Appendix L, Shasta Coldwater Pool Management

Attachment L6 Coldwater Pool Storage and Exceedance Analysis

L.6.1 Model Overview

The National Environmental Policy Act (NEPA) alternatives proposed for the long-term operations of the Central Valley Project (CVP) and State Water Project (SWP) have different types of storage and coldwater pool criteria. During development of these criteria, several alternatives (Alternative 2 and Alternative 4) have differing storage and coldwater pool criteria. These criteria are surrogates related to winter-run Chinook salmon biological objectives.

L.6.2 Model Development

CalSim 3 results from NEPA alternatives were used to measure the frequency by which different thresholds are met by each of the alternatives. Storage thresholds are described below for the bin definitions in Alternative 2 and the management approaches in Alternatives 3 and 4.

L.6.2.1 Alternative 2

Alternative 2 storage and temperature operational Goals and Indicators include projected end-of-April (EOA) storage and projected end-of-September (EOS) storage thresholds which sort Shasta actions into various "bins". Bin 1 through 3 proportion of actual carryover for EOA and EOS criteria will be evaluated in April and September using CalSim 3 results (Table L.6-1).

Table L.6-1. Alternative 2 Projected End-of-April and End-of-September Storage Indicators and April Temperature Criteria Targets and Location by Bin

Bins	End-of-April Projected Storage	End-of-September Projected Storage
Bin 1A	At least 3.7 MAF	At least 3.0 MAF
Bin 1B	At least 3.7 MAF	At least 2.4 MAF and less than 3.0 MAF
Bin 2A	At least 3.0 MAF	At least 2.2 MAF
Bin 2B	At least 3.0 MAF	At least 2.0 MAF and less than 2.2 MAF
Bin 3A	Less than 3.0 MAF	Greater than 2.0 MAF
Bin 3B	Less than 3.0 MAF	Less than 2.0 MAF

MAF = million acre-feet.

L.6.2.2 Alternative 3

Alternative 3 water temperature management storage requirements include EOA and EOS criteria for different water year types (Table L.6-2).

Table L.6-2. Alternative 3 Projected End-of-April and End-of-September Storage Thresholds and April Temperature Criteria by Water Year Type

Water Year Type	End-of-April Criteria	End-of-September Criteria
Wet	3.9 MAF	2.2 MAF
Above Normal	3.9 MAF	2.2 MAF
Below Normal	3.9 MAF	2.2 MAF
Dry	3.9 MAF	2.2 MAF
Critical	3.6 MAF	1.9 MAF

MAF = million acre-feet.

L.6.2.3 Alternative 4

Alternative 4 water temperature management requirements would make releases to achieve an EOS storage criteria of 2.0 million acre-feet in all water year types (Table 3).

L.6.3 Methods

L.6.3.1 Assumptions/Uncertainty

See Appendix F. Numeric Modeling, *Modeling Methodology*.

L.6.3.2 Code and Data Repository

Data can be found on the ICF SharePoint in the Data and Code folder (Data and Code).

R code can be found on the ICF SharePoint in the Data and Code folder (Data and Code).

L.6.4 Results

Results are provided by Alternative 2, 3, and 4 targets and criteria.

- Alternatives 2v1-v4,3 and 4 met the Alt 2 EOS storage Bin 1A targets every year (Table 1).
- Alternative 2wTUCP and Alt 2woTUCPwfullVA met the Alt 2 EOS storage Bin 1B target most frequently (90% of years) while Alt 4 met it the least frequently (87% of the years).
- Bin2A EOS targets were met most frequently by Alt2woTUCPwsystemVA most frequently (78%) while it was least frequently met in Alt2woTUCPwoVA. Bin2B EOS storage targets were met all the time in Alternative 2 components without TUCPs, 83% of the time in Alt2wTUCP, and least frequently in Alt 4 (67%).
- Bin3A EOS targets were met 57% of the years in Alt 4, 27% of the years in Alt 2 without TUCP and with Vas, 22% of the time in Alt 2wTUCP, and least often in Alt2woTUCPwoVA.
- Bin3B EOS was met less frequently ranging from 13% in Alt2wTUCP, Alt2woTUCPwDeltaVA, and Alt2woTUCPwsystemVA; 9% of the time in Alt4, and 0% of the time in Alt2woTUCPwoVA.

Table L.6-3. Percent of Years Where Alternative 2 End-of-September Storage Targets Are Met for Each Bin

Bin	Projected EOS Target	Alt2wTUCP woVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AllVA	Alt3	Alt4
Bin 1A	3.0 MAF	100% (18 of 18)	100% (18 of 18)	100% (18 of 18)	100% (19 of 19)	TBA	100% (18 of 18)
Bin 1B	2.4 MAF	90% (46 of 51)	88% (45 of 51)	88% (43 of 49)	90% (44 of 49)	TBA	87% (45 of 52)
Bin 2A	2.4 MAF	75% (6 of 8)	63% (5 of 8)	70% (7 of 10)	78% (7 of 9)	TBA	67% (6 of 9)
Bin 2B	2.2 MAF	83% (5 of 6)	100% (5 of 5)	100% (4 of 4)	100% (4 of 4)	TBA	67% (2 of 3)
Bin 3A	2.2 MAF or 2.0 MAF	22% (2 of 9)	20% (2 of 10)	27% (3 of 11)	27% (3 of 11)	TBA	57% (4 of 7)
Bin 3B	2.0 MAF	13% (1 of 8)	0% (0 of 8)	13% (1 of 8)	13% (1 of 8)	TBA	9% (1 of 11)

EOS = end-of-September; MAF = million acre-feet.

Table L.6-4. Bin Assignments in Alternative 2 and Alternative 4, based on End-of-April Storage

Bin	Projected EOA Storage Target	Alt2wTUCP woVA	Alt2woTUCP woVA	Alt2woTUCP DeltaV	Alt2woTUCP AllVA	Alt3
Bin 1	At least 3.7 MAF	69	69	67	68	70
Bin 2	At least 3.0 MAF	14	13	14	13	12
Bin 3	Less than 3.0 MAF	17	18	19	19	18

EOA = end-of-April; MAF = million acre-feet.

Table L.6-5. Percent of Years Where Alternative 3 End-of-April Criteria Is Met in CalSim 3 for Alternatives

Water Year Type	Projected EOA Storage Target	Alt2wTUCP woVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AllVA	Alt3
Wet	At least 3.9 MAF	100% (28 of 28)	100% (28 of 28)	100% (28 of 28)	100% (28 of 28)	100% (28 of 28)
Above Normal	At least 3.9 MAF	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)
Below Normal	At least 3.9 MAF	89% (16 of 18)	83% (15 of 18)	83% (15 of 18)	83% (15 of 18)	89% (16 of 18)
Dry	At least 3.9 MAF	58% (14 of 24)	54% (13 of 24)	54% (13 of 24)	54% (13 of 24)	58% (14 of 24)
Critical	At least 3.6 MAF	6% (1 of 16)	6% (1 of 16)	6% (1 of 16)	6% (1 of 16)	6% (1 of 16)

EOA = end-of-April; MAF = million acre-feet.

Table L.6-6. Percent of Years Where Alternative 3 End-of-September Criteria is Met in CalSim 3 for Alternatives

Water Year Type	Projected EOS Storage Target	Alt2wTUCP woVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AllVA	Alt3
Wet	At least 2.2 MAF	96% (27 of 28)	96% (27 of 28)	96% (27 of 28)	96% (27 of 28)	96% (27 of 28)
Above Normal	At least 2.2 MAF	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)
Below Normal	At least 2.2 MAF	94% (17 of 18)	89% (16 of 18)	89% (16 of 18)	89% (16 of 18)	89% (16 of 18)
Dry	At least 2.2 MAF	92% (22 of 24)	92% (22 of 24)	92% (22 of 24)	96% (23 of 24)	92% (22 of 24)
Critical	At least 1.9 MAF	31% (5 of 16)	31% (5 of 16)	38% (6 of 16)	38% (6 of 16)	31% (5 of 16)

EOS = end-of-September; MAF = million acre-feet.

Table L.6-7. Percent of Years Where Alternative 4 End-of-September Storage Targets Are Met in CalSim 3 for Alternatives

Water Year Type	Projected EOS Storage Target	Alt2wTUCP woVA	Alt2woTUCP woVA	Alt2woTUCP DeltaVA	Alt2woTUCP AllVA	Alt3
Wet	At least 2.0 MAF	100% (28 of 28)	100% (28 of 28)	100% (28 of 28)	100% (28 of 28)	100% (28 of 28)
Above Normal	At least 2.0 MAF	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)	100% (14 of 14)
Below Normal	At least 2.0 MAF	94% (17 of 18)	89% (16 of 18)	89% (16 of 18)	89% (16 of 18)	94% (17 of 18)
Dry	At least 2.0 MAF	96% (23 of 24)	96% (23 of 24)	96% (23 of 24)	96% (23 of 24)	96% (23 of 24)
Critical	At least 2.0 MAF	25% (4 of 16)	19% (3 of 16)	25% (4 of 16)	25% (4 of 16)	31% (5 of 16)

EOS = end-of-September; MAF = million acre-feet.

L.6.5 References