in approximately 50% of the years under CS5.

44500

Oroville End of September Storage



Scope-Approach to CS5 Assessment

1. Delta Scope

- CS5 Delta outflow targets
- Achieve to extent possible by export curtailments on both SWP and CVP
- Address health and safety limits

2. CVP System Scope

- CS5 Delta Outflow and Upstream targets
- Achieve to extent possible through re-operation of CVP upstream facilities (Folsom, Shasta, Trinity) along with delta exports limits
- Target optimization of Sacramento River temp control

3. SWP/CVP System Scope

- CS5 Delta Outflow and Upstream targets
- Achieve to extent possible through re-operation of CVP and SWP upstream facilities (Shasta, Folsom, Trinity, Oroville) along with delta export limits
- Allow flexing of COA to target integrated operations

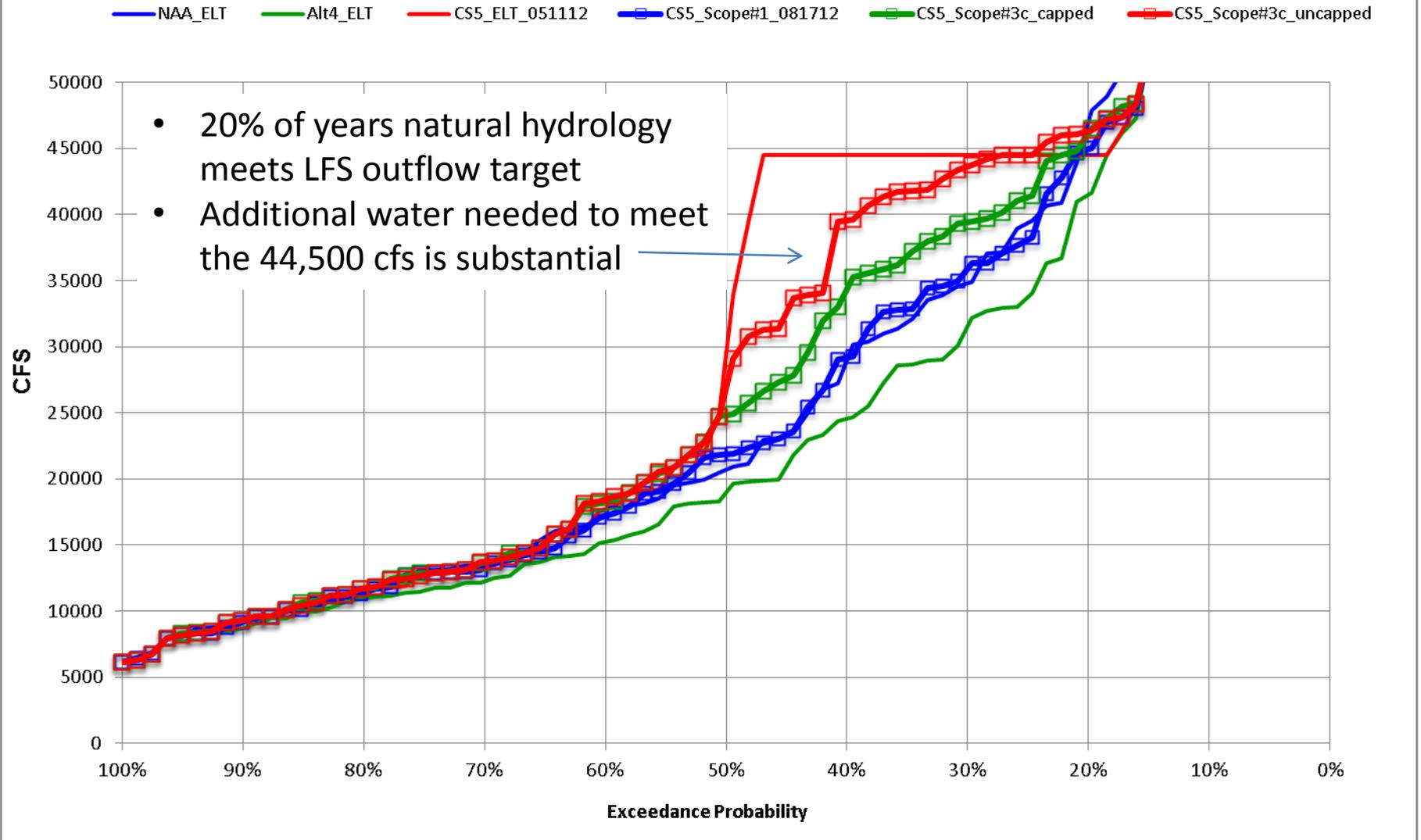
Balancing Upstream Storage and Spring Delta Outflow

- Current evaluation approach
 - SWP and CVP delta exports limited to health and safety limits when CS5 outflow targets are triggered
 - Limit upstream releases to periods of higher storage to reduce late season risk (temperature, carryover)
 - Maintain sufficient supply for tributary needs (non-project water supply, instream flows, temperature, other regulatory obligations)
 - Limit releases to available supplies by tributary (“capped” scenario only)
 - Requires re-balancing of reservoir storage within CVP and between SWP and CVP (COA)

Upstream Release Operations for CS5 Outflow Targets

1. CS5 Delta outflow requirements are first met through export curtailments (Delta Scope)
2. Reservoir releases are requested to meet remaining CS5 Delta Outflow targets based on the following conditions:
 - Protect storage for late season tributary temperature needs. If storage is above target levels, releases for CS5 Delta outflow are permitted
 - If storage falls below target levels, no releases for CS5 delta outflow requirements (exports are curtailed)
 - Target releases to Releases to be up to:
 - a maximum of reservoir inflow; no stored water releases, and;
 - Limited to:
 - Shasta 15,000 cfs
 - Folsom 5,000 cfs
 - Oroville 10,000 cfs
 - Releases from reservoirs are proportionate to expected inflow
3. Preference Oroville over CVP reservoirs for releases

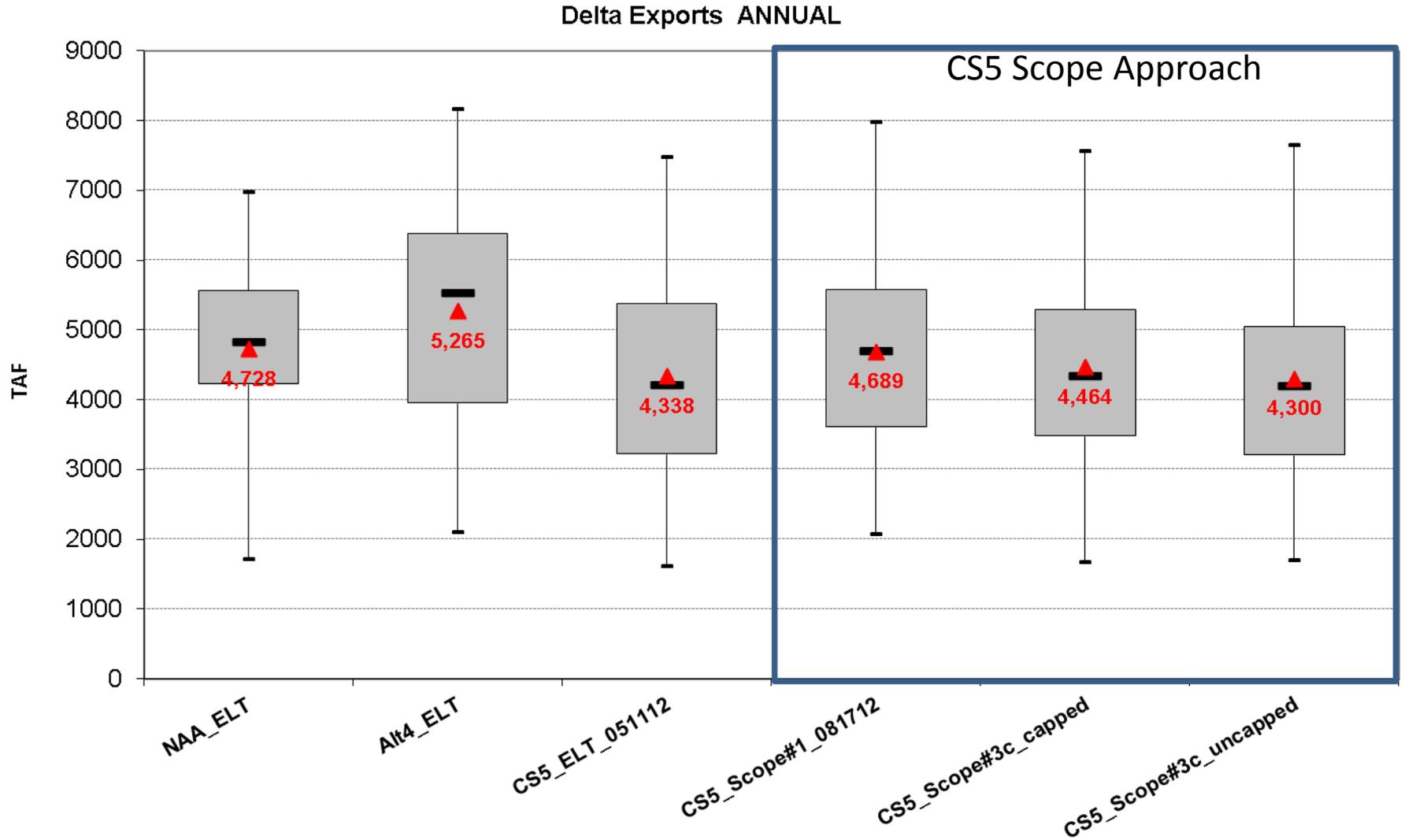
Spring Delta Outflow (Mar-May)



Annual Delta Exports

Single Month Box Plot Study Comparison

(Box=25th to 75th percentile range, whiskers=min and max, dash=median, triangle=mean)



Potential Impacts on Other Resources

- Operational risk related to early-season decision-making
- Potential tradeoffs between temperature operations on Feather and Trinity Rivers, and delta outflow achievement
- Reductions in hydro-electric power generation
- Changes in reservoir storage and recreation; increases in frequency of low levels for Folsom and Oroville
- May require revisiting federal-state sharing arrangements (COA)

Summary Findings

- Most CS5 south delta flow targets (entrainment), fall outflow targets (delta smelt habitat), and summer outflow targets (delta smelt habitat) are already achieved in Alt 4
- All CS5 targets, except spring outflow can be achieved through modified exports in the delta; limited changes to upstream storage operations (CS5 Scope 1)
- Spring outflow targets CANNOT be fully achieved without substantial changes to operations at upstream reservoirs.
- Two scenarios (CS5 Scope 3c “capped” and “uncapped”) illustrate that partial achievement of spring outflow targets is likely possible with protections for tributary reservoir and biological operations
 - “Capped” scenario is largely protective of upstream storage conditions and focuses on hydrologic synchrony of tributary inflow and releases
 - “Uncapped” scenario results in significant re-operation of Oroville (to a lesser extent Folsom and Trinity Reservoirs) and large stored water releases to target spring outflow
- Re-operation of Oroville in particular, through both bypassing reservoir inflows and stored water releases to offset Shasta releases, is significant
 - Reoperation will increase the risk to recreational resources, water delivery resources, and hydropower resources, and may increase the risk of Feather River biological resources (sturgeon) dependent on summer and fall flow regimes.

Summary of Proposed Project Conservation Measure 1

- 9,000 cfs north Delta intake capacity
 - 2010 bypass flow criteria with ramp up and adaptive management
 - Intakes 2, 3, and 5
- Scenario 6 south Delta operations
 - Adaptive management of OMR and head of Old River barrier
- Decision Tree for fall and spring outflow
- Commitment to no changes in Shasta or Trinity; no changes in Folsom end of May storage and in Oroville end of September storage

Decision Tree Detail

- Fall X2
 - Either D-1641 or FWS RPA (74 km in wet, 79 km in above normal)
- Spring (March to May) outflow
 - Either D-1641 or

Exceedance %	10%	20%	30%	40%	50%	60%	70%	80%	90%
Proposed Project (cfs in Mar-May based on 90% forecast)	> = 44,500	> = 44,500	> = 35,000	> = 32,000	> = 23,000	17,209	13,274	11,382	9,178

- Both the high and low ends of the decision tree are fully evaluated in the effects analysis