

## **Appendix 12I**

# **Salmonid Population Modeling**

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Line items and numbers identified or noted as “No Action Alternative” represent the “Existing Conditions/No Project/No Action Condition” (described in Chapter 2 Alternatives Analysis).  
Table numbering may not be consecutive for all appendixes.

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# APPENDIX 12I

## Salmonid Population Modeling

### 12I.1 Overview

This appendix provides a summary of modeling performed to simulate the annual production potential for each run of Chinook salmon in the Sacramento River for the Draft Environmental Impact Report/Environmental Impact Statement (DEIR/EIS). It includes a description of the SALMOD model and the results used in the detailed evaluation of the Sites Reservoir Project (Project) action alternatives (alternatives). Results were used or referenced in Chapter 12 Aquatic Biological Resources. The fisheries impact assessment and methodology is described in Chapter 12 Aquatic Biological Resources and in Appendix 12B Fisheries Impact Assessment Methodology and Appendix 12C Fisheries Impact Summary.

#### 12I.1.1 Introduction

The analytical framework used to evaluate the alternatives is summarized in Chapter 5 Guide to the Resource Analyses and Appendix 6B Water Resources System Modeling. Assumptions used in modeling the alternatives are summarized in Appendix 6A Modeling of Alternatives. SALMOD was applied to compute the annual production potential for juvenile Chinook salmon, including number of out-migrants, annual mortality, length, and weight of the smolts for the fall, late-fall, winter, and spring runs in the Sacramento River from Keswick Dam to just upstream of the Red Bluff Diversion Dam (RBDD).

#### 12I.1.2 SALMOD

SALMOD simulates the population dynamics of the freshwater life stages of anadromous Chinook salmon. Model processes include spawning (egg deposition), egg and alevin development and growth, mortality, and movement (due to habitat limitation, freshets, and seasonal stimuli). Pre-smolts do not graduate to the smolt stage within the model. Instead, they exit the study area and the population is reinitialized with survey estimates of spawning adults each biological year. SALMOD is a spatially explicit model in which habitat quality and carrying capacity are characterized by the hydraulic and thermal properties of individual mesohabitats, which serve as spatial computational units in the model. SALMOD is organized around events occurring during a biological year beginning with spawning and typically concluding with fish that are physiologically “ready” (e.g., pre-smolts), swimming downstream toward the ocean. It operates on a weekly timestep for one or more biological years. Input variables (e.g., streamflow, water temperature, number and distribution of adult spawners) are represented by their weekly average values. SALMOD tracks a population of spatially distinct cohorts that originate as eggs and grow from one life stage to another as a function of local water temperature. The biological characteristics of fish within a cohort are the same. Fish cohorts are tracked by life stage and size class within the spatial computational units. SALMOD uses the weekly averages of the daily flow outputs from the Upper Sacramento River Daily Operations Model (USRDOM) and the daily temperature outputs from the Upper Sacramento River Water Quality Model (USRWQM). The USRDOM model is described in Appendix 6C Upper Sacramento River Daily River Flow and Operations Modeling and the USRWQM model is described in Appendix 7E River Temperature Modeling.

The 2008 Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment (OCAP BA) Technical Appendix P (Reclamation, 2008) describes the SALMOD model in

detail including the development history, model formulation, input assumptions, use of outputs, and limitations of the model. Appendix 12B Fisheries Impact Assessment Methodology also briefly describes the model, its inputs, and summarizes the use of the model results in the detailed evaluation of the alternatives, along with the model limitations.

## 12I.2 SALMOD Assumptions of Returning Chinook Salmon Spawners

This section presents the assumptions used for returning Chinook salmon spawners used in SALMOD modeling for evaluation of the alternatives. The Chinook salmon runs considered in SALMOD include winter, spring, fall, and late fall.

Based on spatial distribution of surveyed redds on various segments of the Sacramento River, a distribution of spawners is assumed for the reach segments in the SALMOD model. The distribution is based on fish survey data and is reported in Appendix P (Reclamation, 2008) of the 2008 OCAP BA.

The total number of returning adults assumed for each of the four runs is shown in Table 12I-1. The numbers of returning adults assumed for each run summarized in Table 12I-1 are approximate maximums of values assumed in recent applications of the SALMOD model. The ratios of spawning females to total number of returning adults are also included in Table 12I-1. References are unavailable for these ratios. The fractional distribution of returning adults, for each reach segment, for each salmon run, are summarized in Table 12I-2. Each segment is identified by locations along the Sacramento River. Using the fractional distribution of spawners shown in Table 12I-2, the number of returning adults was apportioned to the reach segments in the model. The assumed distribution of numbers of returning adults, for each segment, for each salmon run, are summarized in Table 12I-3.

SALMOD modeled production potential is assumed to vary across alternatives and within each alternative across each biological year according to variations in water temperatures, flows, and the resultant habitat available for Chinook salmon. The assumed number and distribution of returning female spawners is not varied by biological year. The high value was assumed for the number of returning female spawners so as to describe the potential available habitat under a wide range of flow and temperature conditions (value based on maximums of values assumed in recent applications of the SALMOD model). Therefore, the SALMOD results are not intended to estimate a specific number of Chinook salmon produced, but rather to provide an index of available habitat assuming that the number of returning female spawners is not limited.

**Table 12I-1  
Number of Returning Chinook Salmon Adults, and Ratio of Spawning Females to All Returning Adults, on the Sacramento River**

| Chinook Salmon Run | Returning Adults (High Curve) | Ratio of Spawning Adults to Non-spawning Adults |
|--------------------|-------------------------------|---|
| Winter             | 8,500                         | 0.48  |
| Spring             | 999                           | 0.48  |
| Fall               | 65,000                        | 0.48  |
| Late Fall          | 14,000                        | 0.48  |

**Table 12I-2**  
**Distribution of Returning Chinook Salmon Adults in Eight Spawning Segments**  
**on the Sacramento River**

| Cumulative Distance from Keswick Dam (meters) | Location of Sacramento River Segment                              | Fraction of Returning Chinook Salmon Adults (percentage) |            |          |               |
|---|---|--|------------|----------|---------------|
|   |   | Winter-Run   | Spring-Run | Fall-Run | Late Fall-Run |
| 5791  | Keswick Dam to Anderson-Cottonwood Irrigation District (ACID) Dam | 41.80  | 4.50       | 10.31    | 34.50         |
| 9025  | ACID Dam to Highway 44 Bridge                                     | 20.50  | 19.08      | 6.21     | 15.30         |
| 28810   | Highway 44 Bridge to Airport Road Bridge                          | 35.40  | 31.67      | 11.11    | 22.80         |
| 41411   | Airport Road Bridge to Balls Ferry Bridge                         | 1.90   | 17.58      | 19.21    | 18.30         |
| 49207   | Balls Ferry Bridge to Battle Creek.                               | 0.10   | 10.59      | 12.91    | 5.60          |
| 56538   | Battle Creek to Jellys Ferry Bridge                               | 0.10   | 15.08      | 18.81    | 2.06          |
| 71413   | Jellys Ferry Bridge to Bend Bridge                                | 0.20   | 1.50       | 13.61    | 0.95          |
| 84828   | Bend Bridge to just upstream of the Red Bluff Diversion Dam       | 0.0  | 0.0        | 7.81     | 0.49          |

**Table 12I-3**  
**Number of Returning Chinook Salmon Adults in Eight Spawning**  
**Segments on the Sacramento River**

| Cumulative Distance from Keswick Dam (meters) | Location of Sacramento River Segment                              | Assumed Number of Returning Adults |            |               |               |
|---|---|------------------------------------|------------|---------------|---------------|
|   |   | Winter-Run                         | Spring-Run | Fall-Run      | Late Fall-Run |
| 5791  | Keswick Dam to Anderson-Cottonwood Irrigation District (ACID) Dam | 3,553                              | 45         | 6,703         | 4,830         |
| 9025  | ACID to Highway 44 Bridge   | 1,742                              | 191        | 4,038         | 2,142         |
| 28810   | Highway 44 Bridge to Airport Road Bridge                          | 3,009                              | 316        | 7,223         | 3,192         |
| 41411   | Airport Road Bridge to Balls Ferry Bridge                         | 161                                | 176        | 12,489        | 2,562         |
| 49207   | Balls Ferry Bridge to Battle Creek.                               | 9                                  | 106        | 8,393         | 784           |
| 56538   | Battle Creek to Jellys Ferry Bridge                               | 9                                  | 151        | 12,228        | 288           |
| 71413   | Jellys Ferry Bridge to Bend Bridge                                | 17                                 | 15         | 8,848         | 133           |
| 84828   | Bend Bridge to just upstream of the Red Bluff Diversion Dam       | 0                                  | 0          | 5,078         | 68            |
| <b>Total</b>                                  |   | <b>8,500</b>                       | <b>999</b> | <b>65,000</b> | <b>14,000</b> |

## 12I.3 Results

This section includes the results of the SALMOD Model for the alternatives evaluated in the DEIR/EIS. The fisheries impact assessment and methodology is described in Chapter 12 Aquatic Biological Resources and in Appendix 12B Fisheries Impact Assessment Methodology and Appendix 12C Fisheries Impact Summary.

### 12I.3.1 Introduction

SALMOD overall annual production potential and potential production by life stage for each Chinook salmon run are included in this appendix. This document includes summary tables and exceedance plots comparing the results. The summary tables and exceedance plots are organized by the Chinook salmon run, in the following order:

- Sacramento Fall-Run
- Sacramento Late Fall-Run
- Sacramento Winter-Run
- Sacramento Spring-Run

Summary tables for annual production potential include long-term average and averages by water year type (SWRCB D-1641 40-30-30 Index). The tables also include the absolute and relative differences between alternatives.

Exceedance Probability Charts and Summary Tables are included for Total Potential Production. Only Summary Tables are included for Potential Production by Life stage.

SALMOD results are not intended to estimate a specific number of Chinook salmon produced, but rather to provide an index of available habitat assuming that the number of returning female spawners is not limited. Further guidance on the appropriate use of model results is presented in Appendix 6B Water Resources System Modeling.

### 12I.3.2 Comparisons

For each parameter, a report is provided for the following comparisons:

- Alternative A compared to No Action Alternative
- Alternative B compared to No Action Alternative
- Alternative C compared to No Action Alternative
- Alternative D compared to No Action Alternative

## 12I.4 References

Bureau of Reclamation (Reclamation). 2008. 2008 Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment. Technical Appendix P SALMOD Model. May 2008. U.S. Bureau of Reclamation, Mid-Pacific Region, Sacramento, California. Accessible at [http://www.usbr.gov/mp/cvo/OCAP/sep08\\_docs/Appendix\\_P.pdf](http://www.usbr.gov/mp/cvo/OCAP/sep08_docs/Appendix_P.pdf).

# **Appendix 12I**

## **Salmonid Population Modeling (SALMOD)**

### **Results**

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Line items and numbers identified or noted as “No Action Alternative” represent the “Existing Conditions/No Project/No Action Condition” (described in Chapter 2 Alternatives Analysis).  
Table numbering may not be consecutive for all appendixes.

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**Alternative A Compared to No Action Alternative**

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Table AQ-02-3a-1

| Annual Potential Production for Fall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 26,765,370                                   |
| Alternative A   | 27,462,353                                   |
| Difference  | 696,983                                      |
| Percent Difference <sup>3</sup>   | 2.6  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 18,628,120                                   |
| Alternative A   | 17,066,670                                   |
| Difference  | -1,561,450                                   |
| Percent Difference  | -8.4   |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 23,411,148                                   |
| Alternative A   | 25,904,237                                   |
| Difference  | 2,493,089                                    |
| Percent Difference  | 10.6   |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 31,508,109                                   |
| Alternative A   | 31,494,393                                   |
| Difference  | -13,716                                      |
| Percent Difference  | 0.0  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 33,288,388                                   |
| Alternative A   | 35,158,561                                   |
| Difference  | 1,870,174                                    |
| Percent Difference  | 5.6  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 31,873,541                                   |
| Alternative A   | 35,036,403                                   |
| Difference  | 3,162,861                                    |
| Percent Difference  | 9.9  |
| <sup>1</sup> Based on the 80-year simulation period<br><sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.<br><sup>3</sup> Relative difference of the annual average |  |

Table AQ-02-3a-2

| Annual Production of Listed Life-stages for Fall-Run Chinook Salmon   |                                    |            |            |                |                                 |
|---|------------------------------------|------------|------------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production  |                                    |            |            |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |            |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt  | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |            |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 57,847,525                         | 35,498,044 | 27,541,840 | 26,765,767     | 54,307,608                      |
| Alternative A   | 59,275,140                         | 36,450,009 | 28,293,867 | 27,462,422     | 55,756,288                      |
| Difference  | 1,427,615                          | 951,965    | 752,026    | 696,654        | 1,448,681                       |
| Percent Difference <sup>3</sup>   | 2.5                                | 2.7        | 2.7        | 2.6            | 2.7                             |
| <b>Water Year Types<sup>2</sup></b>   |                                    |            |            |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 35,415,749                         | 24,936,409 | 19,162,458 | 18,628,457     | 37,790,915                      |
| Alternative A   | 31,977,752                         | 22,937,160 | 17,578,672 | 17,066,879     | 34,645,551                      |
| Difference  | -3,437,997                         | -1,999,250 | -1,583,786 | -1,561,578     | -3,145,364                      |
| Percent Difference  | -9.7                               | -8.0       | -8.3       | -8.4           | -8.3                            |
| <b>Above Normal (12.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 50,324,981                         | 31,117,803 | 24,141,029 | 23,411,153     | 47,552,182                      |
| Alternative A   | 55,342,833                         | 34,357,132 | 26,679,326 | 25,904,250     | 52,583,576                      |
| Difference  | 5,017,852                          | 3,239,329  | 2,538,297  | 2,493,098      | 5,031,394                       |
| Percent Difference  | 10.0                               | 10.4       | 10.5       | 10.6           | 10.6                            |
| <b>Below Normal (17.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 72,575,785                         | 41,303,199 | 32,269,476 | 31,508,877     | 63,778,353                      |
| Alternative A   | 72,841,411                         | 41,335,311 | 32,297,449 | 31,494,387     | 63,791,836                      |
| Difference  | 265,626                            | 32,113     | 27,973     | -14,490        | 13,483                          |
| Percent Difference  | 0.4                                | 0.1        | 0.1        | 0.0            | 0.0                             |
| <b>Dry (22.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 75,122,779                         | 43,988,393 | 34,206,128 | 33,289,065     | 67,495,194                      |
| Alternative A   | 79,371,362                         | 46,528,403 | 36,201,078 | 35,158,562     | 71,359,640                      |
| Difference  | 4,248,583                          | 2,540,010  | 1,994,950  | 1,869,497      | 3,864,447                       |
| Percent Difference  | 5.7                                | 5.8        | 5.8        | 5.6            | 5.7                             |
| <b>Critical (15%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 69,622,645                         | 42,523,582 | 33,019,172 | 31,873,544     | 64,892,716                      |
| Alternative A   | 75,724,757                         | 46,654,801 | 36,323,909 | 35,036,403     | 71,360,312                      |
| Difference  | 6,102,111                          | 4,131,219  | 3,304,737  | 3,162,860      | 6,467,596                       |
| Percent Difference  | 8.8                                | 9.7        | 10.0       | 9.9            | 10.0                            |
| 1 Based on the 80-year simulation period  |                                    |            |            |                |                                 |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |                                    |            |            |                |                                 |
| 3 Relative difference of the annual average   |                                    |            |            |                |                                 |

Figure AQ-02-3a

Annual Potential Production for Fall-Run Chinook Salmon

No Action Alternative

Alternative A

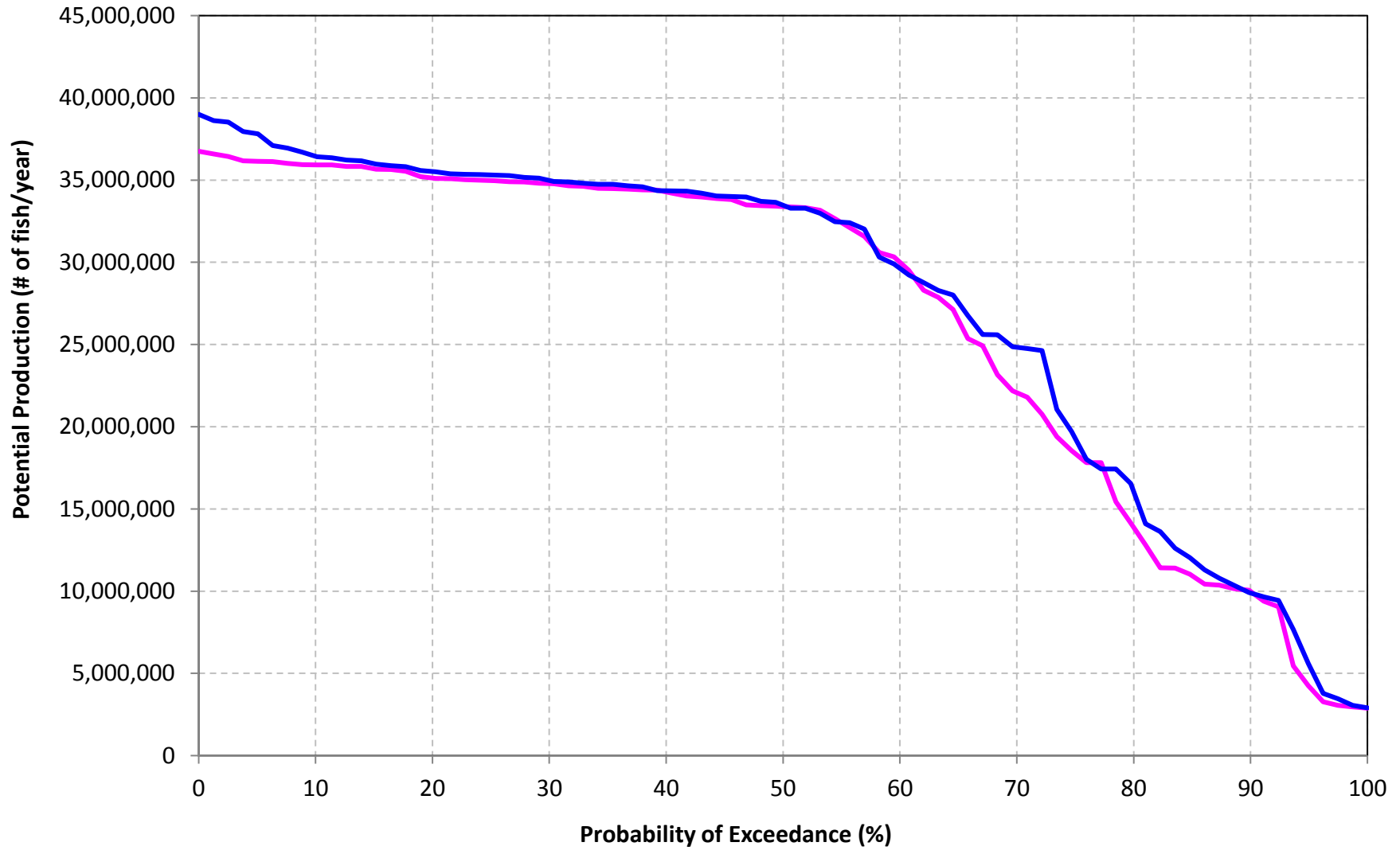


Table AQ-02-3b-1

| Annual Potential Production for LateFall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 7,063,598                                    |
| Alternative A   | 7,200,274                                    |
| Difference  | 136,676                                      |
| Percent Difference <sup>3</sup>   | 1.9  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 6,086,322                                    |
| Alternative A   | 6,078,904                                    |
| Difference  | -7,418                                       |
| Percent Difference  | -0.1   |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 6,786,532                                    |
| Alternative A   | 6,892,545                                    |
| Difference  | 106,013                                      |
| Percent Difference  | 1.6  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 7,885,249                                    |
| Alternative A   | 8,032,452                                    |
| Difference  | 147,203                                      |
| Percent Difference  | 1.9  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 8,016,842                                    |
| Alternative A   | 8,072,276                                    |
| Difference  | 55,435                                       |
| Percent Difference  | 0.7  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 7,023,457                                    |
| Alternative A   | 7,607,470                                    |
| Difference  | 584,013                                      |
| Percent Difference  | 8.3  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-3b-2

| Annual Production of Listed Life-stages for LateFall-Run Chinook Salmon |                                    |            |           |                |                                 |
|---|------------------------------------|------------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production      |                                    |            |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |           |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                               |                                    |            |           |                |                                 |
| No Action Alternative   | 15,438,352                         | 10,129,943 | 7,564,502 | 7,063,599      | 14,628,100                      |
| Alternative A   | 15,609,911                         | 10,253,601 | 7,702,956 | 7,200,274      | 14,903,230                      |
| Difference  | 171,559                            | 123,658    | 138,454   | 136,675        | 275,130                         |
| Percent Difference <sup>3</sup>   | 1.1                                | 1.2        | 1.8       | 1.9            | 1.9                             |
| <b>Water Year Types<sup>2</sup></b>                                     |                                    |            |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 12,053,317                         | 8,428,711  | 6,355,705 | 6,086,326      | 12,442,031                      |
| Alternative A   | 12,025,706                         | 8,423,068  | 6,350,736 | 6,078,905      | 12,429,641                      |
| Difference  | -27,611                            | -5,643     | -4,968    | -7,421         | -12,390                         |
| Percent Difference  | -0.2                               | -0.1       | -0.1      | -0.1           | -0.1                            |
| <b>Above Normal (12.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 13,704,957                         | 9,482,718  | 7,166,993 | 6,786,532      | 13,953,525                      |
| Alternative A   | 13,801,632                         | 9,643,149  | 7,288,302 | 6,892,545      | 14,180,847                      |
| Difference  | 96,675                             | 160,431    | 121,310   | 106,013        | 227,322                         |
| Percent Difference  | 0.7                                | 1.7        | 1.7       | 1.6            | 1.6                             |
| <b>Below Normal (17.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 17,122,923                         | 11,026,435 | 8,347,212 | 7,885,249      | 16,232,461                      |
| Alternative A   | 17,707,507                         | 11,256,918 | 8,502,530 | 8,032,452      | 16,534,981                      |
| Difference  | 584,584                            | 230,483    | 155,318   | 147,203        | 302,521                         |
| Percent Difference  | 3.4                                | 2.1        | 1.9       | 1.9            | 1.9                             |
| <b>Dry (22.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 17,972,683                         | 11,327,517 | 8,601,905 | 8,016,842      | 16,618,747                      |
| Alternative A   | 18,207,355                         | 11,437,508 | 8,660,389 | 8,072,276      | 16,732,665                      |
| Difference  | 234,672                            | 109,992    | 58,483    | 55,435         | 113,918                         |
| Percent Difference  | 1.3                                | 1.0        | 0.7       | 0.7            | 0.7                             |
| <b>Critical (15%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 18,450,262                         | 11,513,031 | 8,045,552 | 7,023,457      | 15,069,009                      |
| Alternative A   | 18,539,223                         | 11,782,065 | 8,609,326 | 7,607,470      | 16,216,796                      |
| Difference  | 88,961                             | 269,034    | 563,774   | 584,013        | 1,147,787                       |
| Percent Difference  | 0.5                                | 2.3        | 7.0       | 8.3            | 7.6                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-3b

Annual Potential Production for LateFall-Run Chinook Salmon

No Action Alternative

Alternative A

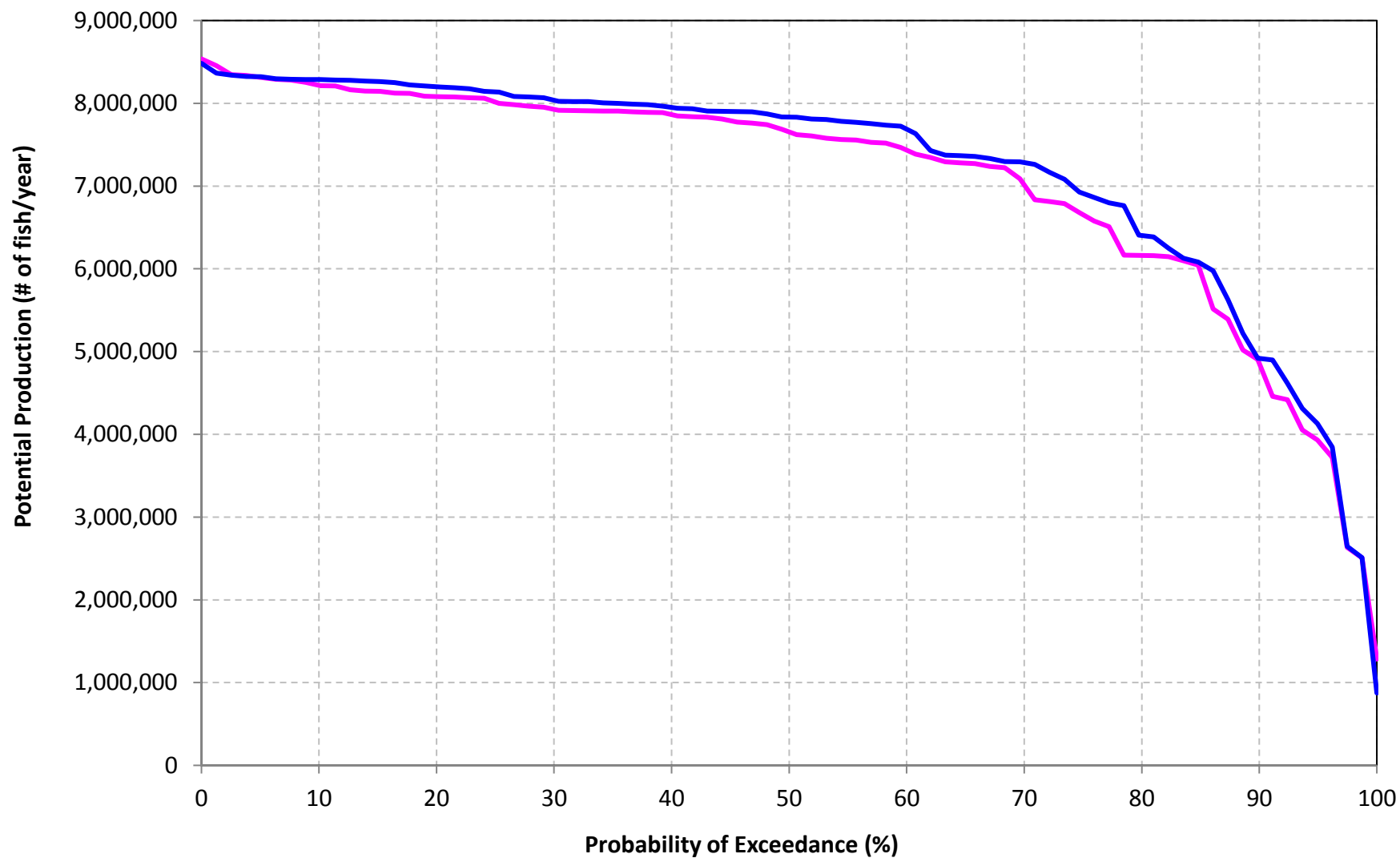




Table AQ-02-3c-1

| Annual Potential Production for Winter-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 3,751,166                                    |
| Alternative A   | 3,827,418                                    |
| Difference  | 76,252                                       |
| Percent Difference <sup>3</sup>   | 2.0  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 3,874,738                                    |
| Alternative A   | 3,883,810                                    |
| Difference  | 9,072  |
| Percent Difference  | 0.2  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 3,321,532                                    |
| Alternative A   | 3,532,905                                    |
| Difference  | 211,372                                      |
| Percent Difference  | 6.4  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 3,684,470                                    |
| Alternative A   | 3,720,838                                    |
| Difference  | 36,367                                       |
| Percent Difference  | 1.0  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 3,833,673                                    |
| Alternative A   | 3,938,872                                    |
| Difference  | 105,199                                      |
| Percent Difference  | 2.7  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 3,795,508                                    |
| Alternative A   | 3,907,828                                    |
| Difference  | 112,320                                      |
| Percent Difference  | 3.0  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-3c-2

| Annual Production of Listed Life-stages for Winter-Run Chinook Salmon |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production    |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                             |                                    |           |           |                |                                 |
| No Action Alternative   | 6,927,445                          | 5,237,474 | 3,868,159 | 3,751,221      | 7,619,381                       |
| Alternative A   | 7,071,510                          | 5,336,453 | 3,938,060 | 3,827,534      | 7,765,595                       |
| Difference  | 144,065                            | 98,980    | 69,901    | 76,313         | 146,214                         |
| Percent Difference <sup>3</sup>                                       | 2.1                                | 1.9       | 1.8       | 2.0            | 1.9                             |
| <b>Water Year Types<sup>2</sup></b>                                   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,098,364                          | 5,356,368 | 3,964,284 | 3,874,738      | 7,839,021                       |
| Alternative A   | 7,164,982                          | 5,371,379 | 3,963,361 | 3,884,167      | 7,847,528                       |
| Difference  | 66,617                             | 15,011    | -922      | 9,429          | 8,507                           |
| Percent Difference  | 0.9                                | 0.3       | 0.0       | 0.2            | 0.1                             |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,302,972                          | 4,674,443 | 3,400,860 | 3,321,532      | 6,722,392                       |
| Alternative A   | 6,695,977                          | 4,953,537 | 3,634,801 | 3,532,905      | 7,167,705                       |
| Difference  | 393,005                            | 279,094   | 233,941   | 211,372        | 445,313                         |
| Percent Difference  | 6.2                                | 6.0       | 6.9       | 6.4            | 6.6                             |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,729,987                          | 5,119,537 | 3,773,798 | 3,684,786      | 7,458,584                       |
| Alternative A   | 6,807,742                          | 5,175,376 | 3,810,711 | 3,720,838      | 7,531,549                       |
| Difference  | 77,755                             | 55,840    | 36,914    | 36,051         | 72,965                          |
| Percent Difference  | 1.2                                | 1.1       | 1.0       | 1.0            | 1.0                             |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,087,788                          | 5,358,934 | 3,984,011 | 3,833,673      | 7,817,684                       |
| Alternative A   | 7,238,631                          | 5,501,931 | 4,074,566 | 3,938,872      | 8,013,438                       |
| Difference  | 150,843                            | 142,997   | 90,555    | 105,199        | 195,754                         |
| Percent Difference  | 2.1                                | 2.7       | 2.3       | 2.7            | 2.5                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 7,067,367                          | 5,404,463 | 3,985,618 | 3,795,508      | 7,781,126                       |
| Alternative A   | 7,238,979                          | 5,519,585 | 4,079,773 | 3,907,828      | 7,987,601                       |
| Difference  | 171,613                            | 115,122   | 94,155    | 112,320        | 206,475                         |
| Percent Difference  | 2.4                                | 2.1       | 2.4       | 3.0            | 2.7                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-3c

Annual Potential Production for Winter-Run Chinook Salmon

No Action Alternative

Alternative A

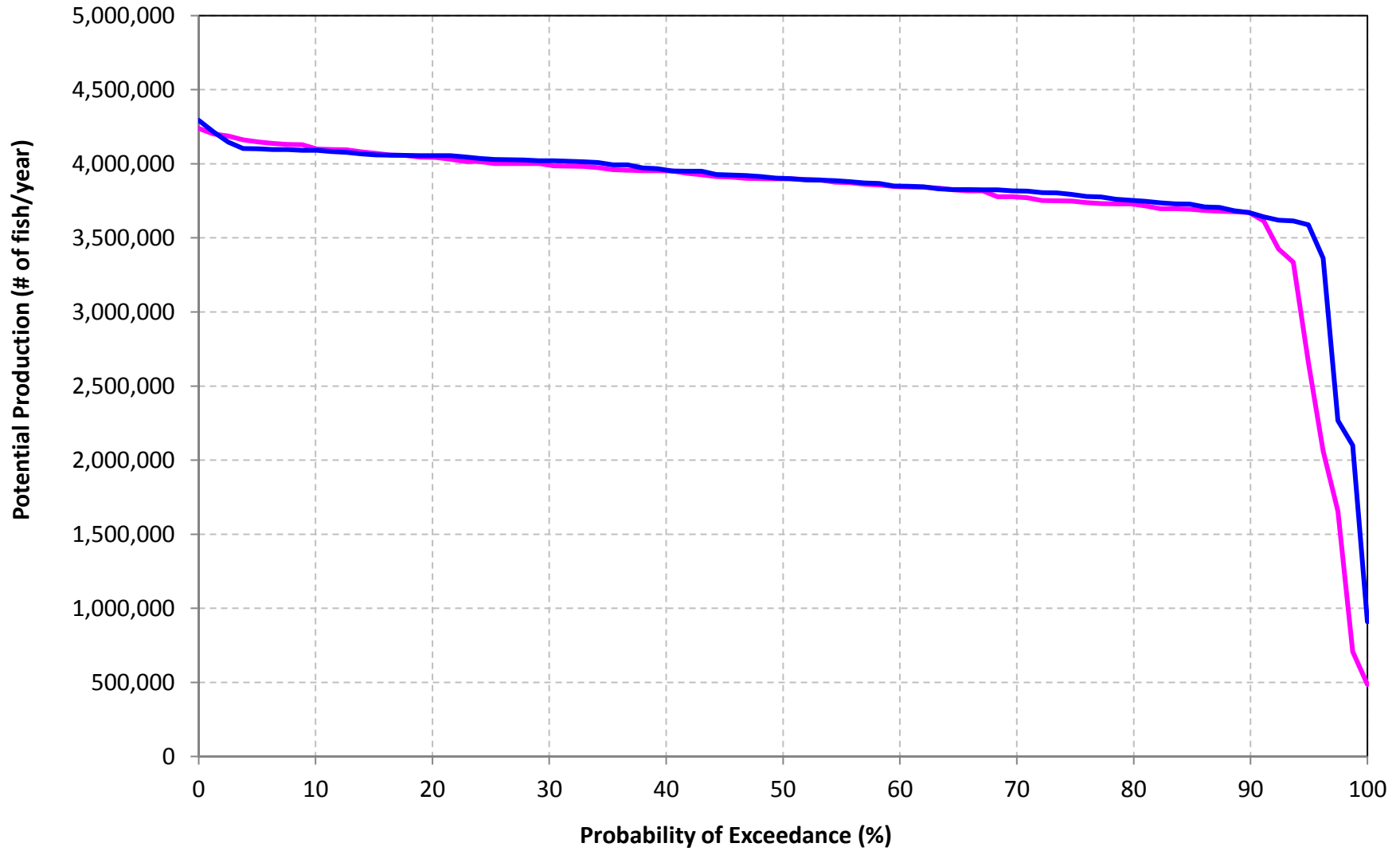


Table AQ-02-3d-1

| Annual Potential Production for Spring-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 764,306                                      |
| Alternative A   | 790,818                                      |
| Difference  | 26,512                                       |
| Percent Difference <sup>3</sup>   | 3.5  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 836,109                                      |
| Alternative A   | 856,776                                      |
| Difference  | 20,667                                       |
| Percent Difference  | 2.5  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 711,508                                      |
| Alternative A   | 716,116                                      |
| Difference  | 4,607  |
| Percent Difference  | 0.6  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 819,955                                      |
| Alternative A   | 821,455                                      |
| Difference  | 1,500  |
| Percent Difference  | 0.2  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 741,759                                      |
| Alternative A   | 809,432                                      |
| Difference  | 67,672                                       |
| Percent Difference  | 9.1  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 621,625                                      |
| Alternative A   | 646,498                                      |
| Difference  | 24,873                                       |
| Percent Difference  | 4.0  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-3d-2

| Annual Production of Listed Life-stages for Spring-Run Chinook Salmon |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production    |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                             |                                    |           |           |                |                                 |
| No Action Alternative   | 1,263,784                          | 1,023,289 | 765,107   | 764,542        | 1,529,649                       |
| Alternative A   | 1,302,588                          | 1,055,428 | 791,619   | 791,140        | 1,582,760                       |
| Difference  | 38,804                             | 32,138    | 26,512    | 26,599         | 53,111                          |
| Percent Difference <sup>3</sup>                                       | 3.1                                | 3.1       | 3.5       | 3.5            | 3.5                             |
| <b>Water Year Types<sup>2</sup></b>                                   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,394,102                          | 1,121,764 | 837,127   | 836,836        | 1,673,963                       |
| Alternative A   | 1,425,232                          | 1,145,576 | 857,768   | 857,561        | 1,715,329                       |
| Difference  | 31,130                             | 23,812    | 20,641    | 20,725         | 41,366                          |
| Percent Difference  | 2.2                                | 2.1       | 2.5       | 2.5            | 2.5                             |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,166,537                          | 941,700   | 711,840   | 711,508        | 1,423,348                       |
| Alternative A   | 1,169,381                          | 947,494   | 716,959   | 716,654        | 1,433,613                       |
| Difference  | 2,844                              | 5,794     | 5,119     | 5,146          | 10,265                          |
| Percent Difference  | 0.2                                | 0.6       | 0.7       | 0.7            | 0.7                             |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,354,240                          | 1,096,333 | 820,396   | 819,955        | 1,640,351                       |
| Alternative A   | 1,352,189                          | 1,097,144 | 821,772   | 821,455        | 1,643,227                       |
| Difference  | -2,051                             | 811       | 1,377     | 1,500          | 2,877                           |
| Percent Difference  | -0.2                               | 0.1       | 0.2       | 0.2            | 0.2                             |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,221,369                          | 995,035   | 742,745   | 741,759        | 1,484,504                       |
| Alternative A   | 1,325,758                          | 1,080,483 | 810,448   | 809,432        | 1,619,879                       |
| Difference  | 104,390                            | 85,448    | 67,703    | 67,672         | 135,375                         |
| Percent Difference  | 8.5                                | 8.6       | 9.1       | 9.1            | 9.1                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,020,561                          | 835,082   | 622,494   | 621,625        | 1,244,119                       |
| Alternative A   | 1,055,244                          | 863,800   | 647,093   | 646,498        | 1,293,591                       |
| Difference  | 34,683                             | 28,718    | 24,599    | 24,873         | 49,472                          |
| Percent Difference  | 3.4                                | 3.4       | 4.0       | 4.0            | 4.0                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

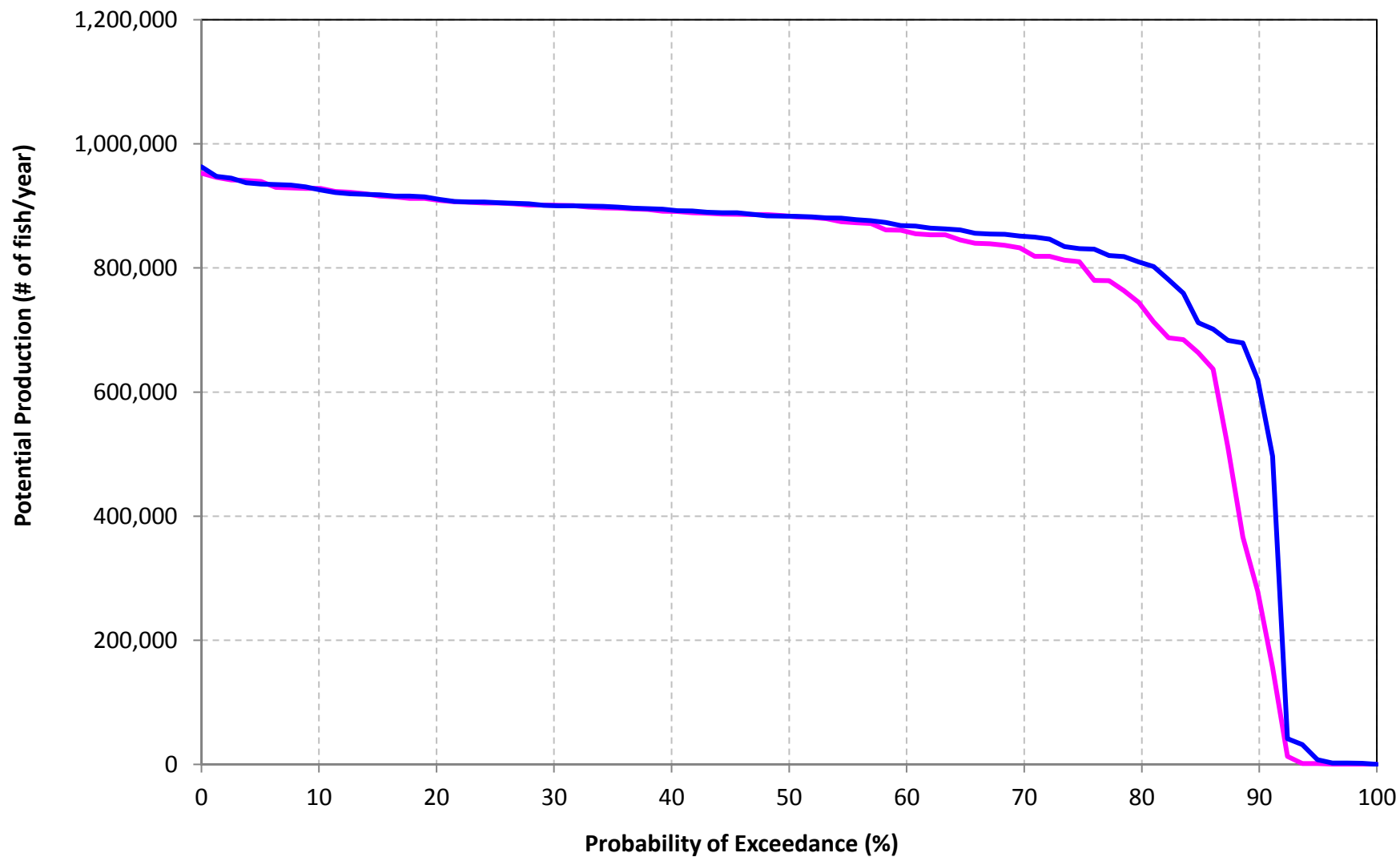
<sup>3</sup> Relative difference of the annual average

Figure AQ-02-3d

Annual Potential Production for Spring-Run Chinook Salmon

No Action Alternative

Alternative A



## **Alternative B Compared to No Action Alternative**

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Table AQ-02-5a-1

| Annual Potential Production for Fall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 26,765,370                                   |
| Alternative B   | 27,290,388                                   |
| Difference  | 525,018                                      |
| Percent Difference <sup>3</sup>   | 2.0  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 18,628,120                                   |
| Alternative B   | 17,192,443                                   |
| Difference  | -1,435,677                                   |
| Percent Difference  | -7.7   |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 23,411,148                                   |
| Alternative B   | 25,831,393                                   |
| Difference  | 2,420,245                                    |
| Percent Difference  | 10.3   |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 31,508,109                                   |
| Alternative B   | 31,465,382                                   |
| Difference  | -42,727                                      |
| Percent Difference  | -0.1   |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 33,288,388                                   |
| Alternative B   | 34,491,915                                   |
| Difference  | 1,203,527                                    |
| Percent Difference  | 3.6  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 31,873,541                                   |
| Alternative B   | 34,711,983                                   |
| Difference  | 2,838,442                                    |
| Percent Difference  | 8.9  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-5a-2

| Annual Production of Listed Life-stages for Fall-Run Chinook Salmon |                                    |            |            |                |                                 |
|---|------------------------------------|------------|------------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production  |                                    |            |            |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |            |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt  | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |            |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                           |                                    |            |            |                |                                 |
| No Action Alternative   | 57,847,525                         | 35,498,044 | 27,541,840 | 26,765,767     | 54,307,608                      |
| Alternative B   | 59,150,947                         | 36,246,572 | 28,124,282 | 27,290,389     | 55,414,671                      |
| Difference  | 1,303,422                          | 748,528    | 582,442    | 524,621        | 1,107,063                       |
| Percent Difference <sup>3</sup>                                     | 2.3                                | 2.1        | 2.1        | 2.0            | 2.0                             |
| <b>Water Year Types<sup>2</sup></b>                                 |                                    |            |            |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 35,415,749                         | 24,936,409 | 19,162,458 | 18,628,457     | 37,790,915                      |
| Alternative B   | 33,015,469                         | 23,095,051 | 17,707,474 | 17,192,447     | 34,899,920                      |
| Difference  | -2,400,280                         | -1,841,358 | -1,454,984 | -1,436,011     | -2,890,995                      |
| Percent Difference  | -6.8                               | -7.4       | -7.6       | -7.7           | -7.6                            |
| <b>Above Normal (12.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 50,324,981                         | 31,117,803 | 24,141,029 | 23,411,153     | 47,552,182                      |
| Alternative B   | 54,884,170                         | 34,346,342 | 26,624,787 | 25,831,394     | 52,456,181                      |
| Difference  | 4,559,189                          | 3,228,538  | 2,483,758  | 2,420,241      | 4,903,999                       |
| Percent Difference  | 9.1                                | 10.4       | 10.3       | 10.3           | 10.3                            |
| <b>Below Normal (17.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 72,575,785                         | 41,303,199 | 32,269,476 | 31,508,877     | 63,778,353                      |
| Alternative B   | 72,936,172                         | 41,336,091 | 32,270,825 | 31,465,375     | 63,736,200                      |
| Difference  | 360,387                            | 32,892     | 1,349      | -43,503        | -42,153                         |
| Percent Difference  | 0.5                                | 0.1        | 0.0        | -0.1           | -0.1                            |
| <b>Dry (22.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 75,122,779                         | 43,988,393 | 34,206,128 | 33,289,065     | 67,495,194                      |
| Alternative B   | 78,137,247                         | 45,686,933 | 35,520,554 | 34,491,916     | 70,012,469                      |
| Difference  | 3,014,469                          | 1,698,540  | 1,314,425  | 1,202,850      | 2,517,275                       |
| Percent Difference  | 4.0                                | 3.9        | 3.8        | 3.6            | 3.7                             |
| <b>Critical (15%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 69,622,645                         | 42,523,582 | 33,019,172 | 31,873,544     | 64,892,716                      |
| Alternative B   | 74,771,252                         | 46,226,744 | 36,011,575 | 34,711,984     | 70,723,559                      |
| Difference  | 5,148,607                          | 3,703,161  | 2,992,403  | 2,838,441      | 5,830,844                       |
| Percent Difference  | 7.4                                | 8.7        | 9.1        | 8.9            | 9.0                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-5a

Annual Potential Production for Fall-Run Chinook Salmon

No Action Alternative

Alternative B

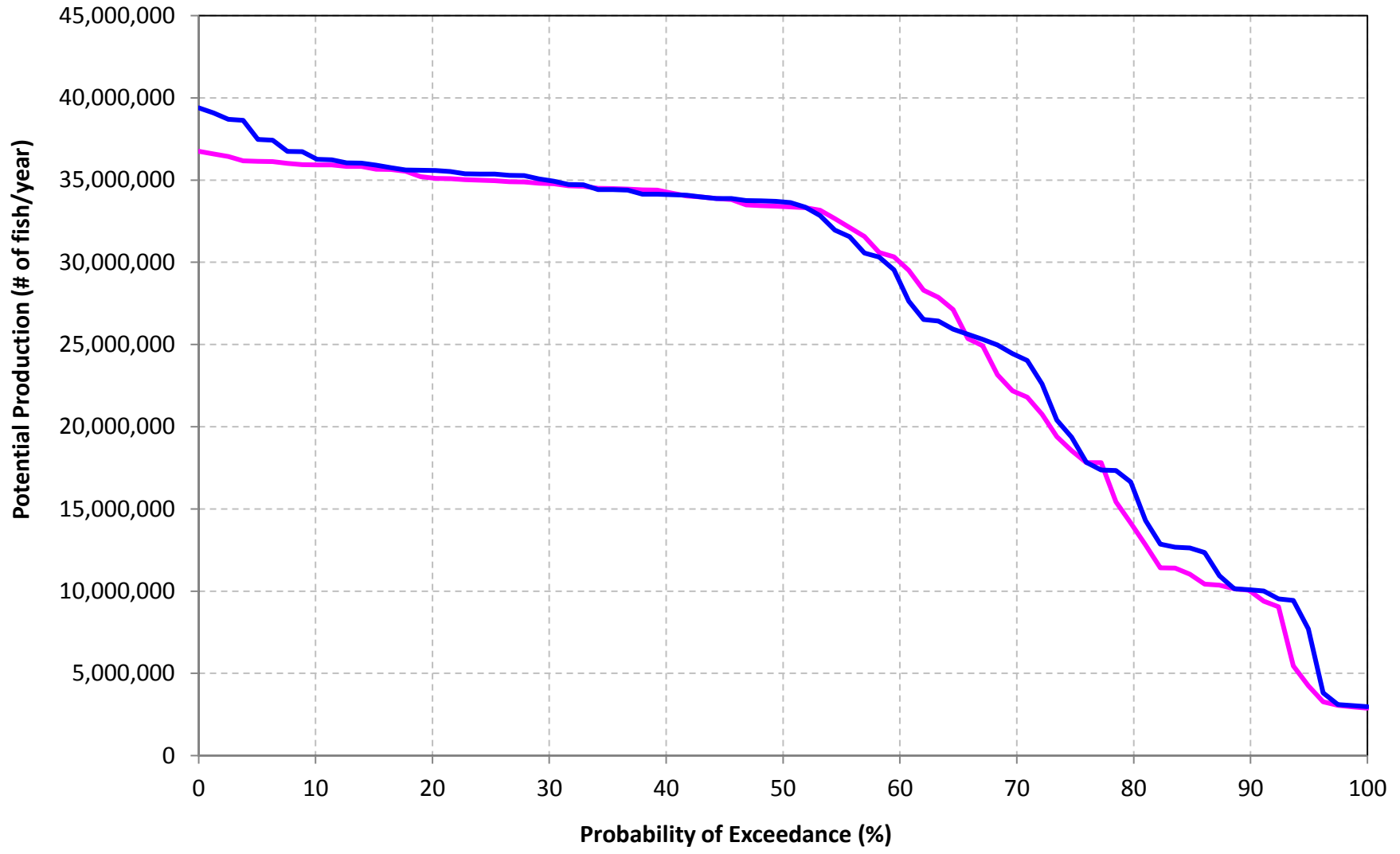


Table AQ-02-5b-1

| Annual Potential Production for LateFall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 7,063,598                                    |
| Alternative B   | 7,144,517                                    |
| Difference  | 80,919                                       |
| Percent Difference <sup>3</sup>   | 1.1  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 6,086,322                                    |
| Alternative B   | 6,108,745                                    |
| Difference  | 22,423                                       |
| Percent Difference  | 0.4  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 6,786,532                                    |
| Alternative B   | 6,594,784                                    |
| Difference  | -191,748                                     |
| Percent Difference  | -2.8   |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 7,885,249                                    |
| Alternative B   | 8,024,493                                    |
| Difference  | 139,245                                      |
| Percent Difference  | 1.8  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 8,016,842                                    |
| Alternative B   | 8,035,590                                    |
| Difference  | 18,748                                       |
| Percent Difference  | 0.2  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 7,023,457                                    |
| Alternative B   | 7,483,553                                    |
| Difference  | 460,096                                      |
| Percent Difference  | 6.6  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-5b-2

| Annual Production of Listed Life-stages for LateFall-Run Chinook Salmon |                                    |            |           |                |                                 |
|---|------------------------------------|------------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production      |                                    |            |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |           |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                               |                                    |            |           |                |                                 |
| No Action Alternative   | 15,438,352                         | 10,129,943 | 7,564,502 | 7,063,599      | 14,628,100                      |
| Alternative B   | 15,553,207                         | 10,191,668 | 7,650,916 | 7,144,517      | 14,795,433                      |
| Difference  | 114,855                            | 61,725     | 86,414    | 80,918         | 167,333                         |
| Percent Difference <sup>3</sup>   | 0.7                                | 0.6        | 1.1       | 1.1            | 1.1                             |
| <b>Water Year Types<sup>2</sup></b>                                     |                                    |            |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 12,053,317                         | 8,428,711  | 6,355,705 | 6,086,326      | 12,442,031                      |
| Alternative B   | 12,080,716                         | 8,457,697  | 6,379,705 | 6,108,745      | 12,488,450                      |
| Difference  | 27,399                             | 28,986     | 24,001    | 22,419         | 46,420                          |
| Percent Difference  | 0.2                                | 0.3        | 0.4       | 0.4            | 0.4                             |
| <b>Above Normal (12.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 13,704,957                         | 9,482,718  | 7,166,993 | 6,786,532      | 13,953,525                      |
| Alternative B   | 13,314,310                         | 9,213,295  | 6,954,226 | 6,594,784      | 13,549,010                      |
| Difference  | -390,647                           | -269,423   | -212,766  | -191,748       | -404,514                        |
| Percent Difference  | -2.9                               | -2.8       | -3.0      | -2.8           | -2.9                            |
| <b>Below Normal (17.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 17,122,923                         | 11,026,435 | 8,347,212 | 7,885,249      | 16,232,461                      |
| Alternative B   | 17,579,510                         | 11,253,671 | 8,494,973 | 8,024,493      | 16,519,466                      |
| Difference  | 456,587                            | 227,236    | 147,761   | 139,245        | 287,005                         |
| Percent Difference  | 2.7                                | 2.1        | 1.8       | 1.8            | 1.8                             |
| <b>Dry (22.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 17,972,683                         | 11,327,517 | 8,601,905 | 8,016,842      | 16,618,747                      |
| Alternative B   | 18,225,055                         | 11,397,908 | 8,634,215 | 8,035,590      | 16,669,805                      |
| Difference  | 252,372                            | 70,391     | 32,310    | 18,748         | 51,058                          |
| Percent Difference  | 1.4                                | 0.6        | 0.4       | 0.2            | 0.3                             |
| <b>Critical (15%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 18,450,262                         | 11,513,031 | 8,045,552 | 7,023,457      | 15,069,009                      |
| Alternative B   | 18,570,896                         | 11,715,551 | 8,526,098 | 7,483,553      | 16,009,651                      |
| Difference  | 120,635                            | 202,520    | 480,546   | 460,096        | 940,642                         |
| Percent Difference  | 0.7                                | 1.8        | 6.0       | 6.6            | 6.2                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-5b

Annual Potential Production for LateFall-Run Chinook Salmon

No Action Alternative

Alternative B

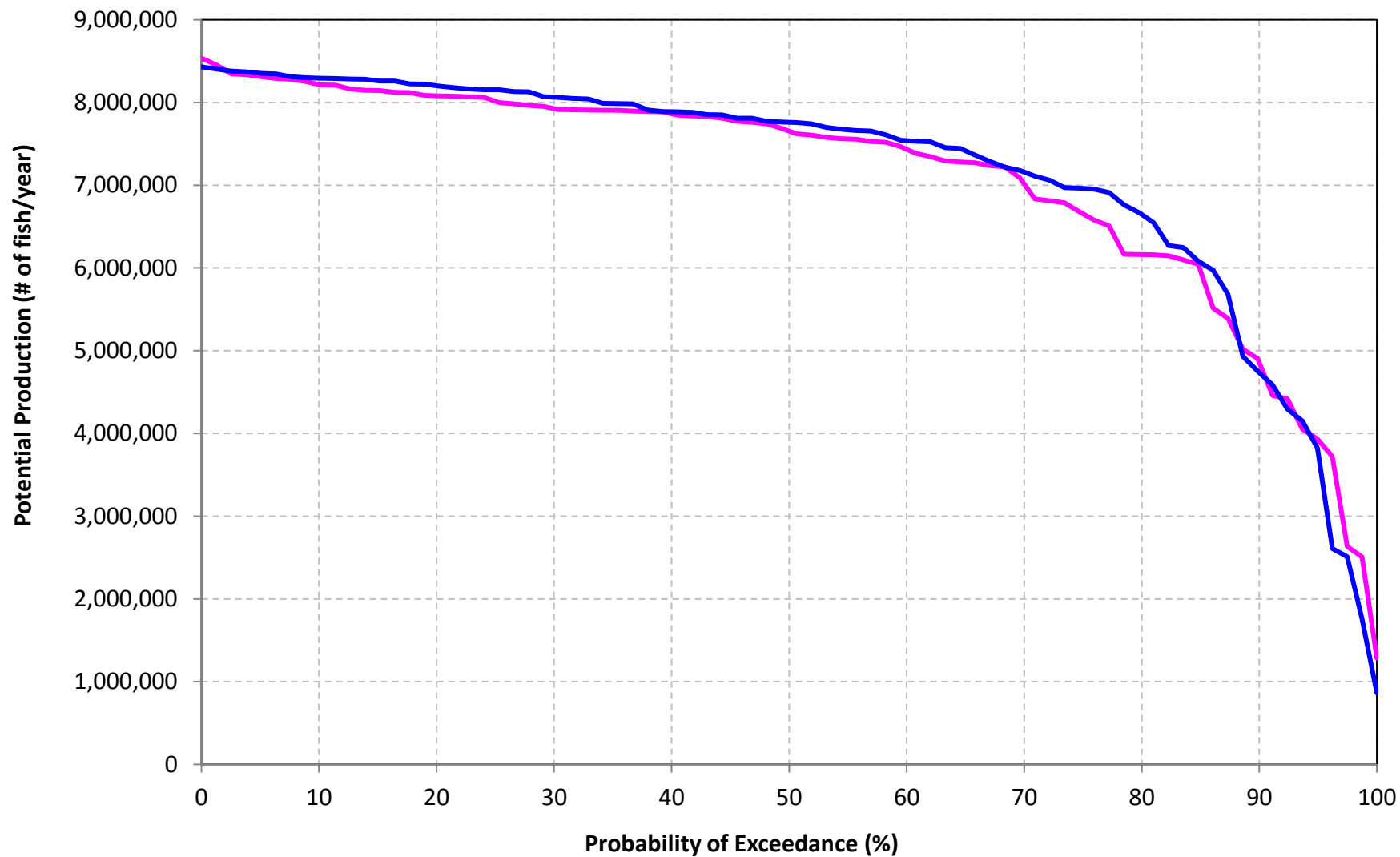


Table AQ-02-5c-1

| Annual Potential Production for Winter-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 3,751,166                                    |
| Alternative B   | 3,807,030                                    |
| Difference  | 55,864                                       |
| Percent Difference <sup>3</sup>   | 1.5  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 3,874,738                                    |
| Alternative B   | 3,880,713                                    |
| Difference  | 5,976  |
| Percent Difference  | 0.2  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 3,321,532                                    |
| Alternative B   | 3,581,508                                    |
| Difference  | 259,976                                      |
| Percent Difference  | 7.8  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 3,684,470                                    |
| Alternative B   | 3,691,622                                    |
| Difference  | 7,151  |
| Percent Difference  | 0.2  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 3,833,673                                    |
| Alternative B   | 3,896,684                                    |
| Difference  | 63,011                                       |
| Percent Difference  | 1.6  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 3,795,508                                    |
| Alternative B   | 3,835,481                                    |
| Difference  | 39,973                                       |
| Percent Difference  | 1.1  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-5c-2

| Annual Production of Listed Life-stages for Winter-Run Chinook Salmon   |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production  |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,927,445                          | 5,237,474 | 3,868,159 | 3,751,221      | 7,619,381                       |
| Alternative B   | 7,074,075                          | 5,309,521 | 3,918,109 | 3,807,030      | 7,725,139                       |
| Difference  | 146,630                            | 72,048    | 49,950    | 55,809         | 105,758                         |
| Percent Difference <sup>3</sup>   | 2.1                                | 1.4       | 1.3       | 1.5            | 1.4                             |
| <b>Water Year Types<sup>2</sup></b>   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,098,364                          | 5,356,368 | 3,964,284 | 3,874,738      | 7,839,021                       |
| Alternative B   | 7,170,871                          | 5,364,321 | 3,961,980 | 3,880,713      | 7,842,693                       |
| Difference  | 72,507                             | 7,953     | -2,304    | 5,976          | 3,672                           |
| Percent Difference  | 1.0                                | 0.1       | -0.1      | 0.2            | 0.0                             |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,302,972                          | 4,674,443 | 3,400,860 | 3,321,532      | 6,722,392                       |
| Alternative B   | 6,793,585                          | 5,026,358 | 3,689,030 | 3,581,508      | 7,270,538                       |
| Difference  | 490,612                            | 351,915   | 288,170   | 259,976        | 548,146                         |
| Percent Difference  | 7.8                                | 7.5       | 8.5       | 7.8            | 8.2                             |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,729,987                          | 5,119,537 | 3,773,798 | 3,684,786      | 7,458,584                       |
| Alternative B   | 6,828,538                          | 5,142,464 | 3,780,509 | 3,691,622      | 7,472,130                       |
| Difference  | 98,551                             | 22,927    | 6,711     | 6,835          | 13,546                          |
| Percent Difference  | 1.5                                | 0.4       | 0.2       | 0.2            | 0.2                             |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,087,788                          | 5,358,934 | 3,984,011 | 3,833,673      | 7,817,684                       |
| Alternative B   | 7,229,184                          | 5,442,886 | 4,027,083 | 3,896,684      | 7,923,767                       |
| Difference  | 141,395                            | 83,952    | 43,072    | 63,011         | 106,083                         |
| Percent Difference  | 2.0                                | 1.6       | 1.1       | 1.6            | 1.4                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 7,067,367                          | 5,404,463 | 3,985,618 | 3,795,508      | 7,781,126                       |
| Alternative B   | 7,151,891                          | 5,421,611 | 4,011,030 | 3,835,481      | 7,846,510                       |
| Difference  | 84,524                             | 17,148    | 25,412    | 39,973         | 65,385                          |
| Percent Difference  | 1.2                                | 0.3       | 0.6       | 1.1            | 0.8                             |
| 1 Based on the 80-year simulation period  |                                    |           |           |                |                                 |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |                                    |           |           |                |                                 |
| 3 Relative difference of the annual average   |                                    |           |           |                |                                 |



Figure AQ-02-5c

Annual Potential Production for Winter-Run Chinook Salmon

No Action Alternative

Alternative B

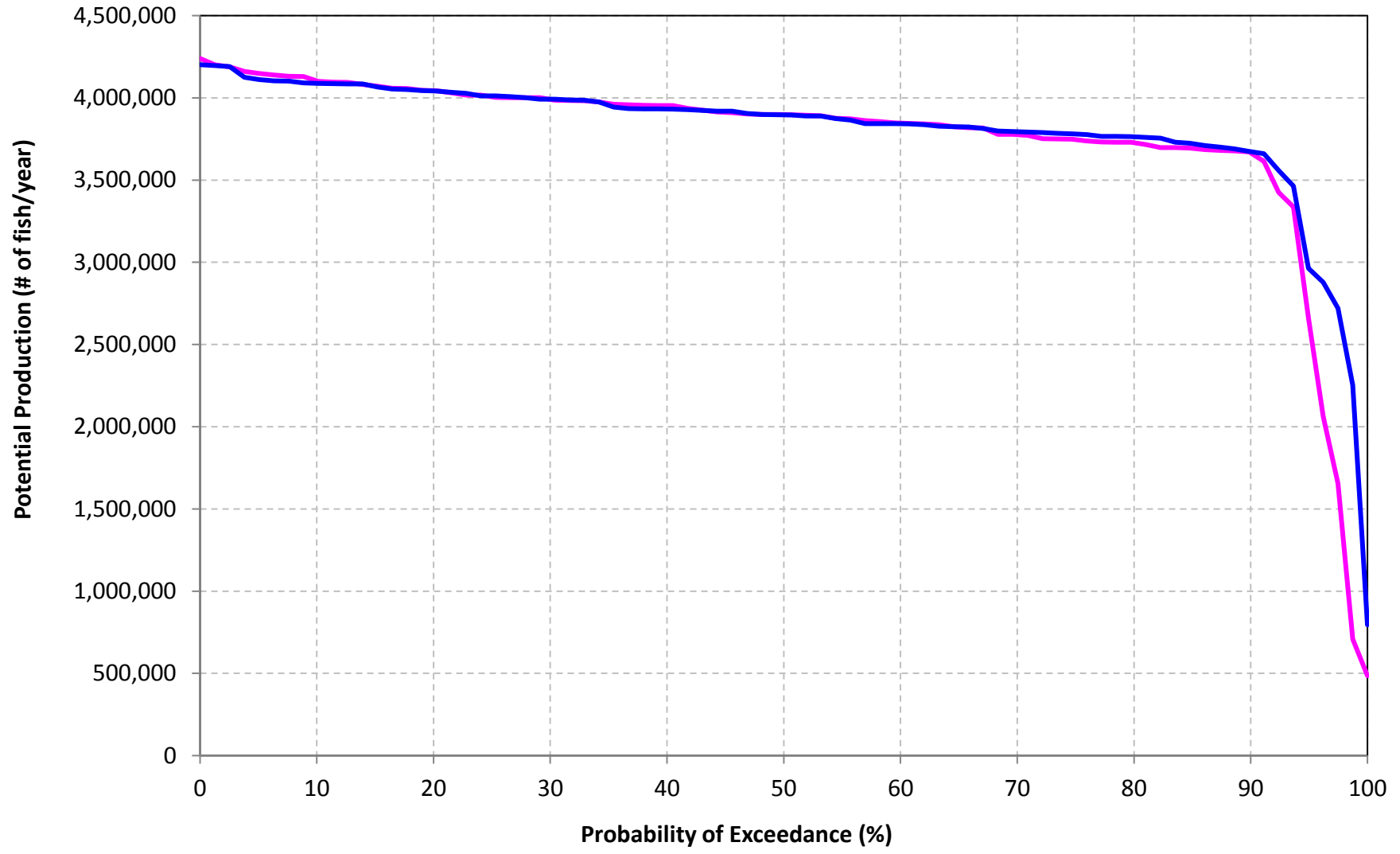


Table AQ-02-5d-1

| Annual Potential Production for Spring-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 764,306                                      |
| Alternative B   | 785,958                                      |
| Difference  | 21,652                                       |
| Percent Difference <sup>3</sup>   | 2.8  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 836,109                                      |
| Alternative B   | 848,738                                      |
| Difference  | 12,629                                       |
| Percent Difference  | 1.5  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 711,508                                      |
| Alternative B   | 718,443                                      |
| Difference  | 6,934  |
| Percent Difference  | 1.0  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 819,955                                      |
| Alternative B   | 822,786                                      |
| Difference  | 2,831  |
| Percent Difference  | 0.3  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 741,759                                      |
| Alternative B   | 801,727                                      |
| Difference  | 59,968                                       |
| Percent Difference  | 8.1  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 621,625                                      |
| Alternative B   | 639,575                                      |
| Difference  | 17,950                                       |
| Percent Difference  | 2.9  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-5d-2

| Annual Production of Listed Life-stages for Spring-Run Chinook Salmon |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production    |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                             |                                    |           |           |                |                                 |
| No Action Alternative   | 1,263,784                          | 1,023,289 | 765,107   | 764,542        | 1,529,649                       |
| Alternative B   | 1,294,382                          | 1,048,840 | 786,665   | 786,207        | 1,572,872                       |
| Difference  | 30,597                             | 25,550    | 21,558    | 21,665         | 43,223                          |
| Percent Difference <sup>3</sup>                                       | 2.4                                | 2.5       | 2.8       | 2.8            | 2.8                             |
| <b>Water Year Types<sup>2</sup></b>                                   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,394,102                          | 1,121,764 | 837,127   | 836,836        | 1,673,963                       |
| Alternative B   | 1,412,629                          | 1,135,110 | 849,605   | 849,410        | 1,699,015                       |
| Difference  | 18,527                             | 13,346    | 12,478    | 12,574         | 25,052                          |
| Percent Difference  | 1.3                                | 1.2       | 1.5       | 1.5            | 1.5                             |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,166,537                          | 941,700   | 711,840   | 711,508        | 1,423,348                       |
| Alternative B   | 1,173,202                          | 950,474   | 718,985   | 718,692        | 1,437,677                       |
| Difference  | 6,665                              | 8,775     | 7,146     | 7,184          | 14,330                          |
| Percent Difference  | 0.6                                | 0.9       | 1.0       | 1.0            | 1.0                             |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,354,240                          | 1,096,333 | 820,396   | 819,955        | 1,640,351                       |
| Alternative B   | 1,354,154                          | 1,099,242 | 823,087   | 822,786        | 1,645,872                       |
| Difference  | -86                                | 2,908     | 2,691     | 2,831          | 5,522                           |
| Percent Difference  | 0.0                                | 0.3       | 0.3       | 0.3            | 0.3                             |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,221,369                          | 995,035   | 742,745   | 741,759        | 1,484,504                       |
| Alternative B   | 1,311,096                          | 1,069,217 | 802,719   | 801,727        | 1,604,447                       |
| Difference  | 89,728                             | 74,182    | 59,974    | 59,968         | 119,942                         |
| Percent Difference  | 7.3                                | 7.5       | 8.1       | 8.1            | 8.1                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,020,561                          | 835,082   | 622,494   | 621,625        | 1,244,119                       |
| Alternative B   | 1,044,356                          | 854,522   | 640,123   | 639,575        | 1,279,698                       |
| Difference  | 23,795                             | 19,440    | 17,629    | 17,950         | 35,579                          |
| Percent Difference  | 2.3                                | 2.3       | 2.8       | 2.9            | 2.9                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

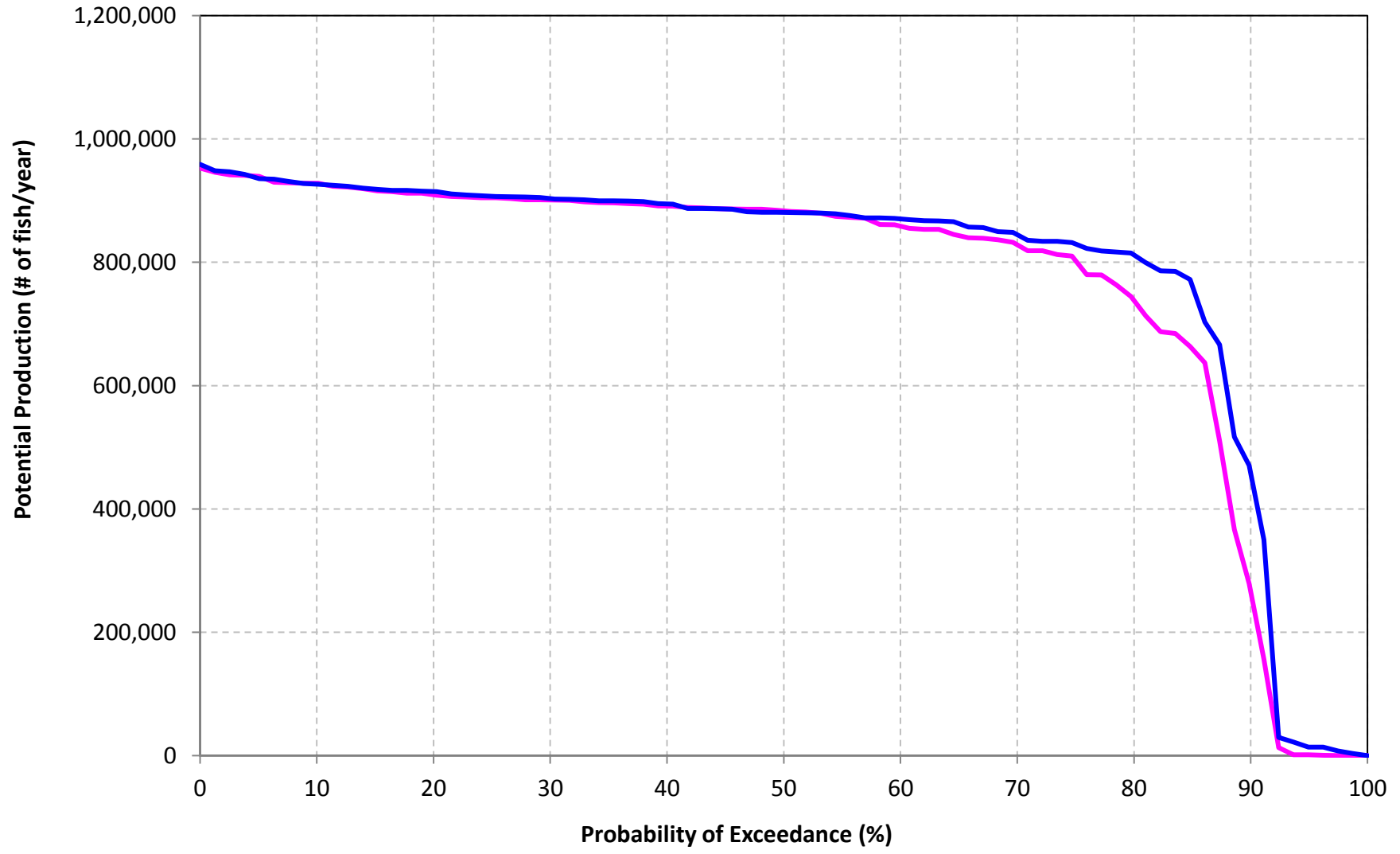
<sup>3</sup> Relative difference of the annual average

Figure AQ-02-5d

Annual Potential Production for Spring-Run Chinook Salmon

No Action Alternative

Alternative B



## **Alternative C Compared to No Action Alternative**

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Table AQ-02-7a-1

| Annual Potential Production for Fall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 26,765,370                                   |
| Alternative C   | 27,277,778                                   |
| Difference  | 512,408                                      |
| Percent Difference <sup>3</sup>   | 1.9  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 18,628,120                                   |
| Alternative C   | 17,121,178                                   |
| Difference  | -1,506,942                                   |
| Percent Difference  | -8.1   |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 23,411,148                                   |
| Alternative C   | 24,702,746                                   |
| Difference  | 1,291,598                                    |
| Percent Difference  | 5.5  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 31,508,109                                   |
| Alternative C   | 31,483,788                                   |
| Difference  | -24,321                                      |
| Percent Difference  | -0.1   |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 33,288,388                                   |
| Alternative C   | 34,425,167                                   |
| Difference  | 1,136,779                                    |
| Percent Difference  | 3.4  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 31,873,541                                   |
| Alternative C   | 35,801,508                                   |
| Difference  | 3,927,967                                    |
| Percent Difference  | 12.3   |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-7a-2

| Annual Production of Listed Life-stages for Fall-Run Chinook Salmon   |                                    |            |            |                |                                 |
|---|------------------------------------|------------|------------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production  |                                    |            |            |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |            |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt  | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |            |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 57,847,525                         | 35,498,044 | 27,541,840 | 26,765,767     | 54,307,608                      |
| Alternative C   | 59,110,794                         | 36,226,529 | 28,112,821 | 27,277,786     | 55,390,607                      |
| Difference  | 1,263,268                          | 728,485    | 570,980    | 512,019        | 1,082,999                       |
| Percent Difference <sup>3</sup>   | 2.2                                | 2.1        | 2.1        | 1.9            | 2.0                             |
| <b>Water Year Types<sup>2</sup></b>   |                                    |            |            |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 35,415,749                         | 24,936,409 | 19,162,458 | 18,628,457     | 37,790,915                      |
| Alternative C   | 32,399,237                         | 23,016,074 | 17,638,029 | 17,121,207     | 34,759,236                      |
| Difference  | -3,016,512                         | -1,920,335 | -1,524,429 | -1,507,250     | -3,031,679                      |
| Percent Difference  | -8.5                               | -7.7       | -8.0       | -8.1           | -8.0                            |
| <b>Above Normal (12.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 50,324,981                         | 31,117,803 | 24,141,029 | 23,411,153     | 47,552,182                      |
| Alternative C   | 52,429,563                         | 32,917,057 | 25,479,959 | 24,702,760     | 50,182,719                      |
| Difference  | 2,104,582                          | 1,799,253  | 1,338,929  | 1,291,608      | 2,630,537                       |
| Percent Difference  | 4.2                                | 5.8        | 5.5        | 5.5            | 5.5                             |
| <b>Below Normal (17.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 72,575,785                         | 41,303,199 | 32,269,476 | 31,508,877     | 63,778,353                      |
| Alternative C   | 72,946,811                         | 41,339,563 | 32,283,620 | 31,483,777     | 63,767,397                      |
| Difference  | 371,026                            | 36,365     | 14,144     | -25,100        | -10,956                         |
| Percent Difference  | 0.5                                | 0.1        | 0.0        | -0.1           | 0.0                             |
| <b>Dry (22.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 75,122,779                         | 43,988,393 | 34,206,128 | 33,289,065     | 67,495,194                      |
| Alternative C   | 78,181,286                         | 45,613,119 | 35,459,308 | 34,425,166     | 69,884,474                      |
| Difference  | 3,058,507                          | 1,624,726  | 1,253,179  | 1,136,100      | 2,389,280                       |
| Percent Difference  | 4.1                                | 3.7        | 3.7        | 3.4            | 3.5                             |
| <b>Critical (15%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 69,622,645                         | 42,523,582 | 33,019,172 | 31,873,544     | 64,892,716                      |
| Alternative C   | 77,805,768                         | 47,561,984 | 37,116,592 | 35,801,506     | 72,918,099                      |
| Difference  | 8,183,123                          | 5,038,402  | 4,097,420  | 3,927,963      | 8,025,383                       |
| Percent Difference  | 11.8                               | 11.8       | 12.4       | 12.3           | 12.4                            |
| 1 Based on the 80-year simulation period  |                                    |            |            |                |                                 |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |                                    |            |            |                |                                 |
| 3 Relative difference of the annual average   |                                    |            |            |                |                                 |



Figure AQ-02-7a

Annual Potential Production for Fall-Run Chinook Salmon

No Action Alternative

Alternative C

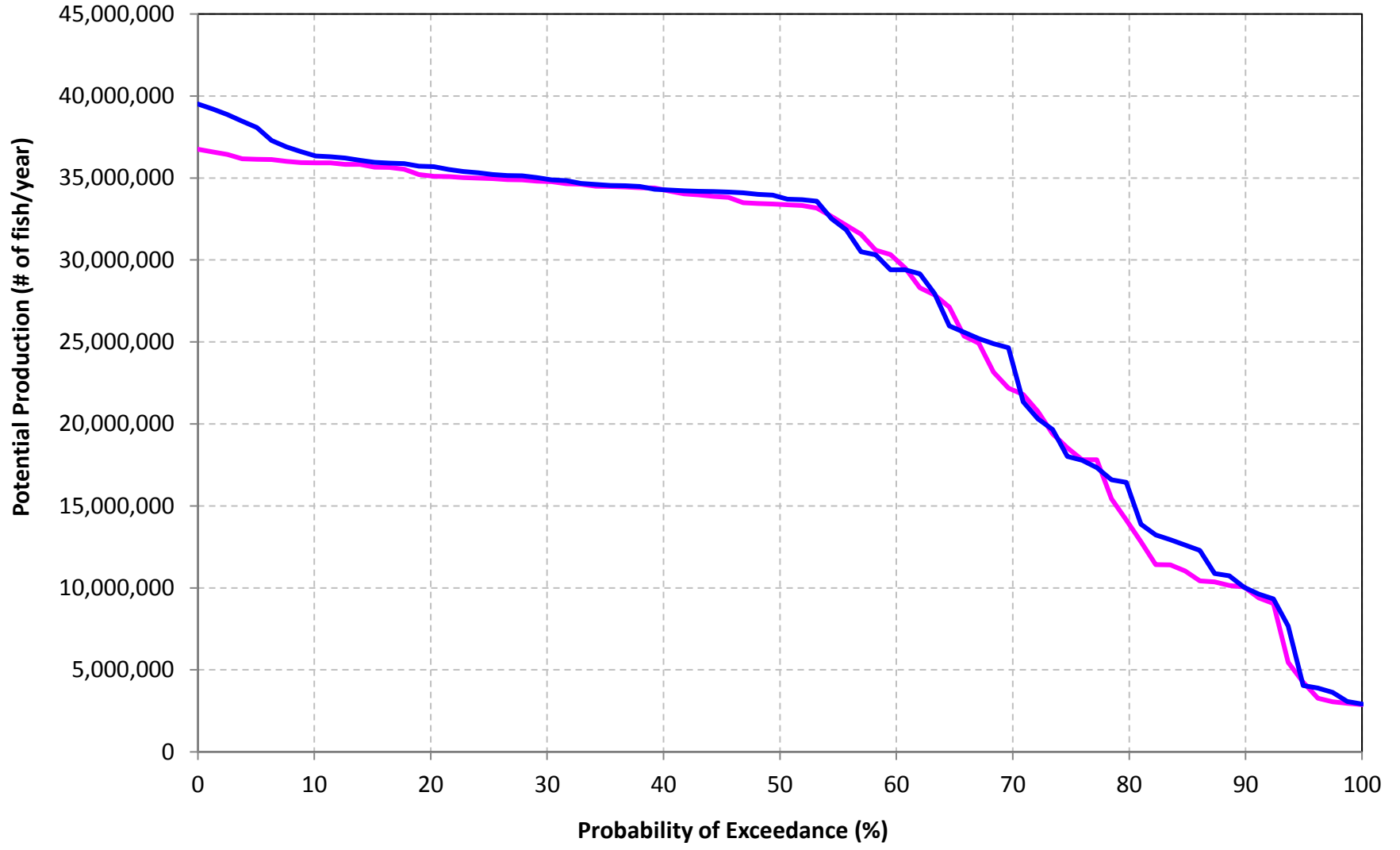


Table AQ-02-7b-1

| Annual Potential Production for LateFall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 7,063,598                                    |
| Alternative C   | 7,204,130                                    |
| Difference  | 140,532                                      |
| Percent Difference <sup>3</sup>   | 2.0  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 6,086,322                                    |
| Alternative C   | 6,069,439                                    |
| Difference  | -16,884                                      |
| Percent Difference  | -0.3   |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 6,786,532                                    |
| Alternative C   | 6,857,936                                    |
| Difference  | 71,404                                       |
| Percent Difference  | 1.1  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 7,885,249                                    |
| Alternative C   | 8,023,634                                    |
| Difference  | 138,386                                      |
| Percent Difference  | 1.8  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 8,016,842                                    |
| Alternative C   | 8,092,670                                    |
| Difference  | 75,828                                       |
| Percent Difference  | 0.9  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 7,023,457                                    |
| Alternative C   | 7,662,223                                    |
| Difference  | 638,766                                      |
| Percent Difference  | 9.1  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-7b-2

| Annual Production of Listed Life-stages for LateFall-Run Chinook Salmon |                                    |            |           |                |                                 |
|---|------------------------------------|------------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production      |                                    |            |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |           |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                               |                                    |            |           |                |                                 |
| No Action Alternative   | 15,438,352                         | 10,129,943 | 7,564,502 | 7,063,599      | 14,628,100                      |
| Alternative C   | 15,642,145                         | 10,249,485 | 7,707,013 | 7,204,130      | 14,911,143                      |
| Difference  | 203,793                            | 119,542    | 142,512   | 140,531        | 283,043                         |
| Percent Difference <sup>3</sup>   | 1.3                                | 1.2        | 1.9       | 2.0            | 1.9                             |
| <b>Water Year Types<sup>2</sup></b>                                     |                                    |            |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 12,053,317                         | 8,428,711  | 6,355,705 | 6,086,326      | 12,442,031                      |
| Alternative C   | 12,025,420                         | 8,407,797  | 6,339,804 | 6,069,440      | 12,409,244                      |
| Difference  | -27,897                            | -20,914    | -15,901   | -16,886        | -32,787                         |
| Percent Difference  | -0.2                               | -0.2       | -0.3      | -0.3           | -0.3                            |
| <b>Above Normal (12.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 13,704,957                         | 9,482,718  | 7,166,993 | 6,786,532      | 13,953,525                      |
| Alternative C   | 13,930,278                         | 9,603,631  | 7,250,270 | 6,857,936      | 14,108,206                      |
| Difference  | 225,320                            | 120,913    | 83,277    | 71,404         | 154,681                         |
| Percent Difference  | 1.6                                | 1.3        | 1.2       | 1.1            | 1.1                             |
| <b>Below Normal (17.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 17,122,923                         | 11,026,435 | 8,347,212 | 7,885,249      | 16,232,461                      |
| Alternative C   | 17,735,382                         | 11,240,818 | 8,489,294 | 8,023,634      | 16,512,928                      |
| Difference  | 612,459                            | 214,383    | 142,082   | 138,386        | 280,468                         |
| Percent Difference  | 3.6                                | 1.9        | 1.7       | 1.8            | 1.7                             |
| <b>Dry (22.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 17,972,683                         | 11,327,517 | 8,601,905 | 8,016,842      | 16,618,747                      |
| Alternative C   | 18,223,190                         | 11,468,292 | 8,683,104 | 8,092,670      | 16,775,774                      |
| Difference  | 250,507                            | 140,775    | 81,199    | 75,828         | 157,027                         |
| Percent Difference  | 1.4                                | 1.2        | 0.9       | 0.9            | 0.9                             |
| <b>Critical (15%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 18,450,262                         | 11,513,031 | 8,045,552 | 7,023,457      | 15,069,009                      |
| Alternative C   | 18,591,261                         | 11,793,256 | 8,673,124 | 7,662,223      | 16,335,347                      |
| Difference  | 140,999                            | 280,225    | 627,572   | 638,766        | 1,266,338                       |
| Percent Difference  | 0.8                                | 2.4        | 7.8       | 9.1            | 8.4                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-7b

Annual Potential Production for LateFall-Run Chinook Salmon

No Action Alternative

Alternative C

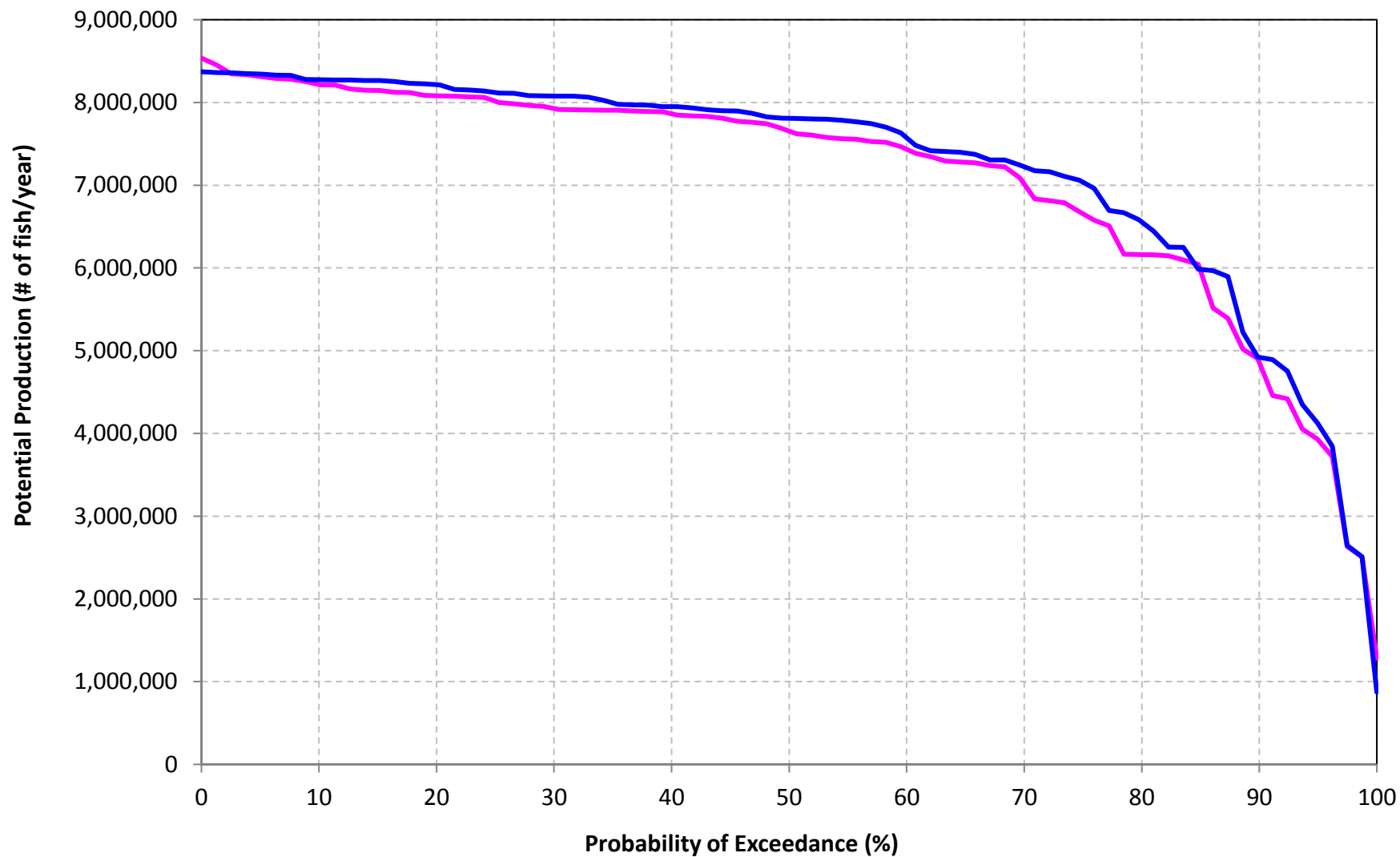


Table AQ-02-7c-1

| Annual Potential Production for Winter-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 3,751,166                                    |
| Alternative C   | 3,825,046                                    |
| Difference  | 73,879                                       |
| Percent Difference <sup>3</sup>   | 2.0  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 3,874,738                                    |
| Alternative C   | 3,877,085                                    |
| Difference  | 2,347  |
| Percent Difference  | 0.1  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 3,321,532                                    |
| Alternative C   | 3,588,665                                    |
| Difference  | 267,133                                      |
| Percent Difference  | 8.0  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 3,684,470                                    |
| Alternative C   | 3,704,496                                    |
| Difference  | 20,026                                       |
| Percent Difference  | 0.5  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 3,833,673                                    |
| Alternative C   | 3,911,075                                    |
| Difference  | 77,402                                       |
| Percent Difference  | 2.0  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 3,795,508                                    |
| Alternative C   | 3,920,873                                    |
| Difference  | 125,365                                      |
| Percent Difference  | 3.3  |
| <sup>1</sup> Based on the 80-year simulation period<br><sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.<br><sup>3</sup> Relative difference of the annual average |  |

Table AQ-02-7c-2

| Annual Production of Listed Life-stages for Winter-Run Chinook Salmon |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production    |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                             |                                    |           |           |                |                                 |
| No Action Alternative   | 6,927,445                          | 5,237,474 | 3,868,159 | 3,751,221      | 7,619,381                       |
| Alternative C   | 7,086,094                          | 5,328,853 | 3,935,090 | 3,825,046      | 7,760,135                       |
| Difference  | 158,649                            | 91,380    | 66,931    | 73,824         | 140,755                         |
| Percent Difference <sup>3</sup>                                       | 2.3                                | 1.7       | 1.7       | 2.0            | 1.8                             |
| <b>Water Year Types<sup>2</sup></b>                                   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,098,364                          | 5,356,368 | 3,964,284 | 3,874,738      | 7,839,021                       |
| Alternative C   | 7,172,080                          | 5,362,111 | 3,957,794 | 3,877,085      | 7,834,879                       |
| Difference  | 73,715                             | 5,742     | -6,490    | 2,347          | -4,143                          |
| Percent Difference  | 1.0                                | 0.1       | -0.2      | 0.1            | -0.1                            |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,302,972                          | 4,674,443 | 3,400,860 | 3,321,532      | 6,722,392                       |
| Alternative C   | 6,913,779                          | 5,044,422 | 3,685,049 | 3,588,665      | 7,273,714                       |
| Difference  | 610,807                            | 369,979   | 284,189   | 267,133        | 551,322                         |
| Percent Difference  | 9.7                                | 7.9       | 8.4       | 8.0            | 8.2                             |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,729,987                          | 5,119,537 | 3,773,798 | 3,684,786      | 7,458,584                       |
| Alternative C   | 6,749,494                          | 5,140,356 | 3,791,080 | 3,704,496      | 7,495,577                       |
| Difference  | 19,507                             | 20,819    | 17,283    | 19,710         | 36,993                          |
| Percent Difference  | 0.3                                | 0.4       | 0.5       | 0.5            | 0.5                             |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,087,788                          | 5,358,934 | 3,984,011 | 3,833,673      | 7,817,684                       |
| Alternative C   | 7,209,248                          | 5,462,303 | 4,044,109 | 3,911,075      | 7,955,184                       |
| Difference  | 121,459                            | 103,368   | 60,098    | 77,402         | 137,500                         |
| Percent Difference  | 1.7                                | 1.9       | 1.5       | 2.0            | 1.8                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 7,067,367                          | 5,404,463 | 3,985,618 | 3,795,508      | 7,781,126                       |
| Alternative C   | 7,251,357                          | 5,513,561 | 4,098,750 | 3,920,873      | 8,019,623                       |
| Difference  | 183,991                            | 109,098   | 113,132   | 125,365        | 238,497                         |
| Percent Difference  | 2.6                                | 2.0       | 2.8       | 3.3            | 3.1                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-7c

Annual Potential Production for Winter-Run Chinook Salmon

No Action Alternative

Alternative C

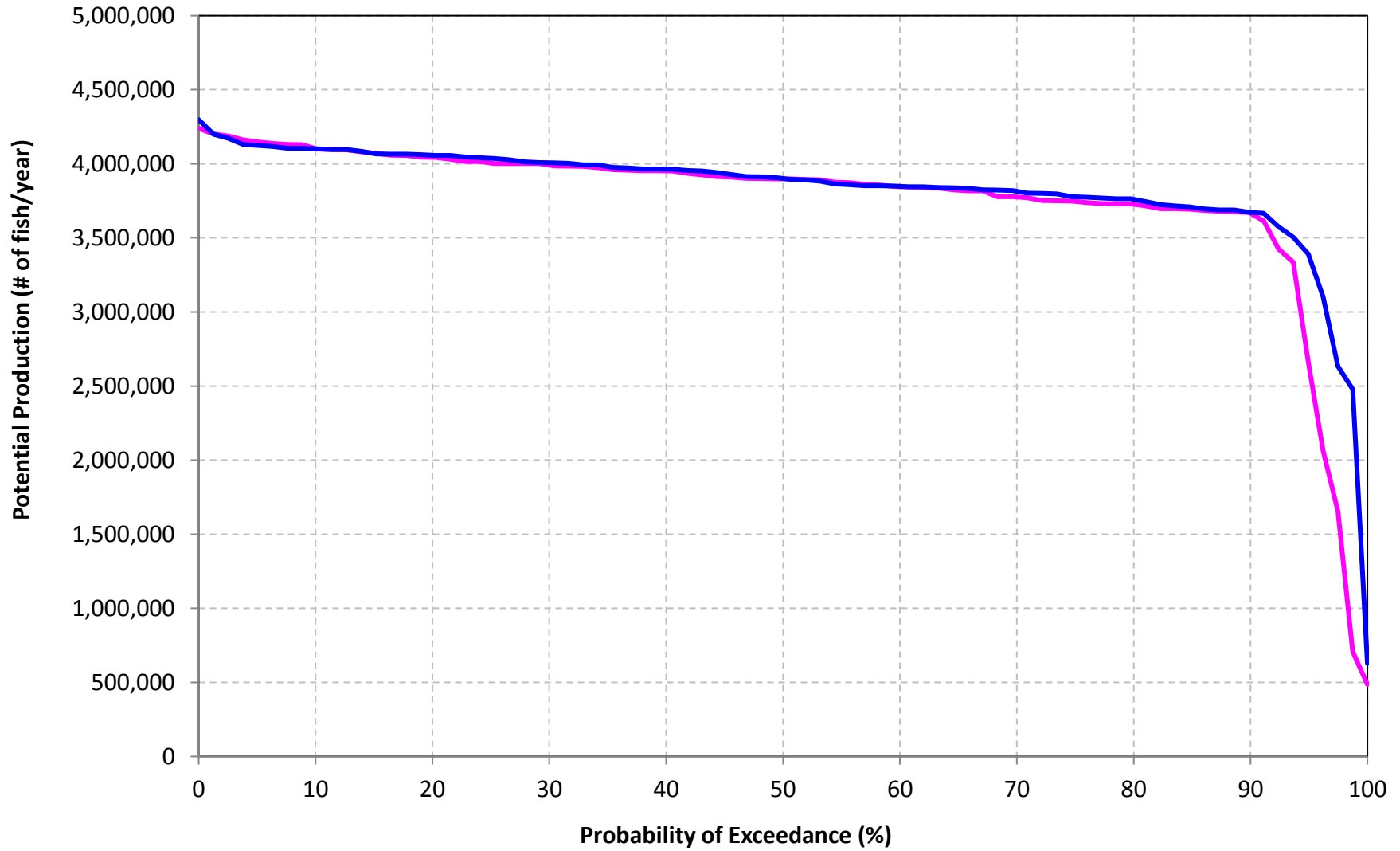


Table AQ-02-7d-1

| Annual Potential Production for Spring-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 764,306                                      |
| Alternative C   | 793,831                                      |
| Difference  | 29,525                                       |
| Percent Difference <sup>3</sup>   | 3.9  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 836,109                                      |
| Alternative C   | 857,764                                      |
| Difference  | 21,654                                       |
| Percent Difference  | 2.6  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 711,508                                      |
| Alternative C   | 716,341                                      |
| Difference  | 4,833  |
| Percent Difference  | 0.7  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 819,955                                      |
| Alternative C   | 819,072                                      |
| Difference  | -883   |
| Percent Difference  | -0.1   |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 741,759                                      |
| Alternative C   | 806,269                                      |
| Difference  | 64,510                                       |
| Percent Difference  | 8.7  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 621,625                                      |
| Alternative C   | 671,780                                      |
| Difference  | 50,155                                       |
| Percent Difference  | 8.1  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |



Table AQ-02-7d-2

| Annual Production of Listed Life-stages for Spring-Run Chinook Salmon |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production    |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                             |                                    |           |           |                |                                 |
| No Action Alternative   | 1,263,784                          | 1,023,289 | 765,107   | 764,542        | 1,529,649                       |
| Alternative C   | 1,307,477                          | 1,059,565 | 794,662   | 794,138        | 1,588,800                       |
| Difference  | 43,693                             | 36,275    | 29,555    | 29,596         | 59,151                          |
| Percent Difference <sup>3</sup>                                       | 3.5                                | 3.5       | 3.9       | 3.9            | 3.9                             |
| <b>Water Year Types<sup>2</sup></b>                                   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,394,102                          | 1,121,764 | 837,127   | 836,836        | 1,673,963                       |
| Alternative C   | 1,426,484                          | 1,145,921 | 858,765   | 858,579        | 1,717,345                       |
| Difference  | 32,382                             | 24,157    | 21,638    | 21,744         | 43,382                          |
| Percent Difference  | 2.3                                | 2.2       | 2.6       | 2.6            | 2.6                             |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,166,537                          | 941,700   | 711,840   | 711,508        | 1,423,348                       |
| Alternative C   | 1,169,200                          | 947,098   | 716,960   | 716,676        | 1,433,636                       |
| Difference  | 2,663                              | 5,398     | 5,120     | 5,168          | 10,288                          |
| Percent Difference  | 0.2                                | 0.6       | 0.7       | 0.7            | 0.7                             |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,354,240                          | 1,096,333 | 820,396   | 819,955        | 1,640,351                       |
| Alternative C   | 1,348,479                          | 1,094,442 | 819,391   | 819,072        | 1,638,463                       |
| Difference  | -5,761                             | -1,892    | -1,005    | -883           | -1,888                          |
| Percent Difference  | -0.4                               | -0.2      | -0.1      | -0.1           | -0.1                            |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,221,369                          | 995,035   | 742,745   | 741,759        | 1,484,504                       |
| Alternative C   | 1,320,472                          | 1,076,821 | 807,351   | 806,269        | 1,613,620                       |
| Difference  | 99,103                             | 81,786    | 64,606    | 64,510         | 129,115                         |
| Percent Difference  | 8.1                                | 8.2       | 8.7       | 8.7            | 8.7                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,020,561                          | 835,082   | 622,494   | 621,625        | 1,244,119                       |
| Alternative C   | 1,097,534                          | 899,606   | 672,639   | 671,780        | 1,344,419                       |
| Difference  | 76,973                             | 64,524    | 50,145    | 50,155         | 100,300                         |
| Percent Difference  | 7.5                                | 7.7       | 8.1       | 8.1            | 8.1                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

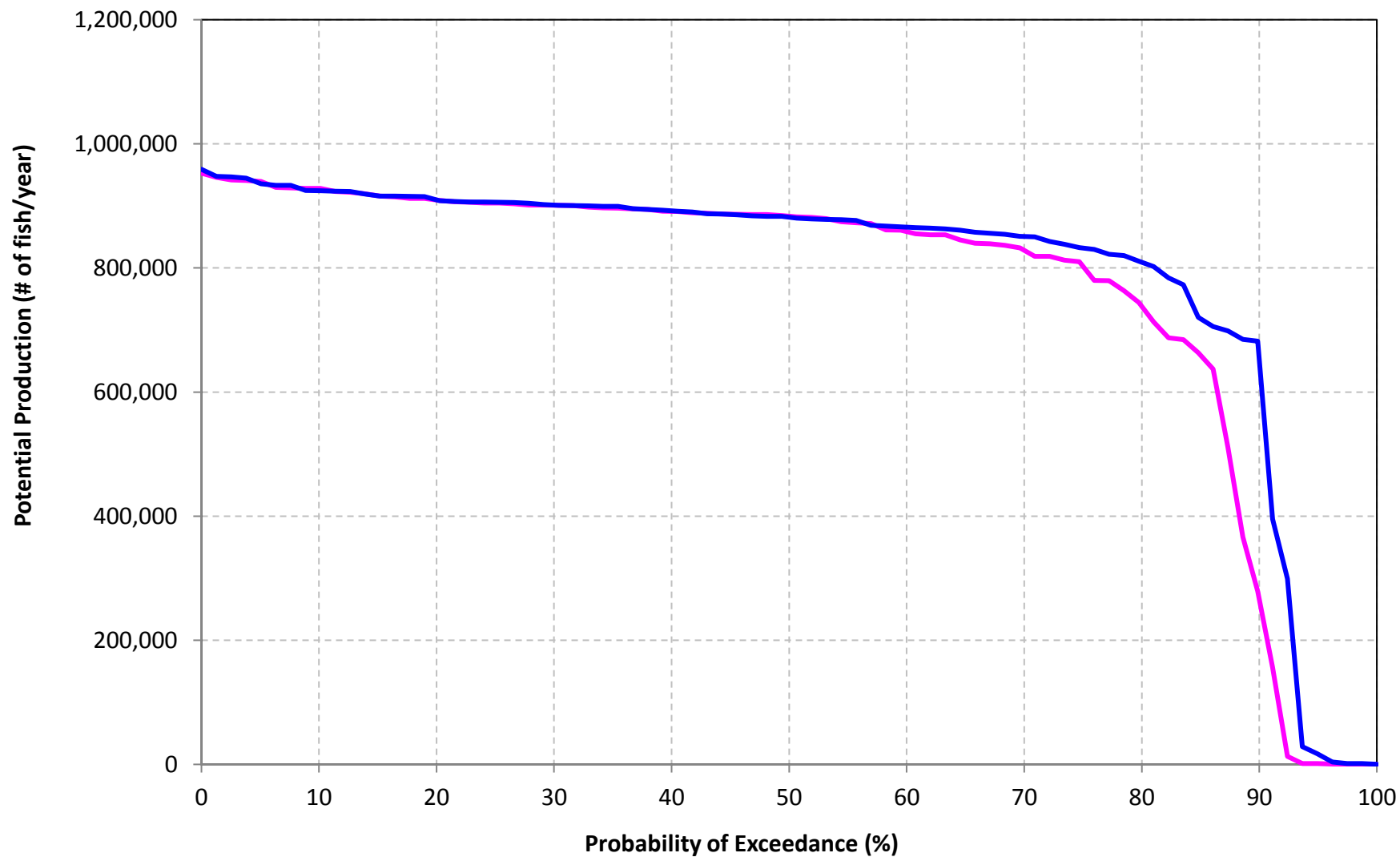
<sup>3</sup> Relative difference of the annual average

Figure AQ-02-7d

Annual Potential Production for Spring-Run Chinook Salmon

No Action Alternative

Alternative C



## **Alternative D Compared to No Action Alternative**

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Table AQ-02-9a-1

| Annual Potential Production for Fall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 26,765,370                                   |
| Alternative D   | 27,431,377                                   |
| Difference  | 666,007                                      |
| Percent Difference <sup>3</sup>   | 2.5  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 18,628,120                                   |
| Alternative D   | 17,123,621                                   |
| Difference  | -1,504,499                                   |
| Percent Difference  | -8.1   |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 23,411,148                                   |
| Alternative D   | 24,711,569                                   |
| Difference  | 1,300,421                                    |
| Percent Difference  | 5.6  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 31,508,109                                   |
| Alternative D   | 31,518,116                                   |
| Difference  | 10,008                                       |
| Percent Difference  | 0.0  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 33,288,388                                   |
| Alternative D   | 35,087,523                                   |
| Difference  | 1,799,135                                    |
| Percent Difference  | 5.4  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 31,873,541                                   |
| Alternative D   | 35,779,275                                   |
| Difference  | 3,905,734                                    |
| Percent Difference  | 12.3   |
| <sup>1</sup> Based on the 80-year simulation period<br><sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.<br><sup>3</sup> Relative difference of the annual average |  |

Table AQ-02-9a-2

| Annual Production of Listed Life-stages for Fall-Run Chinook Salmon   |                                    |            |            |                |                                 |
|---|------------------------------------|------------|------------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production  |                                    |            |            |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |            |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt  | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |            |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 57,847,525                         | 35,498,044 | 27,541,840 | 26,765,767     | 54,307,608                      |
| Alternative D   | 59,655,589                         | 36,441,548 | 28,254,731 | 27,431,385     | 55,686,116                      |
| Difference  | 1,808,063                          | 943,505    | 712,891    | 665,618        | 1,378,509                       |
| Percent Difference <sup>3</sup>   | 3.1                                | 2.7        | 2.6        | 2.5            | 2.5                             |
| <b>Water Year Types<sup>2</sup></b>   |                                    |            |            |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 35,415,749                         | 24,936,409 | 19,162,458 | 18,628,457     | 37,790,915                      |
| Alternative D   | 31,962,101                         | 23,010,802 | 17,639,284 | 17,123,645     | 34,762,929                      |
| Difference  | -3,453,647                         | -1,925,608 | -1,523,174 | -1,504,812     | -3,027,986                      |
| Percent Difference  | -9.8                               | -7.7       | -7.9       | -8.1           | -8.0                            |
| <b>Above Normal (12.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 50,324,981                         | 31,117,803 | 24,141,029 | 23,411,153     | 47,552,182                      |
| Alternative D   | 52,563,399                         | 32,938,910 | 25,483,421 | 24,711,575     | 50,194,997                      |
| Difference  | 2,238,418                          | 1,821,107  | 1,342,392  | 1,300,423      | 2,642,815                       |
| Percent Difference  | 4.4                                | 5.9        | 5.6        | 5.6            | 5.6                             |
| <b>Below Normal (17.5%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 72,575,785                         | 41,303,199 | 32,269,476 | 31,508,877     | 63,778,353                      |
| Alternative D   | 73,301,780                         | 41,407,046 | 32,284,561 | 31,518,107     | 63,802,668                      |
| Difference  | 725,995                            | 103,848    | 15,085     | 9,230          | 24,315                          |
| Percent Difference  | 1.0                                | 0.3        | 0.0        | 0.0            | 0.0                             |
| <b>Dry (22.5%)</b>  |                                    |            |            |                |                                 |
| No Action Alternative   | 75,122,779                         | 43,988,393 | 34,206,128 | 33,289,065     | 67,495,194                      |
| Alternative D   | 80,261,246                         | 46,406,994 | 36,105,167 | 35,087,523     | 71,192,690                      |
| Difference  | 5,138,467                          | 2,418,601  | 1,899,039  | 1,798,458      | 3,697,497                       |
| Percent Difference  | 6.8                                | 5.5        | 5.6        | 5.4            | 5.5                             |
| <b>Critical (15%)</b>   |                                    |            |            |                |                                 |
| No Action Alternative   | 69,622,645                         | 42,523,582 | 33,019,172 | 31,873,544     | 64,892,716                      |
| Alternative D   | 78,739,261                         | 47,719,117 | 37,087,171 | 35,779,280     | 72,866,451                      |
| Difference  | 9,116,615                          | 5,195,535  | 4,067,999  | 3,905,736      | 7,973,735                       |
| Percent Difference  | 13.1                               | 12.2       | 12.3       | 12.3           | 12.3                            |
| 1 Based on the 80-year simulation period  |                                    |            |            |                |                                 |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |                                    |            |            |                |                                 |
| 3 Relative difference of the annual average   |                                    |            |            |                |                                 |

Figure AQ-02-9a

Annual Potential Production for Fall-Run Chinook Salmon

No Action Alternative

Alternative D

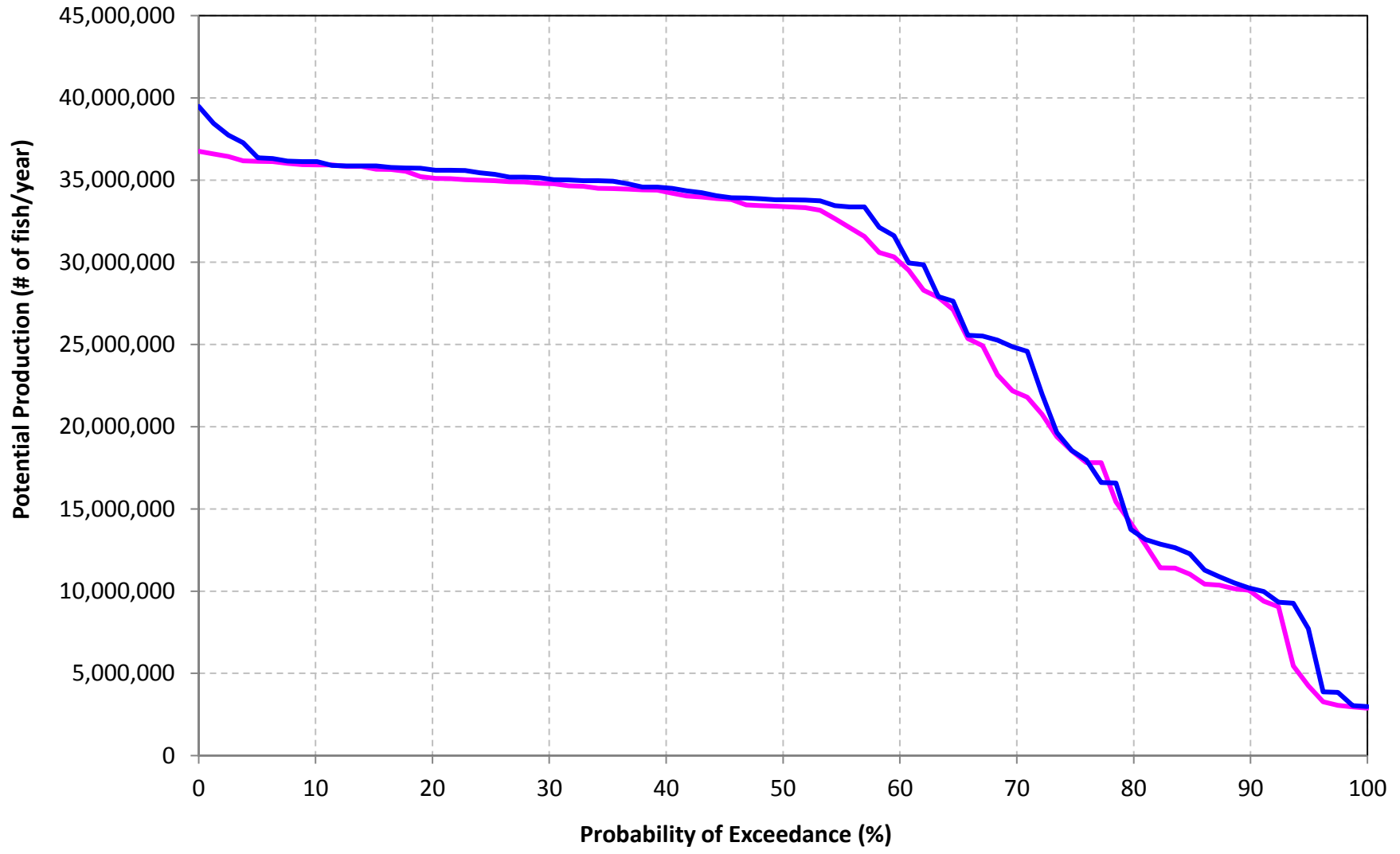


Table AQ-02-9b-1

| Annual Potential Production for LateFall-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 7,063,598                                    |
| Alternative D   | 7,233,390                                    |
| Difference  | 169,792                                      |
| Percent Difference <sup>3</sup>   | 2.4  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 6,086,322                                    |
| Alternative D   | 6,086,733                                    |
| Difference  | 411  |
| Percent Difference  | 0.0  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 6,786,532                                    |
| Alternative D   | 6,857,905                                    |
| Difference  | 71,373                                       |
| Percent Difference  | 1.1  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 7,885,249                                    |
| Alternative D   | 7,969,970                                    |
| Difference  | 84,721                                       |
| Percent Difference  | 1.1  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 8,016,842                                    |
| Alternative D   | 8,173,701                                    |
| Difference  | 156,859                                      |
| Percent Difference  | 2.0  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 7,023,457                                    |
| Alternative D   | 7,760,905                                    |
| Difference  | 737,448                                      |
| Percent Difference  | 10.5   |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |



Table AQ-02-9b-2

| Annual Production of Listed Life-stages for LateFall-Run Chinook Salmon |                                    |            |           |                |                                 |
|---|------------------------------------|------------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production      |                                    |            |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |            |           |                |                                 |
|   | Eggs                               | Fry        | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |            |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                               |                                    |            |           |                |                                 |
| No Action Alternative   | 15,438,352                         | 10,129,943 | 7,564,502 | 7,063,599      | 14,628,100                      |
| Alternative D   | 15,541,313                         | 10,263,029 | 7,736,059 | 7,233,390      | 14,969,449                      |
| Difference  | 102,961                            | 133,086    | 171,557   | 169,791        | 341,348                         |
| Percent Difference <sup>3</sup>   | 0.7                                | 1.3        | 2.3       | 2.4            | 2.3                             |
| <b>Water Year Types<sup>2</sup></b>                                     |                                    |            |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 12,053,317                         | 8,428,711  | 6,355,705 | 6,086,326      | 12,442,031                      |
| Alternative D   | 12,020,491                         | 8,426,013  | 6,356,703 | 6,086,733      | 12,443,436                      |
| Difference  | -32,825                            | -2,699     | 998       | 407            | 1,406                           |
| Percent Difference  | -0.3                               | 0.0        | 0.0       | 0.0            | 0.0                             |
| <b>Above Normal (12.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 13,704,957                         | 9,482,718  | 7,166,993 | 6,786,532      | 13,953,525                      |
| Alternative D   | 13,822,487                         | 9,596,899  | 7,246,459 | 6,857,905      | 14,104,364                      |
| Difference  | 117,530                            | 114,181    | 79,467    | 71,373         | 150,840                         |
| Percent Difference  | 0.9                                | 1.2        | 1.1       | 1.1            | 1.1                             |
| <b>Below Normal (17.5%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 17,122,923                         | 11,026,435 | 8,347,212 | 7,885,249      | 16,232,461                      |
| Alternative D   | 17,352,726                         | 11,166,116 | 8,436,558 | 7,969,970      | 16,406,528                      |
| Difference  | 229,803                            | 139,681    | 89,347    | 84,721         | 174,068                         |
| Percent Difference  | 1.3                                | 1.3        | 1.1       | 1.1            | 1.1                             |
| <b>Dry (22.5%)</b>  |                                    |            |           |                |                                 |
| No Action Alternative   | 17,972,683                         | 11,327,517 | 8,601,905 | 8,016,842      | 16,618,747                      |
| Alternative D   | 18,179,787                         | 11,561,263 | 8,762,665 | 8,173,701      | 16,936,366                      |
| Difference  | 207,104                            | 233,746    | 160,759   | 156,859        | 317,619                         |
| Percent Difference  | 1.2                                | 2.1        | 1.9       | 2.0            | 1.9                             |
| <b>Critical (15%)</b>   |                                    |            |           |                |                                 |
| No Action Alternative   | 18,450,262                         | 11,513,031 | 8,045,552 | 7,023,457      | 15,069,009                      |
| Alternative D   | 18,531,090                         | 11,797,388 | 8,775,506 | 7,760,905      | 16,536,411                      |
| Difference  | 80,829                             | 284,357    | 729,954   | 737,448        | 1,467,402                       |
| Percent Difference  | 0.4                                | 2.5        | 9.1       | 10.5           | 9.7                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-9b

Annual Potential Production for LateFall-Run Chinook Salmon

No Action Alternative

Alternative D

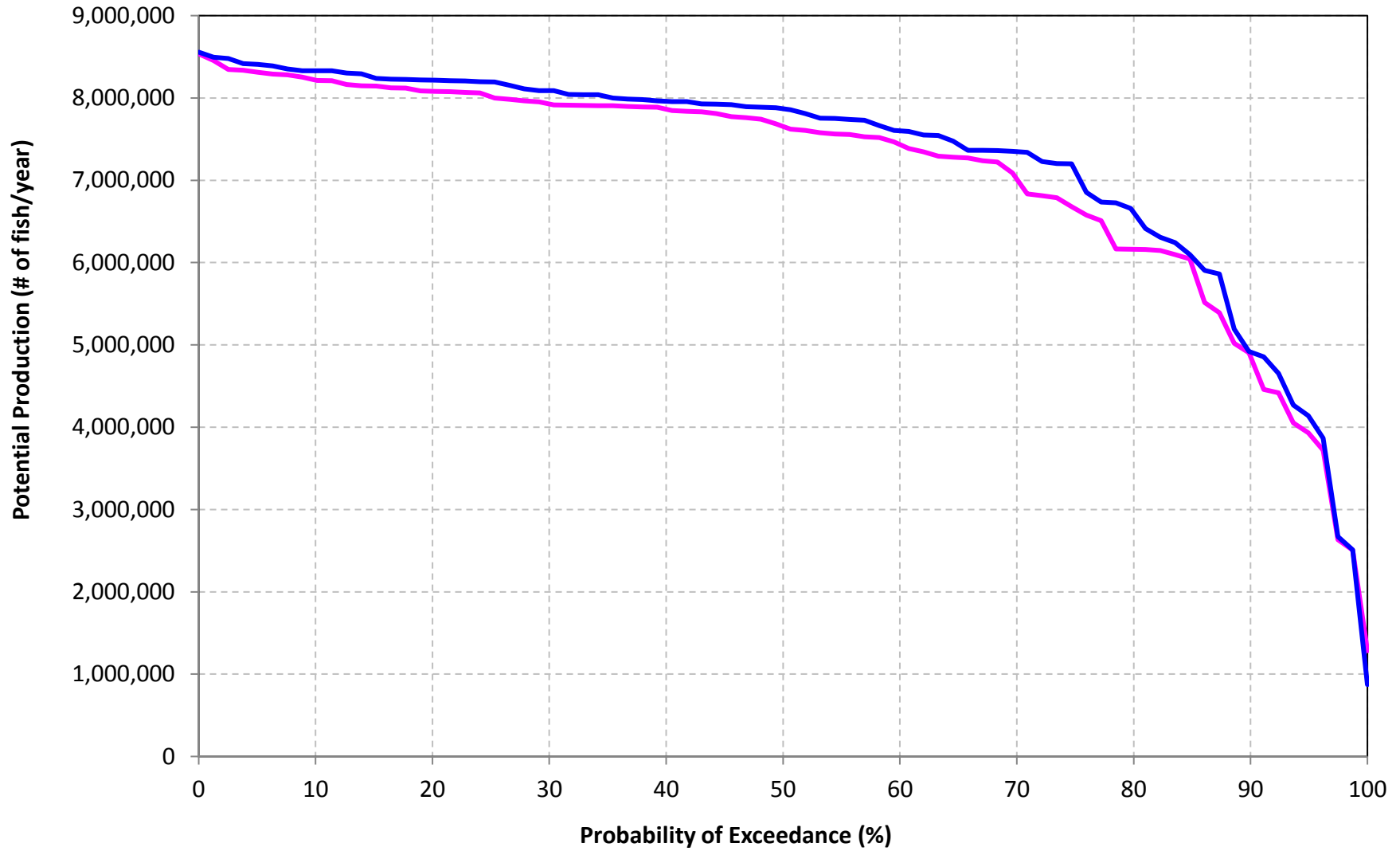


Table AQ-02-9c-1

| Annual Potential Production for Winter-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 3,751,166                                    |
| Alternative D   | 3,874,173                                    |
| Difference  | 123,006                                      |
| Percent Difference <sup>3</sup>   | 3.3  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 3,874,738                                    |
| Alternative D   | 3,883,652                                    |
| Difference  | 8,915  |
| Percent Difference  | 0.2  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 3,321,532                                    |
| Alternative D   | 3,673,377                                    |
| Difference  | 351,844                                      |
| Percent Difference  | 10.6   |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 3,684,470                                    |
| Alternative D   | 3,812,354                                    |
| Difference  | 127,883                                      |
| Percent Difference  | 3.5  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 3,833,673                                    |
| Alternative D   | 3,951,885                                    |
| Difference  | 118,212                                      |
| Percent Difference  | 3.1  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 3,795,508                                    |
| Alternative D   | 3,976,517                                    |
| Difference  | 181,009                                      |
| Percent Difference  | 4.8  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-9c-2

| Annual Production of Listed Life-stages for Winter-Run Chinook Salmon |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production    |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                             |                                    |           |           |                |                                 |
| No Action Alternative   | 6,927,445                          | 5,237,474 | 3,868,159 | 3,751,221      | 7,619,381                       |
| Alternative D   | 7,157,922                          | 5,400,417 | 3,989,037 | 3,874,260      | 7,863,297                       |
| Difference  | 230,477                            | 162,943   | 120,877   | 123,039        | 243,916                         |
| Percent Difference <sup>3</sup>                                       | 3.3                                | 3.1       | 3.1       | 3.3            | 3.2                             |
| <b>Water Year Types<sup>2</sup></b>                                   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,098,364                          | 5,356,368 | 3,964,284 | 3,874,738      | 7,839,021                       |
| Alternative D   | 7,180,096                          | 5,372,699 | 3,965,678 | 3,883,652      | 7,849,330                       |
| Difference  | 81,731                             | 16,331    | 1,394     | 8,915          | 10,309                          |
| Percent Difference  | 1.2                                | 0.3       | 0.0       | 0.2            | 0.1                             |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,302,972                          | 4,674,443 | 3,400,860 | 3,321,532      | 6,722,392                       |
| Alternative D   | 6,982,885                          | 5,169,784 | 3,780,098 | 3,674,076      | 7,454,174                       |
| Difference  | 679,913                            | 495,341   | 379,238   | 352,544        | 731,782                         |
| Percent Difference  | 10.8                               | 10.6      | 11.2      | 10.6           | 10.9                            |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 6,729,987                          | 5,119,537 | 3,773,798 | 3,684,786      | 7,458,584                       |
| Alternative D   | 7,010,841                          | 5,325,331 | 3,909,442 | 3,812,354      | 7,721,796                       |
| Difference  | 280,855                            | 205,795   | 135,645   | 127,567        | 263,212                         |
| Percent Difference  | 4.2                                | 4.0       | 3.6       | 3.5            | 3.5                             |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 7,087,788                          | 5,358,934 | 3,984,011 | 3,833,673      | 7,817,684                       |
| Alternative D   | 7,271,973                          | 5,507,166 | 4,089,897 | 3,951,885      | 8,041,782                       |
| Difference  | 184,185                            | 148,232   | 105,886   | 118,212        | 224,098                         |
| Percent Difference  | 2.6                                | 2.8       | 2.7       | 3.1            | 2.9                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 7,067,367                          | 5,404,463 | 3,985,618 | 3,795,508      | 7,781,126                       |
| Alternative D   | 7,256,263                          | 5,580,141 | 4,155,333 | 3,976,517      | 8,131,850                       |
| Difference  | 188,897                            | 175,678   | 169,715   | 181,009        | 350,724                         |
| Percent Difference  | 2.7                                | 3.3       | 4.3       | 4.8            | 4.5                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-9c

Annual Potential Production for Winter-Run Chinook Salmon

No Action Alternative

Alternative D

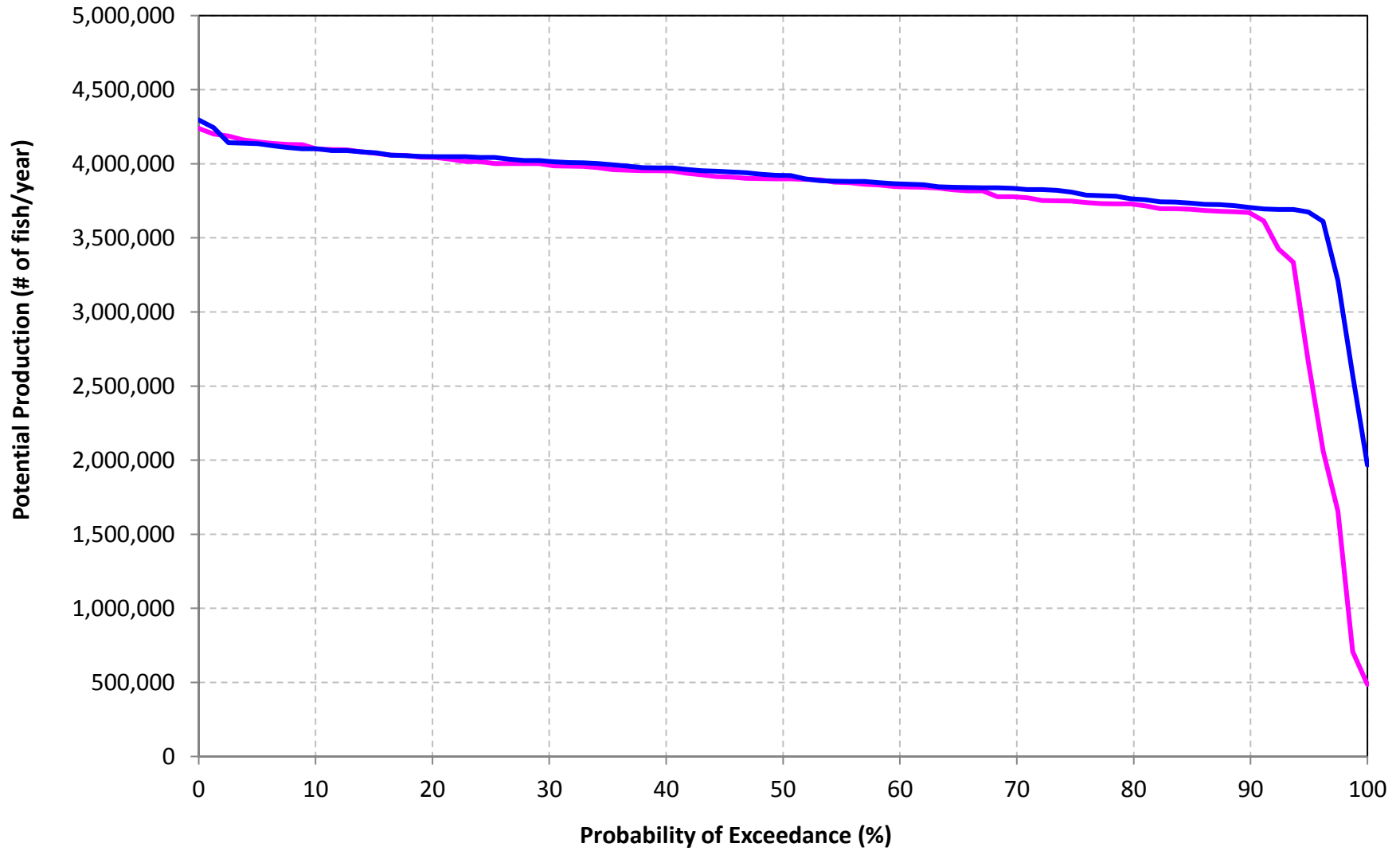


Table AQ-02-9d-1

| Annual Potential Production for Spring-Run Chinook Salmon   |  |
|---|--|
| Long-term Average and Average by Water Year Type Annual Production  |  |
| Analysis Period   | Annual Potential Production (# of Fish/year) |
| <b>Long-term</b>  |  |
| <b>Full Simulation Period<sup>1</sup></b>   |  |
| No Action Alternative   | 764,306                                      |
| Alternative D   | 791,090                                      |
| Difference  | 26,784                                       |
| Percent Difference <sup>3</sup>   | 3.5  |
| <b>Water Year Types<sup>2</sup></b>   |  |
| <b>Wet (32.5%)</b>  |  |
| No Action Alternative   | 836,109                                      |
| Alternative D   | 849,827                                      |
| Difference  | 13,717                                       |
| Percent Difference  | 1.6  |
| <b>Above Normal (12.5%)</b>   |  |
| No Action Alternative   | 711,508                                      |
| Alternative D   | 716,102                                      |
| Difference  | 4,594  |
| Percent Difference  | 0.6  |
| <b>Below Normal (17.5%)</b>   |  |
| No Action Alternative   | 819,955                                      |
| Alternative D   | 823,921                                      |
| Difference  | 3,967  |
| Percent Difference  | 0.5  |
| <b>Dry (22.5%)</b>  |  |
| No Action Alternative   | 741,759                                      |
| Alternative D   | 807,110                                      |
| Difference  | 65,351                                       |
| Percent Difference  | 8.8  |
| <b>Critical (15%)</b>   |  |
| No Action Alternative   | 621,625                                      |
| Alternative D   | 663,984                                      |
| Difference  | 42,360                                       |
| Percent Difference  | 6.8  |
| 1 Based on the 80-year simulation period  |  |
| 2 As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD. |  |
| 3 Relative difference of the annual average   |  |

Table AQ-02-9d-2

| Annual Production of Listed Life-stages for Spring-Run Chinook Salmon |                                    |           |           |                |                                 |
|---|------------------------------------|-----------|-----------|----------------|---------------------------------|
| Long-term Average and Average by Water Year Type Annual Production    |                                    |           |           |                |                                 |
| Analysis Period   | Annual Production (# of Fish/year) |           |           |                |                                 |
|   | Eggs                               | Fry       | Pre-Smolt | Immature-Smolt | Juvenile (Pre & Immature Smolt) |
| <b>Long-term</b>  |                                    |           |           |                |                                 |
| <b>Full Simulation Period<sup>1</sup></b>                             |                                    |           |           |                |                                 |
| No Action Alternative   | 1,263,784                          | 1,023,289 | 765,107   | 764,542        | 1,529,649                       |
| Alternative D   | 1,302,574                          | 1,055,533 | 791,968   | 791,493        | 1,583,461                       |
| Difference  | 38,790                             | 32,243    | 26,861    | 26,951         | 53,812                          |
| Percent Difference <sup>3</sup>                                       | 3.1                                | 3.2       | 3.5       | 3.5            | 3.5                             |
| <b>Water Year Types<sup>2</sup></b>                                   |                                    |           |           |                |                                 |
| <b>Wet (32.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,394,102                          | 1,121,764 | 837,127   | 836,836        | 1,673,963                       |
| Alternative D   | 1,414,015                          | 1,136,409 | 851,145   | 850,937        | 1,702,082                       |
| Difference  | 19,913                             | 14,645    | 14,018    | 14,101         | 28,119                          |
| Percent Difference  | 1.4                                | 1.3       | 1.7       | 1.7            | 1.7                             |
| <b>Above Normal (12.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,166,537                          | 941,700   | 711,840   | 711,508        | 1,423,348                       |
| Alternative D   | 1,169,097                          | 946,934   | 716,680   | 716,438        | 1,433,118                       |
| Difference  | 2,560                              | 5,234     | 4,841     | 4,929          | 9,770                           |
| Percent Difference  | 0.2                                | 0.6       | 0.7       | 0.7            | 0.7                             |
| <b>Below Normal (17.5%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,354,240                          | 1,096,333 | 820,396   | 819,955        | 1,640,351                       |
| Alternative D   | 1,355,248                          | 1,100,223 | 824,226   | 823,921        | 1,648,147                       |
| Difference  | 1,008                              | 3,890     | 3,830     | 3,967          | 7,796                           |
| Percent Difference  | 0.1                                | 0.4       | 0.5       | 0.5            | 0.5                             |
| <b>Dry (22.5%)</b>  |                                    |           |           |                |                                 |
| No Action Alternative   | 1,221,369                          | 995,035   | 742,745   | 741,759        | 1,484,504                       |
| Alternative D   | 1,321,299                          | 1,076,965 | 808,087   | 807,110        | 1,615,198                       |
| Difference  | 99,930                             | 81,929    | 65,342    | 65,351         | 130,693                         |
| Percent Difference  | 8.2                                | 8.2       | 8.8       | 8.8            | 8.8                             |
| <b>Critical (15%)</b>   |                                    |           |           |                |                                 |
| No Action Alternative   | 1,020,561                          | 835,082   | 622,494   | 621,625        | 1,244,119                       |
| Alternative D   | 1,082,811                          | 886,515   | 664,680   | 663,984        | 1,328,665                       |
| Difference  | 62,250                             | 51,433    | 42,187    | 42,360         | 84,546                          |
| Percent Difference  | 6.1                                | 6.2       | 6.8       | 6.8            | 6.8                             |

<sup>1</sup> Based on the 80-year simulation period

<sup>2</sup> As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB 1995). Water years may not correspond to the biological years in SALMOD.

<sup>3</sup> Relative difference of the annual average

Figure AQ-02-9d

Annual Potential Production for Spring-Run Chinook Salmon

No Action Alternative

Alternative D

