Appendix 11Q Other Delta Species Analyses

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11Q.1 Introduction

This appendix describes several methods used for analysis of potential effects of Alternatives 1, 2 and 3 (herein identified as Alternatives 1–3) in the Delta: the salvage-density method, X2-abundance index regressions, and the threadfin shad south Delta entrainment risk analysis.

11Q.2 Salvage-Density Method

The salvage-density method was used recently by California Department of Water Resources (2020:E-87). The method was as follows:

- All data were downloaded from https://apps.wildlife.ca.gov/Salvage[1];
- Water years 2009–2020 were included, as these water years were complete, and the water year type was known (http://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST);
- Juvenile salmonids with clipped and unclipped adipose fins were included, as together they represent hatchery-origin and wild fish that are all part of the Evolutionarily Significant Unit (ESU);
- Daily salvage (or loss for juvenile salmonids) density (fish per thousand acre-feet (TAF) of water exported) was calculated for the State Water Project and Central Valley Project south Delta export facilities;
- The daily loss density values for each month, facility, and water year type were multiplied by the CalSim-modeled exports for the No Action Alternative (NAA) and Alternatives 1–3.

The salvage-density method gives outputs in terms of numbers of fish salvaged (or lost), but these outputs are not predictions of future entrainment but rather differences in south Delta exports between alternatives weighted by historical salvage or loss density of fish.

Results from the salvage-density method are presented in the main body of Chapter 11, *Aquatic Biological Resources*.

[1] This website includes salvage density for all species and loss density for salmonids; the latter was used in this analysis.

11Q.3 X2-Abundance Index Regressions

Several regression equations between abundance indices of various Delta species and X2 developed by Kimmerer et al. (2009) were used to compare the NAA and Alternatives 1–3. The regression equations were implemented in a spreadsheet and consisted of the following, which were applied to DSM2-modeled monthly mean X2 outputs for NAA and Alternatives 1–3:

- Striped bass
  - Bay otter trawl index = $10^{(5.2 - 0.73 - 0.016 * (\text{Mean April–June X2}))}$
  - Bay midwater trawl index = $10^{(5.8 - 0.93 - 0.027 * (\text{Mean April–June X2}))}$
  - Fall midwater trawl index = $10^{(4.1 - 0.9 - 0.011 * (\text{Mean April–June X2}))}$
  - Summer townet index = $10^{(2.5 - 1.18 - 0.019 * (\text{Mean April–June X2}))}$
  - Summer townet survival index = $10^{(4.6 - 0.79 - 0.025 * (\text{Mean April–June X2}))}$
- American shad
  - Bay midwater trawl index = $10^{(4.9 - 0.018 * (\text{Mean February–May X2}))}$
  - Fall midwater trawl index = $10^{(4 - 0.21 - 0.013 * (\text{Mean February–May X2}))}$
- Starry flounder
  - Bay otter trawl index = $10^{(4.7 - 0.64 - 0.03 * (\text{Mean March–June X2}))}$
- Bay shrimp
  - Bay otter trawl index = $10^{(3.7 - 0.02 * (\text{Mean March–May X2}))}$

Results of the X2-abundance index regressions are presented in the main body of Chapter 11, *Aquatic Biological Resources*.

11Q.4 Threadfin Shad South Delta Entrainment Risk Analysis

Inference regarding potential entrainment risk to threadfin shad was made on the basis of several statistical relationships between modeled particle entrainment at the south Delta export facilities and export: inflow ratio, as developed by Kimmerer and Nobriga (2008). To correspond with the period of potential impact and the Delta locations with the highest density of threadfin shad (Feyrer et al. 2009), the analysis focused on the months of June–November for the particle release locations of San Joaquin River at Medford Island, Potato Slough, and Stockton. The logistic equations for these locations that were applied in the analysis were as follows (Nobriga pers. comm.):

- Medford Island: Proportional entrainment = $1-(1/(1+0.00592509281258315 * e^{34.8002358833536 * E:I}))$
- Potato Slough: Proportional entrainment = $1-(1/(1+0.0163841512024925 * e^{23.708308398635 * E:I}))$

- Stockton: Proportional entrainment = 1-(1/(1+ 0.00840706847099802*$e^{32.6988703978096*E:I}$))

Results of the threadfin shad south Delta entrainment risk analysis are presented in the main body of Chapter 11, *Aquatic Biological Resources*.

11Q.5 References Cited

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