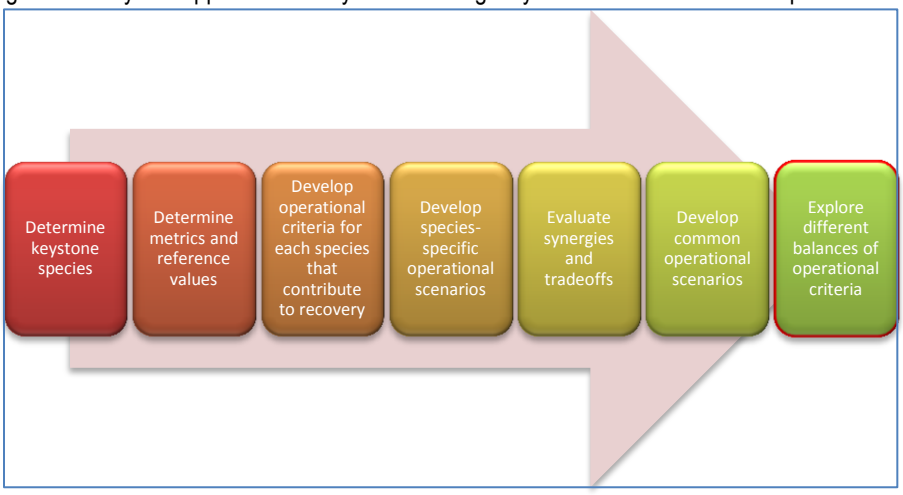
Five Agency BDCP Combined Species Scenario Evaluations and Proposed Project Operations

DRAFT – November 13, 2012

Introduction

In May 2012, the USFWS, NMFS and DFG (Fish Agencies) were requested by DWR to provide technical advice to the project by developing a set of water operations scenarios targeting specific species objectives and evaluated the ability of these scenarios to satisfy a range of performance metrics. Figure 1 summarizes the analytical approach that was developed by the consulting team with input from the fish agencies and followed in the evaluation. Seven keystone species were included in the assessment: winter run Chinook, fall run Chinook, spring run Chinook, delta smelt, longfin smelt, white and green sturgeon, and San Joaquin salmonids. For each of the species, specific flow and storage metrics were developed and some of the metrics were converted to operating criteria. CALSIM II model simulations were developed for each of the species, then operational criteria were combined and refined to create "combined species" simulations. A total of nine combined species simulations were developed to explore different balances of operating criteria. Run #5 is referred to as Combined Species 5 or CS5.

Figure 1. Analytical Approach for May 2012 Fish Agency Scenarios: BDCP Initial Operations Development



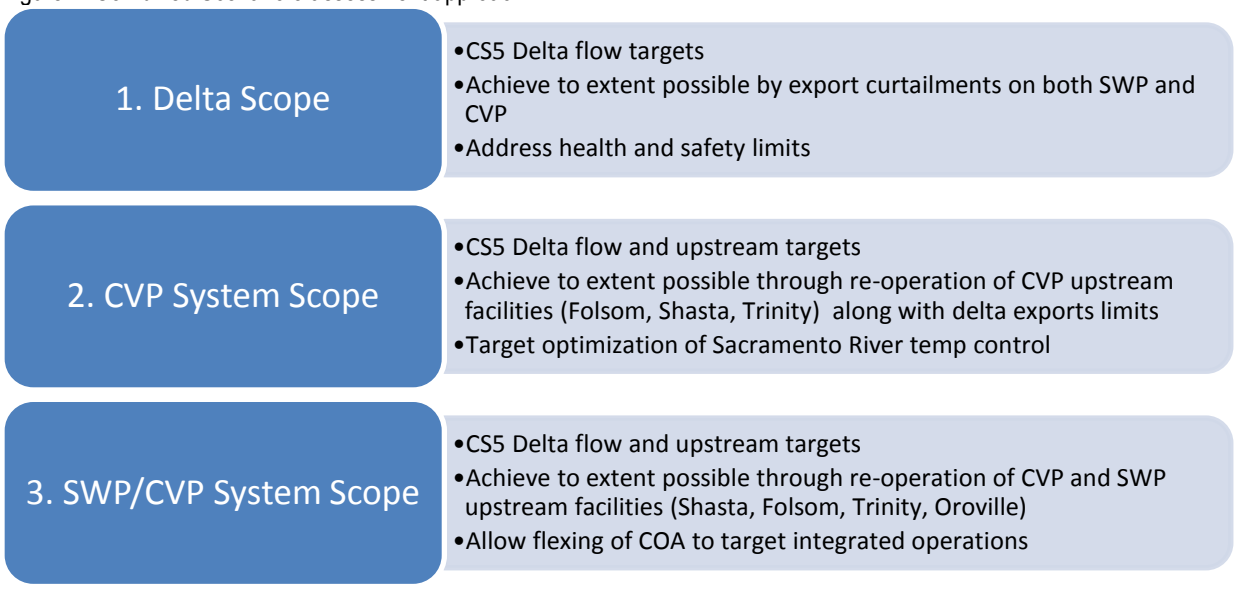
Based on draft CS5 CALSIM II simulation results, the target flow and Shasta storage metrics developed by the Fish Agencies were generally achieved. However, significant changes occurred to upstream storage and river flow conditions on the Trinity River, Feather River, and American River. In addition, some of the Sacramento River spring flow criteria were not achieved due to prioritization of the Shasta coldwater pool.

Updated Assessment

In August and September, further evaluations of the CS5 criteria were performed by the consultants to identify opportunities to achieve Sacramento River spring flow targets while minimizing impacts to other upstream resources. The updated assessment consisted of three

levels of analysis that incrementally add greater operational contributions (or operational scope) to achieve the CS5 targets. The approach is shown graphically in Figure 2. In the "Delta Scope", CS5 delta flows are satisfied to the extent possible through the use of SWP and CVP delta export reduction only. Following this evaluation, the "CVP System Scope" considered adding upstream CVP operational changes to better achieve the CS5 targets. Finally, the "SWP/CVP System Scope" considered adding flexible operations of the SWP upstream facilities in conjunction with CVP and SWP delta operations to maximize the potential to meet CS5 objectives.

Figure 2. Combined Scenario 5 assessment approach:



The updated assessment allowed for incremental analyses and refinements. All evaluations began with the BDCP Alternative 4.Comparisons are made based on the previously defined metrics (May 2012).

Summary Results and Findings

The updated analysis resulted in three main simulations that reflect the deliberations of the inter-agency technical work group. One simulation, CS5_Scope1, reflects the potential to achieve the CS5 delta flow targets through export operations alone. The two other simulations (CS5_Scope3 "capped" and "uncapped"), reflect a broader integration of SWP and CVP upstream and delta operations to achieve the CS5 targets. One simulation targeted contributions to CS5 spring delta outflow targets limited by upstream storage protection and releases no greater than reservoir inflow and tributary ecological flows ("capped" simulation). The other simulation eliminated the "caps" on releases and allowed significant stored water releases to meet CS5 spring outflow targets ("uncapped" simulation).

Over the course of the development of these operational scenarios and through analysis of the resulting simulations, the following key findings can be summarized:

- Most of the CS5 south delta flow criteria (entrainment), fall outflow criteria (delta smelt habitat), and summer outflow criteria (delta smelt habitat) are already achieved in Alt 4 (Alt 4).
- All CS5 criteria, except Sacramento River flows for Fall run Chinook and spring outflow can be achieved through modified exports in the delta. These operations result in limited changes to upstream storage operations (CS5 Scope 1).
- Spring outflow criteria for longfin smelt (LFS), and to a lesser degree white and green Sturgeon (WGS) and fall fun Chinook (FRC), however, 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 criteria is likely possible with protections for tributary reservoir and biological operations, but significant re-operation of Oroville, and to a lesser extent Folsom and Trinity Reservoirs, would be required to achieve the higher levels of spring outflows.
- Re-operation of Oroville in particular, through both bypassing reservoir inflows and stored water releases to offset Shasta releases, is significant. This reoperation would increase the risk to recreational resources, water delivery resources, and hydropower resources. Releases for spring delta outflow often result in high river flows, spills into flood bypasses, and primary delta flow changes occur through the Yolo Bypass

A summary of the key resulting operational metrics from these simulations are included in Table 1.

Proposed Project Operations

Based on the additional scenario modeling, the State and Federal Principals have agreed that the proposed operations (below) are ready to proceed to the draft EIS stage, and that it will carry with it a suitable scope of issues and alternatives to these operations. The proposed project operations include the use of the Decision Tree approach to evaluate the effectiveness of different spring and fall delta outflow criteria (as shown in Table 2). Based on the results of these evaluations, the proposed delta outflow criteria may be refined over the next 10-15 years (between permit issuance and operation of a new north delta facility).

There are disagreements between NMFS and DWR on the underlying science and necessity of including certain additional operational criteria into a range for CM1. Specifically, NMFS recommended inclusion of spring bypass flow criteria, green sturgeon outflow criteria, and additional South delta criteria (refinements to scenario 6) in December through June that were included in the May version of CS5, as these may be necessary permit terms for the initial operations. DWR and DFG recommended that these criteria be included in the adaptive management program. The Principals agreed that these issues will be evaluated in the range of criteria considered in the during the NEPA process.

Table 1. Detailed Summary of Key Operational Metrics

CS5 Operational Metrics	Target Achievement	NAA ELT	Alt 4 ELT	CS5 Scope 1	CS5 Scope 3c Capped	CS5 Scope 3c Uncapped
South Delta Entrainment and Habitat Protection						
OMR Flows (per RPA)	Per RPA	100%	100%	100%	100%	100%
OMR Winter (Jan-Feb) > -2500 cfs	All years	20%	67%	100%	100%	100%
OMR Spring (Mar-May) > -2500 cfs	All years	100%	100%	100%	100%	100%
OMR Summer/Fall (Jun-Dec) > -5000 cfs	All years	17%	84%	85%*	90%*	91%*
Summer and Fall Delta Outflow Criteria						
Fall (Sep-Nov) X2 (per RPA)	All W/AN years	100%	100%	100%	100%	100%
Summer (Jul-Aug) X2 < 81 km	All W/AN years	100%	100%	100%	100%	100%
CS5 Spring Delta Outflow Criteria						
Spring Outflow(Jan-Mar, fall-run) > 35,000 cfs	50%	48%	43%	48%	49%	49%
Spring Outflow (Apr-May, Sturgeon) > 25,000 cfs	50%	33%	26%	32%	43%	45%
Spring Outflow (Mar-May,	50%	44%	39%	44%	49%	50%

Longfin) > 25,000 cfs						
Spring Outflow (Mar-May, Longfin) > 35,000 cfs	50%	29%	24%	30%	40%	41%
Spring Outflow (Mar-May, Longfin) > 44,500 cfs	50%	21%	20%	22%	22%	27%
Spring Outflow (Mar-May) in Wetter Years (cfs)		50,300	46,600	49,300	51,600	54,000
Spring Outflow (Mar-May) in Drier Years (cfs)		12,900	11,900	13,000	13,500	13,400
CS5 Upstream Storage Conditions						
Shasta Storage						
EOA Storage > 3.0 MAF		85%	87%	85%	88%	88%
EOA Storage > 3.6 MAF		79%	80%	79%	88%	88%
EOA Storage > 3.8 MAF		70%	71%	73%	77%	76%
EOS Storage > 1.9 MAF		83%	83%	83%	88%	88%
EOS Storage > 2.2 MAF		73%	73%	74%	79%	78%
EOS Storage > 2.4 MAF		70%	71%	67%	72%	68%
Trinity Storage						
EOM Storage > 2.2 MAF		32%	33%	33%	17%	17%
EOS Storage > 600 TAF		89%	89%	88%	91%	91%
Folsom Storage						
EOM Storage > 850 TAF		61%	61%	62%	48%	50%

EOS Storage > 400 TAF		55%	51%	52%	48%	48%
Oroville Storage						
EOM Storage > 2.4 MAF		74%	76%	76%	70%	48%
EOS Storage > 1.5 TAF		59%	56%	56%	50%	41%
Water Delivery Indicators						
Delta Exports (MAFY)		4.7	5.3	4.7	4.5	4.3
SWP Allocation (%)		61%	71%	66%	60%	57%
CVP SOD Ag Allocation		44%	50%	40%	41%	40%
CVP NOD Ag Allocation		54%	56%	52%	52%	52%

Table 2 – Proposed Project Operations for Conservation Measure 1

Operational Criteria	**Proposed Project**
Shasta Spring Storage - April and September storage to meet temperature management requirements for winter-run Chinook	Existing BO
Keswick flows - for winter-run	Existing BO
North Delta Diversion Bypass Flows - to improve survival of out-migrating Sacramento River salmonids	Steering committee 2010 proposed operations with ramp up and adaptive management
Winter Outflows - to provide for downstream passage of Sacramento Fall-run Chinook fry through the Delta	D-1641
Spring Outflows - to meet the BDCP goal of increased abundance of longfin smelt and provide attraction flows for white/green sturgeon.	Decision Tree with outflow criteria ranging between D-1641and the following exceedance schedule: Exceedance — Delta Outflow Target (cfs) 10% — > = 44,500 20% — > = 44,500 30% — > = 35,000 40% — > = 32,000 50% — > = 23,000 60% — 17,209 70% — 13,274 80% — 11,382 90% — 9,178
Summer Outflows	D-1641
Fall Outflows	Decision Tree with outflow criteria ranging from D-1641 and FWS RPA (74 km in wet, 79 km in above normal)
Head of Old River Barrier	Mar-June ~100% operation consistent with Scenario 6 and adaptive management
South Delta OMR	Scenario 6 with adaptive management