

## APPENDIX D – Estimating Current Population Status.

[Note that the text of this appendix is an extremely early draft. We intend to expand the descriptions of our methods in the next draft.]

We compared historical and current population abundance, productivity, spatial structure and diversity to determine whether values of each of these parameters had declined substantially, indicating that there is the potential to improve population status. Obviously, historical conditions are unavailable in virtually every case. We therefore estimated the intrinsic potential of the landscape to support salmon and steelhead, and used the results of this analysis as our hypothesis of the distribution of salmon and steelhead historically (Appendix C). This comparison does not consider whether current conditions or some point in between current and historical conditions could be considered viable, but rather only whether it is possible to increase the values of each of these parameters, assuming that historical values were a maximum potential.

**Current distributions.** We used GIS layers available on Streamnet and refined with layers provided by Idaho Fish and Game, Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife to describe current spawning and rearing distribution for each species. Digital spatial themes were compiled from existing sources, including Streamnet, the Oregon Department of Fish and Wildlife (ODFW), the Washington Department of Fish and Wildlife (WDFW), and the Idaho Department of Fish and Game (IDFG). Using this state agency data, we created use defined themes describing spawning, rearing, and migration corridors for summer and winter steelhead, and summer, spring, and fall chinook. Spatial layer scales were inherited from the sponsoring agencies, and were left unaltered in our data development efforts. Once the various lifecycle and specie specific themes were separated for each state, we reduced and standardized the attribute tables so that GIS layer merging techniques could be applied. The appended outputs were re-projected into a common coordinate system and combined to form continuous feature layers within the study area. These spatial themes illustrate a presence/absence view, in regards to the various lifecycles, of the population structure within the sub-basins.

In a small number of cases, we have discovered errors in these data layers. For consistency, however, we are using these layers as they were provided (i.e. we have made no changes), and are noting those errors.

We took the following approach to comparing historical and current population status for each viability-related parameter:

**Abundance/Capacity.** We evaluated two characteristics of abundance and capacity. First, for those populations for which a total population estimate was available, we calculated the geometric mean number of spawners for the last five years of the time series. An abundant literature suggests that a population size less than 500 is subject to a variety of demographic and genetic impacts severely limiting viability. Therefore, we judged that any population with less than 500 spawners (geomean over five years) had potential for improvement with respect to

abundance. We used the data set compiled by the Biological Review Team in its recent status review of Northwest ESUs ([www.nwfsc.noaa.gov/trt/brtrpt.htm](http://www.nwfsc.noaa.gov/trt/brtrpt.htm))

For all populations, we also calculated a capacity metric, based on our intrinsic potential analysis (see Appendix D). Specifically, we summed the total number of meters currently occupied, weighted by its intrinsic potential. Stream segments rated high were weighted 1.0; segments rated “moderate” were weighted 0.5; and segments rated “low” were weighted 0.25. This weighted sum was compared with the weighted sum of all stream segments historically accessible and usable. If the value of this relative metric currently was 75% or less of the value historically, we considered the population to have potential for improvement with respect to capacity.

**Productivity.** To evaluate current productivity, we used four metrics used by the Biological Review Teams (BRT) during the 2002/2003 status reviews: short-term trend, long-term trend, long-term population growth rate, assuming hatchery fish do not contribute to subsequent generations and long-term population growth rate assuming that hatchery fish do contribute to subsequent generations (see McClure et al. 2003 for an explanation of these population growth rates). Because it is essentially impossible to gauge a population's historical productivity, we judged that a population had potential to improve with respect to productivity if any one of these metrics was less than one (i.e. the trend or growth rate was declining). For many populations, data were not available to calculate productivity metrics. In these cases, we noted the lack of data; for categorization purposes, we assumed the average of each productivity metric across populations within the relevant ESU. The mean population growth rate of a group of populations is a robust indicator of the central tendency of that group (Holmes and Fagan 2002).

**Spatial Structure.** We used three metrics to gauge whether there was potential for a population's spatial structure to be improved.

*Percent potential habitat currently occupied.* We calculated the percent of the potentially suitable habitat (that is currently occupied; any value less than 66% was deemed as impaired (having potential for improvement). This was an absolute comparison between the absolute stream km currently occupied and the absolute number of stream km identified as usable in our intrinsic potential analysis. This metric is intended to identify those situations where substantial portions of the historic distribution are not occupied.

*Distributional differences.* Second, we calculated the distribution of distances between spawning areas and determined whether there was a significant difference between the historical and current distribution. Any significant difference was deemed to be impaired. We classified each 6<sup>th</sup>-field HUC within the population as occupied or un-occupied based on the current distribution (any presence was scored as occupied). For historic distribution, we classified each 6<sup>th</sup>-field HUC as occupied or unoccupied by the presence of any stream segment ranked “high” or “moderate” in our intrinsic potential analysis. We then generated a matrix of distances from each occupied 6<sup>th</sup>-field HUC to every other occupied 6<sup>th</sup> field HUC. We then tested whether the distribution of distances within these matrices were different using a Kolmogorov-Smirnoff test. Any significant difference was considered impaired. This metric is intended to identify differences in clustering patterns of spawning areas within a population.

*Range.* Finally, we examined the range of distances between spawning areas; any substantial reduction in this range was judged to provide potential for improvement. We based this analysis

on the matrices generated above. If the range (minimum distance between two occupied HUCs to maximum distance between two occupied HUCs) was reduced by 2 or more, the population was considered to have potential to improve. This metric was intended to identify those situations where the current distribution had become restricted in comparison to historical distributions.

A population was deemed to have potential for improvement if any one of these conditions was met.

**Diversity.** Because relevant life history, genetic and morphological diversity has not been characterized for most populations, we relied on habitat differences, characterized by ecoregion as a proxy for the potential for a population to express relevant diversity. We devised a diversity metric that considered both the number of ecoregions and the distribution across those ecoregions. If the historical value was greater than the current value of this metric, we considered there to be room for the population to improve with respect to diversity.

To generate a diversity score, we examined the distribution of spawnable stream km across the EPA level-3 ecoregions using GIS mapping techniques. For a current diversity score, we generated the percentage of currently used stream kilometers in each ecoregion. For a potential historic diversity score we generated the percentage of stream kilometers categorized as “high” or “moderate” for spawning in our intrinsic potential analysis in each ecoregion.

We then calculated a diversity “score” for each population by adding together “points” based on the distribution of stream km across the ecoregions. Any ecoregion with less than 1% of a population’s stream km received 0 points; an ecoregion that contained from 1-10% or 90-100% of the population’s stream km received 1 point and an ecoregion that encompassed from 11-89% of the population’s stream km received 2 points. Thus, a population with streams distributed more or less equally across 3 ecoregions received more points than a population distributed across 3 ecoregions, but with one or two ecoregions containing a very small proportion of the total stream km.

Table D-1. Abundance metrics for Interior Columbia populations

| ESU  | Pop. Code | Population Name                      | Abundance              |                          |            | Capacity                    |                            |                   | Impaired (geomean <500 or capacity <75%) |
|--|-----------|--------------------------------------|------------------------|--------------------------|------------|-----------------------------|----------------------------|-------------------|--|
|  |           |                                      | Geo mean, last 5 years | Last Year of Time Series | Count Type | Historic Weighted Stream km | Current Weighted Stream km | % Stream kms Used |  |
| <b>Snake River Spring / Summer Chinook</b> |           |                                      |                        |                          |            |                             |                            |                   |  |
|  | SNASO     | Asotin River                         | *                      | *                        | *          | 42.60                       | 5.00                       | 11.74             | X  |
|  | SNTUC     | Tucannon River                       | 71.99                  | 2001                     | TLC        | 147.10                      | 34.00                      | 23.11             | X  |
|  | GRWEN     | Wenaha River                         | 81.56 <sup>1</sup>     | 1996                     | TLC        | 58.20                       | 36.90                      | 63.40             | X  |
|  | GRLOS     | Wallowa/Lostine Rivers               | NA                     | NA                       | RC         | 218.60                      | 71.50                      | 32.71             | X  |
|  | GRLOO     | Lookingglass Creek (Historic)        | NA                     | NA                       | RC         | 22.00                       | 12.50                      | 56.82             | X  |
|  | GRMIN     | Minam River                          | 171.93                 | 2001                     | TLC        | 67.20                       | 33.40                      | 49.70             | X  |
|  | GRCAT     | Catherine Creek                      | 22.13                  | 1996                     | TLC        | 167.90                      | 24.20                      | 14.41             | X  |
|  | GRUMA     | Upper Grande Ronde River             | 19.69                  | 1996                     | TLC        | 268.60                      | 43.60                      | 16.23             | X  |
|  | IRMAI     | Imnaha River                         | NA                     | NA                       | EXP. RC    | 98.90                       | 43.40                      | 43.88             | X  |
|  | IRBSH     | Big Sheep Creek                      | NA                     | NA                       | RC         | 53.00                       | 10.80                      | 20.38             | X  |
|  | SRLSR     | Little Salmon River                  | NA                     | NA                       | RPM        | 201.30                      | 54.50                      | 27.07             | X  |
|  | SFMAI     | South Fork Salmon River              | 371.75 <sup>1</sup>    | 2001                     | TLC        | 187.60                      | 87.90                      | 46.86             | X  |
|  | SFSEC     | Secesh River                         | NA                     | NA                       | RPM/RC     | 87.50                       | 53.80                      | 61.49             | X  |
|  | SFEFS     | E Fk S Fk Salmon River               | NA                     | NA                       | RPM        | 121.00                      | 66.50                      | 54.96             | X  |
|  | SRCHA     | Chamberlain Creek                    | NA                     | NA                       | RPM        | 100.40                      | 46.20                      | 46.02             | X  |
|  | MFBIG     | Big Creek                            | 52.509 <sup>1</sup>    | 2001                     | TLC        | 145.40                      | 83.40                      | 57.36             | X  |
|  | MFUMA     | Upper Middle Fork Salmon River       | *                      | *                        | *          | 130.90                      | 67.80                      | 51.80             | X  |
|  | MFLMA     | Lower Middle Fork Salmon River       | *                      | *                        | *          | 32.70                       | 1.70                       | 5.20              | X  |
|  | MFCAM     | Camas Creek                          | NA                     | NA                       | RC         | 61.80                       | 38.80                      | 62.78             | X  |
|  | MFLOO     | Loon Creek                           | NA                     | NA                       | RC         | 54.00                       | 45.30                      | 83.89             |  |
|  | MFSUL     | Sulphur Creek                        | 23.26                  | 2001                     | TLC        | 20.10                       | 17.90                      | 89.05             | X  |
|  | MFBEA     | Bear Valley Creek                    | 266.42                 | 2001                     | TLC        | 131.70                      | 116.80                     | 88.69             | X  |
|  | MFMAR     | Marsh Creek                          | 53.01                  | 2001                     | TLC        | 85.70                       | 70.70                      | 82.50             | X  |
|  | SRPAN     | Panther Creek (Historic)             | *                      | *                        | *          | 90.80                       | 10.80                      | 11.89             | X  |
|  | SRNFS     | N Fk Salmon River                    | NA                     | NA                       | RC         | 56.60                       | 26.60                      | 47.00             | X  |
|  | SRLEM     | Lemhi River                          | NA                     | NA                       | RC         | 294.20                      | 98.60                      | 33.51             | X  |
|  | SRLMA     | Upper Salmon Lower Mainstem          | *                      | *                        | *          | 208.30                      | 130.20                     | 62.51             | X  |
|  | SRPAH     | Pahsimeroi River                     | 161.42 <sup>2</sup>    | 2001                     | TLC        | 182.20                      | 39.50                      | 21.68             | X  |
|  | SREFS     | E Fk Salmon River                    | NA                     | NA                       | RPM        | 83.70                       | 51.40                      | 61.41             | X  |
|  | SRYFS     | Yankee Fork                          | NA                     | NA                       | RPM/RC     | 49.70                       | 48.00                      | 96.58             |  |
|  | SRVAL     | Valley Creek                         | NA                     | NA                       | RPM/RC     | 90.30                       | 77.50                      | 85.83             |  |
|  | SRUMA     | Upper Salmon River                   | NA                     | NA                       | RPM/RC     | 161.90                      | 107.70                     | 66.52             | X  |
| <b>Upper Columbia Chinook</b>              |           |                                      |                        |                          |            |                             |                            |                   |  |
|  | UCWEN     | Wenatchee River                      | 273.78                 | 2001                     | TLC        | 327.90                      | 123.00                     | 37.51             | X  |
|  | UCENT     | Entiat River                         | 64.83                  | 2001                     | TLC        | 68.70                       | 20.80                      | 30.28             | X  |
|  | UCMET     | Methow River                         | 282.21                 | 2001                     | TLC        | 232.60                      | 117.20                     | 50.39             | X  |
| <b>Snake River Fall Chinook</b>            |           |                                      |                        |                          |            |                             |                            |                   |  |
|  | SNMAI     | Snake mainstem and lower tributaries | 871.12                 | 2001                     | TLC        | *                           | 132.80                     | *                 |  |

Abundance metrics for Interior Columbia populations, cont.

| ESU                              | Pop. Code | Population Name                         | Abundance                       |                                   |                 | Capacity                             |                                     |                            | Impaired<br>(geomean<br><500 or<br>capacity<br><75%) |
|----------------------------------|-----------|---|---------------------------------|-----------------------------------|-----------------|--------------------------------------|-------------------------------------|----------------------------|--|
|                                  |           |   | Geo<br>mean,<br>last 5<br>years | Last<br>Year of<br>Time<br>Series | Count<br>Type   | Historic<br>Weighted<br>Stream<br>km | Current<br>Weighted<br>Stream<br>km | %<br>Stream<br>kms<br>Used |  |
| <b>Middle Columbia Steelhead</b> |           |   |                                 |                                   |                 |                                      |                                     |                            |  |
|                                  | MCWSA-s   | White Salmon River (Historic)           | *                               | *                                 | *               | 286.74                               | 2.55                                | 0.89                       | X  |
|                                  | MCKLI-s   | Klickitat River                         | NA                              | NA                                | RC              | 1418.12                              | 100.21                              | 7.07                       | X  |
|                                  | MCFIF-s   | Fifteen Mile Creek (winters)            | NA                              | NA                                | RPM             | 915.10                               | 152.13                              | 16.62                      | X  |
|                                  | DREST-s   | Deschutes River, Eastside               | 4767.92 <sup>3</sup>            | 2002                              | DC<br>(Sherars) | 1807.05                              | 342.56                              | 18.96                      | X  |
|                                  | DRWST-s   | Deschutes River, Westside               | NA                              | NA                                | RPM/RC          | 831.68                               | 130.06                              | 15.64                      | X  |
|                                  | MCROC-s   | Rock Creek                              | *                               | *                                 | *               | 300.12                               | 43.12                               | 14.37                      | X  |
|                                  | JDLMT-s   | John Day River lower mainstem tribs     | NA                              | NA                                | RPM             | 4685.86                              | 1110.72                             | 23.70                      | X  |
|                                  | JDNFJ-s   | North Fork John Day River               | NA                              | NA                                | RPM             | 2518.12                              | 1041.63                             | 41.37                      | X  |
|                                  | JDMFJ-s   | Middle Fork John Day River              | NA                              | NA                                | RPM             | 1151.19                              | 459.21                              | 39.89                      | X  |
|                                  | JDSFJ-s   | South Fork John Day River               | NA                              | NA                                | RPM             | 848.61                               | 205.14                              | 24.17                      | X  |
|                                  | JDUMA-s   | John Day upper mainstem                 | 2042.40                         | 2002                              | TLC             | 1184.08                              | 517.26                              | 43.69                      | X  |
|                                  | MCUMA-s   | Umatilla River                          | 1686.79                         | 2002                              | TLC             | 2346.93                              | 309.93                              | 13.21                      | X  |
|                                  | WWMAI-s   | Walla Walla River                       | 355.36                          | 2000                              | TLC             | 1207.22                              | 165.67                              | 13.72                      | X  |
|                                  | WWTOU-s   | Touchet River                           | 289.79                          | 2001                              | TLC             | 1011.12                              | 126.29                              | 12.49                      | X  |
|                                  | YRTOS-s   | Toppenish and Satus Creeks              | *                               | *                                 | *               | 1412.21                              | 175.88                              | 12.45                      | X  |
|                                  | YRNAC-s   | Naches River                            | *                               | *                                 | *               | 1046.15                              | 230.83                              | 22.07                      | X  |
|                                  | YRUMA-s   | Yakima River upper mainstem             | 1746.70                         | 2001                              | TLC             | 2247.27                              | 117.43                              | 5.23                       | X  |
| <b>Snake River Steelhead</b>     |           |   |                                 |                                   |                 |                                      |                                     |                            |  |
|                                  | SNTUC-s   | Tucannon River                          | 94.62                           | 2001                              | TLC             | 780.64                               | 67.94                               | 8.70                       | X  |
|                                  | SNASO-s   | Asotin Creek                            | NA                              | NA                                | EXP. RC         | 1486.66                              | 125.05                              | 8.41                       | X  |
|                                  | CRLMA-s   | Clearwater lower mainstem               | *                               | *                                 | *               | 1189.40                              | 443.35                              | 37.28                      | X  |
|                                  | CRNFC-s   | North Fork Clearwater (historic)        | *                               | *                                 | *               | 1571.91                              | 0.00                                | 0.00                       | X  |
|                                  | CRLOL-s   | Lolo Creek                              | *                               | *                                 | *               | 229.83                               | 82.50                               | 35.90                      | X  |
|                                  | CRLOC-s   | Lochsa River                            | *                               | *                                 | *               | 685.81                               | 370.16                              | 53.97                      | X  |
|                                  | CRSEL-s   | Selway Reiver                           | *                               | *                                 | *               | 910.78                               | 525.48                              | 57.70                      | X  |
|                                  | CRSFC-s   | South Fork Clearwater River             | *                               | *                                 | *               | 682.92                               | 396.04                              | 57.99                      | X  |
|                                  | GRLMT-s   | Grande Rone lower mainstem tribs        | *                               | *                                 | *               | 980.58                               | 387.19                              | 39.49                      | X  |
|                                  | GRJOS-s   | Joseph Creek                            | 1542.34 <sup>1</sup>            | 2002                              | TLC             | 623.94                               | 276.69                              | 44.35                      | X  |
|                                  | GRWAL-s   | Wallowa River                           | NA                              | NA                                | RPM             | 697.09                               | 289.94                              | 41.59                      | X  |
|                                  | GRUMA-s   | Grande Ronde Upper Mainstem             | NA                              | NA                                | RPM/RC          | 2000.20                              | 773.74                              | 38.68                      | X  |
|                                  | SRLSR-s   | Little Salmon and Rapid Rivers          | *                               | *                                 | *               | 519.86                               | 207.10                              | 39.84                      | X  |
|                                  | SRCHA-s   | Chamberlain Creek                       | *                               | *                                 | *               | 462.24                               | 269.08                              | 58.21                      | X  |
|                                  | SFSEC-s   | Secesh River                            | *                               | *                                 | *               | 175.91                               | 80.02                               | 45.49                      | X  |
|                                  | SFSFS-s   | South Fork Salmon River                 | *                               | *                                 | *               | 443.96                               | 304.90                              | 68.68                      | X  |
|                                  | SRPAN-s   | Panther Creek                           | *                               | *                                 | *               | 461.58                               | 97.94                               | 21.22                      | X  |
|                                  | MFBIG-s   | Big, Camas, and Loon Creeks             | *                               | *                                 | *               | 800.14                               | 522.84                              | 65.34                      | X  |
|                                  | MFUMA-s   | Middle Fork Salmon River Upper Mainstem | *                               | *                                 | *               | 718.38                               | 499.68                              | 69.56                      | X  |
|                                  | SRNFS-s   | North Fork Salmon River                 | *                               | *                                 | *               | 222.61                               | 130.31                              | 58.54                      | X  |
|                                  | SRLEM-s   | Lemhi River                             | *                               | *                                 | *               | 715.43                               | 107.68                              | 15.05                      | X  |
|                                  | SRPAH-s   | Pahsimeroi River                        | *                               | *                                 | *               | 426.91                               | 34.24                               | 8.02                       | X  |
|                                  | SREFS-s   | East Fork Salmon River                  | *                               | *                                 | *               | 501.92                               | 109.13                              | 21.74                      | X  |
|                                  | SRUMA-s   | Salmon River upper mainstem             | *                               | *                                 | *               | 674.51                               | 314.67                              | 46.65                      | X  |
|                                  | SNHCT-s   | snake River Hells Canyon Tributaries    | *                               | *                                 | *               | 163.41                               | 44.91                               | 27.49                      | X  |
|                                  | IRMAI-s   | Imnaha River                            | 42.3 <sup>1</sup>               | 2002                              | TLC             | 748.26                               | 446.27                              | 59.64                      | X  |

Abundance metrics for Interior Columbia populations, cont.

| ESU                                    | Pop. Code          | Population Name           | Abundance                       |                                   |               | Capacity                             |                                     |                            | Impaired<br>(geomean<br><500 or<br>capacity<br><75%) |
|--|--------------------|---------------------------|---------------------------------|-----------------------------------|---------------|--------------------------------------|-------------------------------------|----------------------------|--|
|  |                    |                           | Geo<br>mean,<br>last 5<br>years | Last<br>Year of<br>Time<br>Series | Count<br>Type | Historic<br>Weighted<br>Stream<br>km | Current<br>Weighted<br>Stream<br>km | %<br>Stream<br>kms<br>Used |  |
| <b>Upper Columbia Steelhead</b>        |                    |                           |                                 |                                   |               |                                      |                                     |                            |  |
|  | UCWEN-s            | Wenatchee River           | 893.67 <sup>4</sup>             | 2001                              | TLC           | 806.20                               | 112.33                              | 13.93                      | X  |
|  | UCENT-s            | Entiat River              | 893.67 <sup>4</sup>             | 2001                              | TLC           | 210.29                               | 43.13                               | 20.51                      | X  |
|  | UCMET-s            | Methow River              | 358.37                          | 2001                              | TLC           | 892.86                               | 144.82                              | 16.22                      | X  |
|  | UCOKA-s            | Okanogan River            | *                               | *                                 | *             | 802.36                               | 11.35                               | 1.42                       | X  |
| <b>Columbia River Chum<sup>5</sup></b> |                    |                           |                                 |                                   |               |                                      |                                     |                            |  |
|  |                    | Youngs Bay                | *                               | *                                 |               | 287                                  | 269                                 | 93.73                      |  |
|  |                    | Grays River (Hymer)       | 331                             | 2000                              |               | 230                                  | 229                                 | 99.57                      | X  |
|  |                    | Grays River (Rawding)     | 704                             | 1998                              |               | 230                                  | 229                                 | 99.57                      |  |
|  |                    | Big Creek                 | *                               | *                                 |               | 407                                  | 369                                 | 90.66                      |  |
|  |                    | Elochoman River           | *                               | *                                 |               | 242                                  | 242                                 | 100.00                     |  |
|  |                    | Clatskanie River          | *                               | *                                 |               | 165                                  | 160                                 | 96.97                      |  |
|  |                    | Mill, Abernathy, Germany  | *                               | *                                 |               | 306                                  | 266                                 | 86.93                      |  |
|  |                    | Scappoose Creek           | *                               | *                                 |               | 1,048                                | 888                                 | 84.73                      |  |
|  |                    | Cowlitz River             | *                               | *                                 |               | 120                                  | 114                                 | 95.00                      |  |
|  |                    | Kalama River              | *                               | *                                 |               | 579                                  | 382                                 | 65.98                      | X  |
|  |                    | Lewis River               | *                               | *                                 |               | 362                                  | 319                                 | 88.12                      |  |
|  |                    | Salmon Creek              | *                               | *                                 |               | 471                                  | 416                                 | 88.32                      |  |
|  |                    | Clackamas River           | *                               | *                                 |               | 194                                  | 148                                 | 76.29                      |  |
|  |                    | Sandy River               | *                               | *                                 |               | 240                                  | 125                                 | 52.08                      | X  |
|  |                    | Washougal river           | *                               | *                                 |               | 82                                   | 81                                  | 98.78                      |  |
|  |                    | Lower Gorge Tributaries   | 425                             | 2000                              |               | 77                                   | 55                                  | 71.43                      | X  |
| <b>Snake River Sockeye</b>             |                    |                           |                                 |                                   |               |                                      |                                     |                            |  |
|  | SRRED <sup>6</sup> | Redfish Lake <sup>6</sup> |                                 |                                   |               |                                      |                                     |                            | X  |

\* No data available

NA--Not Applicable

<sup>1</sup>Data available for only part of the population.

<sup>2</sup> Hatchery data are unavailable; % wild is assumed to be 100 for the purpose of calculating geo mean.

<sup>3</sup>Abundance for DREST-s was calculated from data for the entire Deschutes basin.

<sup>4</sup>Wenatchee and Entiat Rivers are combined.

<sup>5</sup>Data for Chum are from BRT Report.

<sup>6</sup>Sockeye are maintained in captive propagation and therefore have room to improve in all areas.

Table D-2. Productivity metrics for Interior Columbia populations

| ESU  | Pop. Code          | Population Name                      | Productivity/Freshwater Survival |                        |                     |                  | Range (years used)             |                     | Impaired<br>(Trend<br>or<br>Lambda<br>< 1) |
|--|--------------------|--------------------------------------|----------------------------------|------------------------|---------------------|------------------|--------------------------------|---------------------|--|
|  |                    |                                      | Long<br>Term<br>Trend            | Short<br>Term<br>Trend | Long Term Lambda    |                  | Long Term<br>Trend &<br>Lambda | Short Term<br>Trend |  |
|  |                    |                                      |                                  |                        | without<br>hatchery | with<br>hatchery |                                |                     |  |
| <b>Snake River Spring / Summer Chinook</b> |                    |                                      |                                  |                        |                     |                  |                                |                     |  |
|  | SNASO              | Asotin River                         | *                                | *                      | *                   | *                | *                              | *                   | *  |
|  | SNTUC              | Tucannon River                       | 0.890                            | 0.860                  | 0.951               | 0.883            | 1979-2001                      | 1990-2001           | X  |
|  | GRWEN              | Wenaha River                         | 0.928                            | 1.232                  | 0.977               | 0.909            | 1963-2001                      | 1990-2002           | X  |
|  | GRLOS              | Wallowa/Lostine Rivers               | 0.937                            | 1.162                  | 0.970               | 0.649            | 1964-2001                      | 1990-2003           | X  |
|  | GRLOO              | Lookingglass Creek (Historic)        | 0.885                            | 0.884                  | 0.903               | 0.757            | 1957-2000                      | 1990-2000           | X  |
|  | GRMIN              | Minam River                          | 0.953                            | 1.152                  | 0.977               | 0.940            | 1964-2001                      | 1990-2001           | X  |
|  | GRCAT              | Catherine Creek                      | 0.966                            | #                      | 0.98                | 0.926            | 1953-1996                      | #                   | X  |
|  | GRUMA              | Upper Grande Ronde River             | 0.915                            | 0.959                  | 0.937               | 0.366            | 1960-2001                      | 1990-2001           | X  |
|  | IRMAI              | Imnaha River                         | 0.916                            | 1.065                  | 0.916               | 0.873            | 1957-2001                      | 1990-2001           | X  |
|  | IRBSH              | Big Sheep Creek                      | 0.888                            | 1.014                  | 0.863               | 0.819            | 1957-2001                      | 1990-2001           | X  |
|  | SRLSR <sup>1</sup> | Little Salmon River <sup>1</sup>     | 0.975                            | 0.933                  | 0.966               | *                | 1972-2001                      | *                   | X  |
|  | SFMAI              | South Fork Salmon River              | 0.965                            | 1.010                  | 0.967               | 0.961            | 1957-2001                      | 1990-2001           | X  |
|  | SFSEC              | Secesh River                         | 0.975                            | #                      | 0.959               | 0.957            | 1957-1997                      | #                   | X  |
|  | SFEFS              | E Fk S Fk Salmon River               | *                                | *                      | *                   | *                | *                              | *                   | *  |
|  | SRCHA <sup>1</sup> | Chamberlain Creek <sup>1</sup>       | 1.001                            | #                      | 0.992               | *                | 1952-1997                      | #                   | X  |
|  | MFBIG <sup>1</sup> | Big Creek <sup>1</sup>               | 0.926                            | 1.035                  | 0.948               | 0.969            | 1957-2001                      | 1990-2001           | X  |
|  | MFLMA              | Lower Middle Fork Salmon River       | *                                | *                      | *                   | *                | *                              | *                   | *  |
|  | MFCAM              | Camas Creek                          | 0.959                            | 1.114                  | 0.992               | 0.992            | 1974-2001                      | 1990-2001           | X  |
|  | MFLOO              | Loon Creek                           | 0.928                            | 1.122                  | 0.970               | 0.970            | 1957-2001                      | 1990-2001           | X  |
|  | MFUMA              | Upper Middle Fork Salmon River       | *                                | *                      | *                   | *                | *                              | *                   | *  |
|  | MFSUL              | Sulphur Creek                        | 0.921                            | 0.858                  | 0.961               | 0.961            | 1957-2001                      | 1990-2001           | X  |
|  | MFBEA              | Bear Valley Creek                    | 0.932                            | 1.062                  | 0.959               | 0.959            | 1960-2001                      | 1990-2001           | X  |
|  | MFMAR              | Marsh Creek                          | 0.922                            | 0.960                  | 0.971               | 0.971            | 1957-2001                      | 1990-2001           | X  |
|  | SRPAN              | Panther Creek (Historic)             | *                                | *                      | *                   | *                | *                              | *                   | *  |
|  | SRNFS <sup>1</sup> | N Fk Salmon River <sup>1</sup>       | 0.907                            | 1.156                  | 0.936               | *                | 1960-2000                      | 1990-2000           | X  |
|  | SRLEM              | Lemhi River                          | 0.917                            | 1.128                  | 0.956               | 0.956            | 1957-2001                      | 1990-2001           | X  |
|  | SRLMA              | Upper Salmon Lower Mainstem          | *                                | *                      | *                   | *                | *                              | *                   | *  |
|  | SRPAH <sup>1</sup> | Pahsimeroi River <sup>1</sup>        | 1.154                            | 1.128                  | 1.211               | *                | 1980-2001                      | 1990-2001           |  |
|  | SREFS              | E Fk Salmon River                    | 0.940                            | 1.009                  | 0.946               | 0.946            | 1957-2001                      | 1990-2001           | X  |
|  | SRYFS <sup>1</sup> | Yankee Fork <sup>1</sup>             | 0.900                            | 1.012                  | 0.937               | 0.942            | 1960-2001                      | 1990-2001           | X  |
|  | SRVAL <sup>1</sup> | Valley Creek <sup>1</sup>            | 0.901                            | 1.149                  | 0.952               | 0.955            | 1957-2001                      | 1990-2001           | X  |
|  | SRUMA <sup>1</sup> | Upper Salmon River <sup>1</sup>      | 0.925                            | #                      | 0.893               | *                | 1957-1997                      | #                   | X  |
| <b>Upper Columbia Chinook</b>              |                    |                                      |                                  |                        |                     |                  |                                |                     |  |
|  | UCWEN              | Wenatchee River                      | 0.931                            | 0.926                  | 0.965               | 0.947            | 1960-2001                      | 1990-2001           | X  |
|  | UCENT              | Entiat River                         | 0.943                            | 0.938                  | 0.971               | 0.950            | 1960-2001                      | 1990-2001           | X  |
|  | UCMET              | Methow River                         | 0.946                            | 0.903                  | 0.968               | 0.945            | 1960-2001                      | 1990-2001           | X  |
| <b>Snake River Fall Chinook</b>            |                    |                                      |                                  |                        |                     |                  |                                |                     |  |
|  | SNMAI              | Snake mainstem and lower tributaries | 1.013                            | 1.188                  | 1.024               | 0.899            | 1975-2001                      | 1990-2001           | X  |

Productivity metrics for Interior Columbia populations, cont.

| ESU                              | Pop. Code            | Population Name                             | Productivity/Freshwater Survival   |                        |                     |                  | Range (years used) |                     | Impaired<br>(Trend<br>or<br>Lambda<br>< 1) |  |
|----------------------------------|----------------------|---|------------------------------------|------------------------|---------------------|------------------|--------------------|---------------------|--|--|
|                                  |                      |   | Long<br>Term<br>Trend              | Short<br>Term<br>Trend | Long Term Lambda    |                  | Long Term<br>Trend | Short Term<br>Trend |  |  |
|                                  |                      |   |                                    |                        | without<br>hatchery | with<br>hatchery |                    |                     |  |  |
| <b>Middle Columbia Steelhead</b> |                      |   |                                    |                        |                     |                  |                    |                     |  |  |
|                                  | MCWSA-s              | While Salmon River (Historic)               | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | MCKLI-s <sup>1</sup> | Klickitat River <sup>1</sup>                | 1.139                              | 1.139                  | 1.150               | *                | 1990-2002          | 1990-2002           |  |  |
|                                  | MCFIF-s              | Fifteen Mile Creek (winters)                | 1.021                              | 1.082                  | 1.014               | 1.014            | 1985-2001          | 1990-2001           |  |  |
|                                  | DREST-s <sup>2</sup> | Deschutes River, Eastside <sup>2</sup>      | 0.975                              | 1.089                  | 1.022               | 0.840            | 1978-2002          | 1990-2002           | X  |  |
|                                  | DRWST-s <sup>1</sup> | Deschutes River, Westside <sup>1</sup>      | 1.011                              | 1.078                  | 1.032               | *                | 1982-2002          | 1990-2002           |  |  |
|                                  | MCROC-s              | Rock Creek                                  | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | JDLMT-s              | John Day River lower mainstem<br>tribs      | 0.988                              | 0.975                  | 0.978               | 0.978            | 1965-2002          | 1990-2002           | X  |  |
|                                  | JDNFJ-s              | North Fork John Day River                   | 0.990                              | 1.103                  | 1.009               | 1.010            | 1977-2002          | 1990-2002           | X  |  |
|                                  | JDMFJ-s              | Middle Fork John Day River                  | 0.975                              | 0.973                  | 0.966               | 0.966            | 1974-2001          | 1990-2001           | X  |  |
|                                  | JDSFJ-s              | South Fork John Day River                   | 0.961                              | 0.992                  | 0.967               | 0.967            | 1974-2002          | 1990-2002           | X  |  |
|                                  | JDUMA-s              | John Day upper mainstem                     | 0.975                              | 0.980                  | 0.975               | 0.973            | 1974-2002          | 1990-2002           | X  |  |
|                                  | MCUMA-s              | Umatilla River                              | 0.989                              | 1.084                  | 1.010               | 0.953            | 1966-2002          | 1990-2002           | X  |  |
|                                  | WWMAI-s              | Walla Walla River                           | data series too short to calculate |                        |                     |                  |                    |                     |  |  |
|                                  | WWTOU-s              | Touchet River                               | 0.973                              | 0.983                  | 1.012               | 0.908            | 1987-2001          | 1990-2001           | X  |  |
|                                  | YRTOS-s              | Toppenish and Satus Creeks                  | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | YRNAC-s              | Naches River                                | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | YRUMA-s              | Yakima River upper mainstem                 | 1.100                              | 1.105                  | 1.148               | 1.129            | 1980-2001          | 1990-2001           |  |  |
| <b>Snake River Steelhead</b>     |                      |   |                                    |                        |                     |                  |                    |                     |  |  |
|                                  | SNTUC-s              | Tucannon River                              | 0.877                              | 0.908                  | 0.799               | 0.610            | 1987-2001          | 1990-2001           | X  |  |
|                                  | SNASO-s <sup>1</sup> | Asotin Creek <sup>1</sup>                   | 0.950                              | 1.040                  | 0.950               | *                | 1986-2001          | 1990-2001           | X  |  |
|                                  | CRLMA-s              | Clearwater lower mainstem                   | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | CRNFC-s              | North Fork Clearwater (historic)            | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | CRLOL-s              | Lolo Creek                                  | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | CRLOC-s              | Lochsa River                                | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | CRSEL-s              | Selway Reiver                               | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | CRSFC-s              | South Fork Clearwater River                 | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | GRLMT-s              | Grande Rone lower mainstem<br>tribs         | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | GRJOS-s              | Joseph Creek                                | 1.068                              | 1.050                  | 1.069               | 1.069            | 1974-2002          | 1990-2002           |  |  |
|                                  | GRWAL-s <sup>1</sup> | Wallowa River <sup>1</sup>                  | 1.024                              | 1.151                  | 1.009               | *                | 1965-2001          | 1990-2001           |  |  |
|                                  | GRUMA-s <sup>1</sup> | Grande Ronde Upper<br>Mainstem <sup>1</sup> | 0.992                              | 0.996                  | 0.976               | 0.954            | 1967-2000          | 1990-2000           | X  |  |
|                                  | SRLSR-s              | Little Salmon and Rapid Rivers              | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SRCHA-s              | Chamberlain Creek                           | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SFSEC-s              | Secesh River                                | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SFMAI-s              | South Fork Salmon River                     | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SRPAN-s              | Panther Creek                               | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | MFBIG-s              | Big, Camas, and Loon Creeks                 | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | MFUMA-s              | Middle Fork Salmon River<br>Upper Mainstem  | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SRNFS-s              | North Fork Salmon River                     | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SRLEM-s              | Lemhi River                                 | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SRPAH-s              | Pahsimeroi River                            | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SREFS-s              | East Fork Salmon River                      | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SRUMA-s              | Salmon River upper mainstem                 | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |
|                                  | SNHCT-s              | Snake River Hells Canyon                    | *                                  | *                      | *                   | *                | *                  | *                   | *  |  |

|  |         |              |       |       |       |       |           |           |   |
|--|---------|--------------|-------|-------|-------|-------|-----------|-----------|---|
|  |         | Tributaries  |       |       |       |       |           |           |   |
|  | IRMAI-s | Imnaha River | 0.942 | 0.965 | 0.938 | 0.915 | 1985-2000 | 1990-2000 | X |

Productivity metrics for Interior Columbia populations, cont.

| ESU                             | Pop. Code                 | Population Name                | Productivity/Freshwater Survival |                        |                     |                  | Range (years used) |                     | Impaired<br>(Trend<br>or<br>Lambda<br>< 1) |
|---------------------------------|---------------------------|--------------------------------|----------------------------------|------------------------|---------------------|------------------|--------------------|---------------------|--|
|                                 |                           |                                | Long<br>Term<br>Trend            | Short<br>Term<br>Trend | Long Term Lambda    |                  | Long Term<br>Trend | Short Term<br>Trend |  |
|                                 |                           |                                |                                  |                        | without<br>hatchery | with<br>hatchery |                    |                     |  |
| <b>Upper Columbia Steelhead</b> |                           |                                |                                  |                        |                     |                  |                    |                     |  |
|                                 | UCWEN-s<br>and<br>UCENT-s | Wenatchee River + Entiat River | 1.033                            | 1.066                  | 1.067               | 0.733            | 1976-2001          | 1990-2001           | X  |
|                                 | UCMET-s                   | Methow River                   | 1.059                            | 1.048                  | 1.086               | 0.589            | 1976-2001          | 1990-2001           | X  |
|                                 | UCOKA-s                   | Okanogan River                 | *                                | *                      | *                   | *                | *                  | *                   | *  |
| <b>Columbia River Chum</b>      |                           |                                |                                  |                        |                     |                  |                    |                     |  |
|                                 |                           | Youngs Bay                     | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Grays River (Hymer)            | 0.99                             | 0.904                  | 0.954               | *                | 1951-2000          | 1990-2000           | X  |
|                                 |                           | Grays River (Rawding)          | 1.058                            | #                      | 1.043               | *                | 1967-1998          | #                   |  |
|                                 |                           | Big Creek                      | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Elochoman River                | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Clatskanie River               | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Mill, Abernathy, Germany       | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Scappoose Creek                | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Cowlitz River                  | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Kalama River                   | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Lewis River                    | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Salmon Creek                   | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Clackamas River                | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Sandy River                    | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Washougal river                | *                                | *                      | *                   | *                | *                  | *                   | *  |
|                                 |                           | Lower Gorge Tributaries        | 0.979                            | 1.003                  | 0.984               | *                | 1950-2000          | 1990-2000           | X  |
| <b>Snake River Sockeye</b>      |                           |                                |                                  |                        |                     |                  |                    |                     |  |
|                                 | SRRED <sup>3</sup>        | Redfish Lake <sup>3</sup>      |                                  |                        |                     |                  |                    |                     | X  |

\* No data available

# Insufficient data

<sup>1</sup> Where hatchery data are unavailable, % wild is assumed to be 100 for the purpose of calculating trend and lambda-without-hatchery.

<sup>2</sup> Productivity for DREST-s was calculated from data for the entire Deschutes basin.

<sup>3</sup> Sockeye are maintained in captive propagation and therefore have room to improve in all areas.

Table D-3. Spatial Structure metrics for Interior Columbia chinook populations

| ESU                                      | Pop. Code | Population Name                | % "Historical" Area Currently Used <sup>1</sup> | K-S Statistical Significance (p<0.1) | Current Highest Range | Potential Highest Range | Range Difference | Impaired (Range Difference >= 1) |
|--|-----------|--------------------------------|---|--------------------------------------|-----------------------|-------------------------|------------------|----------------------------------|
| <b>Snake River Spring/Summer Chinook</b> |           |                                |   |                                      |                       |                         |                  |                                  |
|  | SNASO     | Asotin River                   | 10.66%  | Y                                    | 1                     | 3                       | 2                | X                                |
|  | SNTUC     | Tucannon River                 | 22.82%  | Y                                    | 3                     | 8                       | 5                | X                                |
|  | GRWEN     | Wenaha River                   | 24.51%  | N                                    | 4                     | 5                       | 1                | X                                |
|  | GRLOS     | Wallowa/Lostine Rivers         | 21.92%  | Y                                    | 5                     | 8                       | 3                | X                                |
|  | GRLOO     | Lookingglass Creek (historic)  | 54.84%  | N                                    | 1                     | 2                       | 1                | X                                |
|  | GRMIN     | Minam River                    | 49.02%  | N                                    | 2                     | 4                       | 2                | X                                |
|  | GRCAT     | Catherine Creek                | 10.32%  | N                                    | 9                     | 10                      | 1                | X                                |
|  | GRUMA     | Upper Grande Ronde River       | 10.66%  | N                                    | 5                     | 5                       | 0                | X                                |
|  | IRMAI     | Imnaha River                   | 36.43%  | Y                                    | 4                     | 11                      | 7                | X                                |
|  | IRBSH     | Big Sheep Creek                | 16.88%  | Y                                    | 2                     | 7                       | 5                | X                                |
|  | SRLSR     | Little Salmon River            | 28.76%  | N                                    | 17                    | 19                      | 2                | X                                |
|  | SFMAI     | South Fork Salmon River        | 45.84%  | N                                    | 10                    | 10                      | 0                | X                                |
|  | SFSEC     | Secesh River                   | 60.79%  | N                                    | 5                     | 5                       | 0                | X                                |
|  | SFEFS     | E Fk S Fk Salmon River         | 54.63%  | N                                    | 6                     | 7                       | 1                | X                                |
|  | SRCHA     | Chamberlain Creek              | 44.52%  | N                                    | 11                    | 11                      | 0                | X                                |
|  | MFBIG     | Big Creek                      | 56.69%  | Y                                    | 12                    | 13                      | 1                | X                                |
|  | MFLMA     | Lower Middle Fork Salmon River | 1.93%   | Y                                    | 2                     | 8                       | 6                | X                                |
|  | MFCAM     | Camas Creek                    | 62.94%  | N                                    | 6                     | 6                       | 0                | X                                |
|  | MFLOO     | Loon Creek                     | 82.88%  | N                                    | 5                     | 5                       | 0                |                                  |
|  | MFUMA     | Upper Middle Fork Salmon River | 50.53%  | N                                    | 8                     | 8                       | 0                | X                                |
|  | MFSUL     | Sulphur Creek                  | 87.26%  | N                                    | 1                     | 1                       | 0                |                                  |
|  | MFBEA     | Bear Valley Creek              | 86.02%  | N                                    | 3                     | 3                       | 0                |                                  |
|  | MFMAR     | Marsh Creek                    | 76.38%  | N                                    | 3                     | 3                       | 0                |                                  |
|  | SRPAN     | Panther Creek (historic)       | 19.24%  | N                                    | 2                     | 10                      | 8                | X                                |
|  | SRNFS     | N Fk Salmon River              | 46.54%  | N                                    | 5                     | 6                       | 1                | X                                |
|  | SRLEM     | Lemhi River                    | 32.05%  | Y                                    | 9                     | 18                      | 9                | X                                |
|  | SRLMA     | Upper Salmon Lower Mainstem    | 61.38%  | Y                                    | 11                    | 17                      | 6                | X                                |
|  | SRPAH     | Pahsimeroi River               | 20.79%  | N                                    | 2                     | 7                       | 5                | X                                |
|  | SREFS     | E Fk Salmon River              | 63.34%  | N                                    | 5                     | 6                       | 1                | X                                |
|  | SRYFS     | Yankee Fork                    | 93.50%  | N                                    | 3                     | 3                       | 0                |                                  |
|  | SRVAL     | Valley Creek                   | 80.28%  | N                                    | 2                     | 2                       | 0                |                                  |
|  | SRUMA     | Upper Salmon River             | 64.93%  | N                                    | 6                     | 6                       | 0                | X                                |
| <b>Upper Columbia Chinook</b>            |           |                                |   |                                      |                       |                         |                  |                                  |
|  | UCWEN     | Wenatchee River                | 36.30%  | N                                    | 6                     | 7                       | 1                | X                                |
|  | UCENT     | Entiat River                   | 26.50%  | N                                    | 3                     | 4                       | 1                | X                                |
|  | UCMET     | Methow River                   | 51.83%  | N                                    | 7                     | 10                      | 3                | X                                |

Spatial Structure metrics for Interior Columbia chinook populations, cont.

| ESU                              | Pop. Code | Population Name                         | % "Historical" Area Currently Used <sup>1</sup> | K-S Statistical Significance (p<0.1) | Current Highest Range | Potential Highest Range | Range Difference | Impaired (Range Difference >= 1) |
|----------------------------------|-----------|---|---|--------------------------------------|-----------------------|-------------------------|------------------|----------------------------------|
| <b>Middle Columbia Steelhead</b> |           |   |   |                                      |                       |                         |                  |                                  |
|                                  | MCWSA-s   | While Salmon River (Historic)           | 3.0%  |                                      | 9                     | 2                       | 7                | X                                |
|                                  | MCKLI-s   | Klickitat River                         | 18.8%   | N                                    | 12                    | 11                      | 1                | X                                |
|                                  | MCFIF-s   | Fifteen Mile Creek (winters)            | 66.3%   | N                                    | 9                     | 8                       | 1                |                                  |
|                                  | DREST-s   | Deschutes River, Eastside               | 78.6%   | N                                    | 14                    | 14                      | 0                |                                  |
|                                  | DRWST-s   | Deschutes River, Westside               | 40.1%   | N                                    | 8                     | 8                       | 0                | X                                |
|                                  | MCROC-s   | Rock Creek                              | 45.9%   | N                                    | 4                     | 4                       | 0                | X                                |
|                                  | JDLMT-s   | John Day River lower mainstem tribs     | 83.0%   | Y                                    | 29                    | 29                      | 0                | X                                |
|                                  | JDNFJ-s   | North Fork John Day River               | 100.0%  | N                                    | 17                    | 17                      | 0                |                                  |
|                                  | JDMFJ-s   | Middle Fork John Day River              | 100.0%  | N                                    | 15                    | 15                      | 0                |                                  |
|                                  | JDSFJ-s   | South Fork John Day River               | 99.7%   | Y                                    | 9                     | 6                       | 3                | X                                |
|                                  | JDUMA-s   | John Day upper mainstem                 | 100.0%  | N                                    | 17                    | 13                      | 4                | X                                |
|                                  | MCUMA-s   | Umatilla River                          | 39.7%   | Y                                    | 17                    | 12                      | 5                | X                                |
|                                  | WWMAI-s   | Walla Walla River                       | 29.0%   | Y                                    | 9                     | 9                       | 0                | X                                |
|                                  | WWTOU-s   | Touchet River                           | 32.7%   | N                                    | 9                     | 9                       | 0                | X                                |
|                                  | YRTOS-s   | Toppenish ans Satus Creeks              | 35.6%   | Y                                    | 13                    | 13                      | 0                | X                                |
|                                  | YRNAC-s   | Naches River                            | 42.3%   | N                                    | 9                     | 9                       | 0                | X                                |
|                                  | YRUMA-s   | Yakima River upper mainstem             | 17.0%   | Y                                    | 10                    | 6                       | 4                | X                                |
| <b>Snake River Steelhead</b>     |           |   |   |                                      |                       |                         |                  |                                  |
|                                  | SNTUC-s   | Tucannon River                          | 30.5%   | N                                    | 10                    | 10                      | 0                | X                                |
|                                  | SNASO-s   | Asotin Creek                            | 28.7%   | Y                                    | 14                    | 11                      | 3                | X                                |
|                                  | CRLMA-s   | Clearwater lower mainstem               | 35.2%   | N                                    | 13                    | 13                      | 0                | X                                |
|                                  | CRNFC-s   | North Fork Clearwater (historic)        | 0.0%  |                                      | 14                    | 0                       | 14               | X                                |
|                                  | CRLOL-s   | Lolo Creek                              | 51.8%   | N                                    | 2                     | 2                       | 0                | X                                |
|                                  | CRLOC-s   | Lochsa River                            | 59.3%   | N                                    | 11                    | 11                      | 0                | X                                |
|                                  | CRSEL-s   | Selway Reiver                           | 64.6%   | N                                    | 15                    | 15                      | 0                | X                                |
|                                  | CRSFC-s   | South Fork Clearwater River             | 76.2%   | N                                    | 7                     | 7                       | 0                |                                  |
|                                  | GRLMT-s   | Grande Rone lower mainstem tribs        | 68.4%   | N                                    | 11                    | 10                      | 1                |                                  |
|                                  | GRJOS-s   | Joseph Creek                            | 100.0%  | N                                    | 9                     | 9                       | 0                |                                  |
|                                  | GRWAL-s   | Wallowa River                           | 73.9%   | N                                    | 11                    | 10                      | 1                |                                  |
|                                  | GRUMA-s   | Grande Ronde Upper Mainstem             | 92.4%   | N                                    | 14                    | 14                      | 0                |                                  |
|                                  | SRLSR-s   | Little Salmon and Rapid Rivers          | 36.4%   | N                                    | 31                    | 31                      | 0                | X                                |
|                                  | SRCHA-s   | Chamberlain Creek                       | 84.1%   | N                                    | 4                     | 4                       | 0                |                                  |
|                                  | SFSEC-s   | Secesh River                            | 51.7%   | N                                    | 5                     | 5                       | 0                | X                                |
|                                  | SFMAI-s   | South Fork Salmon River                 | 84.0%   | N                                    | 13                    | 12                      | 1                |                                  |
|                                  | SRPAN-s   | Panther Creek                           | 29.6%   | Y                                    | 14                    | 8                       | 6                | X                                |
|                                  | MFBIG-s   | Big, Camas, and Loon Creeks             | 74.4%   | N                                    | 12                    | 12                      | 0                |                                  |
|                                  | MFUMA-s   | Middle Fork Salmon River Upper Mainstem | 81.2%   | N                                    | 14                    | 14                      | 0                |                                  |
|                                  | SRNFS-s   | North Fork Salmon River                 | 68.8%   | N                                    | 6                     | 6                       | 0                |                                  |
|                                  | SRLEM-s   | Lemhi River                             | 21.0%   | Y                                    | 15                    | 8                       | 7                | X                                |
|                                  | SRPAH-s   | Pahsimeroi River                        | 12.0%   | Y                                    | 12                    | 4                       | 8                | X                                |
|                                  | SREFS-s   | East Fork Salmon River                  | 26.4%   | N                                    | 12                    | 10                      | 2                | X                                |
|                                  | SRUMA-s   | Salmon River upper mainstem             | 57.0%   | N                                    | 12                    | 12                      | 0                | X                                |
|                                  | SNHCT-s   | Snake River Hells Canyon Tributaries    | 49.7%   | N                                    | 11                    | 10                      | 1                | X                                |
|                                  | IRMAI-s   | Imnaha River                            | 100.0%  | N                                    | 12                    | 12                      | 0                |                                  |

Spatial Structure metrics for Interior Columbia chinook populations, cont.

| ESU                             | Pop. Code          | Population Name           | % "Historical" Area Currently Used <sup>1</sup> | K-S Statistical Significance (p=<0.1) | Current Highest Range | Potential Highest Range | Range Difference | Impaired (Range Difference >= 1) |
|---------------------------------|--------------------|---------------------------|---|---------------------------------------|-----------------------|-------------------------|------------------|----------------------------------|
| <b>Upper Columbia Steelhead</b> |                    |                           |   |                                       |                       |                         |                  |                                  |
|                                 | UCWEN-s            | Wenatchee River           | 27.7%   | N                                     | 8                     | 8                       | 0                | X                                |
|                                 | UCENT-s            | Entiat River              | 25.4%   | N                                     | 5                     | 3                       | 2                | X                                |
|                                 | UCMET-s            | Methow River              | 29.0%   | Y                                     | 10                    | 8                       | 2                | X                                |
|                                 | UCOKA-s            | Okanogan River            | 2.8%  | N                                     | 2                     | 0                       | 2                | X                                |
| <b>Columbia River Chum</b>      |                    |                           |   |                                       |                       |                         |                  |                                  |
|                                 |                    | Youngs Bay                | 7.5%  | N                                     | 2                     | 4                       | 2                | X                                |
|                                 |                    | Grays & Chinook Rivers    | 40.1%   | N                                     | 3                     | 3                       | 0                | X                                |
|                                 |                    | Big Creek                 | 28.2%   | N                                     | 1                     | 2                       | 1                | X                                |
|                                 |                    | Elochoman River           | 82.7%   | N                                     | 3                     | 3                       | 0                |                                  |
|                                 |                    | Clatskanie River          | 19.2%   | N                                     | 1                     | 6                       | 5                | X                                |
|                                 |                    | Mill Creek                | 41.9%   | N                                     | 0                     | 3                       | 3                | X                                |
|                                 |                    | Scappoose Creek           | 3.4%  | N                                     | 0                     | 4                       | 4                | X                                |
|                                 |                    | Cowlitz River             | 42.2%   | N                                     | 6                     | 6                       | 0                | X                                |
|                                 |                    | Kalama River              | 49.3%   | N                                     | 2                     | 2                       | 0                | X                                |
|                                 |                    | Lewis River               | 40.9%   | N                                     | 3                     | 4                       | 1                | X                                |
|                                 |                    | Salmon Creek              | 20.4%   | N                                     | 1                     | 1                       | 0                | X                                |
|                                 |                    | Clackamas River           | 3.0%  | N                                     | 0                     | 6                       | 6                | X                                |
|                                 |                    | Sandy River               | 13.2%   | N                                     | 1                     | 5                       | 4                | X                                |
|                                 |                    | Washougal river           | 17.6%   | N                                     | 1                     | 3                       | 2                | X                                |
|                                 |                    | Lower Gorge Tribs         | 34.7%   | N                                     | 3                     | 4                       | 1                | X                                |
|                                 |                    | Upper Gorge Tribs         | 52.5%   | N                                     | 4                     | 5                       | 1                | X                                |
| <b>Snake River Sockeye</b>      |                    |                           |   |                                       |                       |                         |                  |                                  |
|                                 | SRRED <sup>2</sup> | Redfish Lake <sup>2</sup> |   |                                       |                       |                         |                  | X                                |

<sup>1</sup>Impaired area is < 66% historic.

<sup>3</sup> Sockeye are maintained in captive propagation and therefore have room to improve in all areas.

Table D-4. Diversity Metrics for Interior Columbia chinook populations

| ESU                                      | Pop. Code | Population Name                | Diversity Score based on Level 4 Ecoregions |         |            | Impaired (Difference >=1) |
|--|-----------|--------------------------------|---|---------|------------|---------------------------|
|  |           |                                | Historic                                    | Current | Difference |                           |
| <b>Snake River Spring/Summer Chinook</b> |           |                                |   |         |            |                           |
|  | SNASO     | Asotin River                   | 5   | 4       | 1          | X                         |
|  | SNTUC     | Tucannon River                 | 5   | 6       | -1         |                           |
|  | GRWEN     | Wenaha River                   | 4   | 1       | 3          | X                         |
|  | GRLOS     | Wallowa/Lostine Rivers         | 8   | 6       | 2          | X                         |
|  | GRLOO     | Lookingglass Creek (Historic)  | 4   | 4       | 0          |                           |
|  | GRMIN     | Minam River                    | 5   | 5       | 0          |                           |
|  | GRCAT     | Catherine Creek                | 6   | 6       | 0          |                           |
|  | GRUMA     | Upper Grande Ronde River       | 5   | 2       | 3          | X                         |
|  | IRMAI     | Imnaha River                   | 6   | 6       | 0          |                           |
|  | IRBSH     | Big Sheep Creek                | 6   | 6       | 0          |                           |
|  | SRLSR     | Little Salmon River            | 11  | 9       | 2          | X                         |
|  | SFMAI     | South Fork Salmon River        | 7   | 5       | 2          | X                         |
|  | SFSEC     | Secesh River                   | 2   | 4       | -2         |                           |
|  | SFEFS     | E Fk S Fk Salmon River         | 4   | 4       | 0          |                           |
|  | SRCHA     | Chamberlain Creek              | 5   | 5       | 0          |                           |
|  | MFBIG     | Big Creek                      | 5   | 5       | 0          |                           |
|  | MFLMA     | Lower Middle Fork Salmon River | 4   | 4       | 0          |                           |
|  | MFCAM     | Camas Creek                    | 4   | 4       | 0          |                           |
|  | MFLOO     | Loon Creek                     | 2   | 2       | 0          |                           |
|  | MFUMA     | Upper Middle Fork Salmon River | 1   | 1       | 0          |                           |
|  | MFSUL     | Sulphur Creek                  | 1   | 1       | 0          |                           |
|  | MFBEA     | Bear Valley Creek              | 1   | 1       | 0          |                           |
|  | MFMAR     | Marsh Creek                    | 4   | 4       | 0          |                           |
|  | SRPAN     | Panther Creek (Historic)       | 0   | 1       | -1         |                           |
|  | SRNFS     | N Fk Salmon River              | 9   | 6       | 3          | X                         |
|  | SRLEM     | Lemhi River                    | 7   | 5       | 2          | X                         |
|  | SRLMA     | Upper Salmon Lower Mainstem    | 9   | 9       | 0          |                           |
|  | SRPAH     | Pahsimeroi River               | 5   | 1       | 4          | X                         |
|  | SREFS     | E Fk Salmon River              | 4   | 4       | 0          |                           |
|  | SRYFS     | Yankee Fork                    | 1   | 1       | 0          |                           |
|  | SRVAL     | Valley Creek                   | 4   | 4       | 0          |                           |
|  | SRUMA     | Upper Salmon River             | 6   | 6       | 0          |                           |
| <b>Upper Columbia Chinook</b>            |           |                                |   |         |            |                           |
|  | UCWEN     | Wenatchee River                | 7   | 5       | 2          | X                         |
|  | UCENT     | Entiat River                   | 7   | 2       | 5          | X                         |
|  | UCMET     | Methow River                   | 7   | 6       | 1          | X                         |

Diversity Metrics for Interior Columbia chinook populations, cont.

| ESU                              | Pop. Code | Population Name                         | Diversity Score based on Level 4 Ecoregions |         |            | Impaired (Difference >=1) |
|----------------------------------|-----------|---|---|---------|------------|---------------------------|
|                                  |           |   | Historic                                    | Current | Difference |                           |
| <b>Middle Columbia Steelhead</b> |           |   |   |         |            |                           |
|                                  | MCWSA-s   | While Salmon River (Historic)           | 5   | 4       | 1          | X                         |
|                                  | MCKLI-s   | Klickitat River                         | 10  | 5       | 5          | X                         |
|                                  | MCFIF-s   | Fifteen Mile Creek (winters)            | 7   | 8       | -1         |                           |
|                                  | DREST-s   | Deschutes River, Eastside               | 8   | 8       | 0          |                           |
|                                  | DRWST-s   | Deschutes River, Westside               | 10  | 9       | 1          | X                         |
|                                  | MCROC-s   | Rock Creek                              | 7   | 7       | 0          |                           |
|                                  | JDLMT-s   | John Day River lower mainstem tribs     | 9   | 9       | 0          |                           |
|                                  | JDNFJ-s   | North Fork John Day River               | 10  | 10      | 0          |                           |
|                                  | JDMFJ-s   | Middle Fork John Day River              | 7   | 7       | 0          |                           |
|                                  | JDSFJ-s   | South Fork John Day River               | 9   | 9       | 0          |                           |
|                                  | JDUMA-s   | John Day upper mainstem                 | 7   | 8       | -1         |                           |
|                                  | MCUMA-s   | Umatilla River                          | 9   | 8       | 1          | X                         |
|                                  | WWMAI-s   | Walla Walla River                       | 11  | 10      | 1          | X                         |
|                                  | WWTOU-s   | Touchet River                           | 7   | 6       | 1          | X                         |
|                                  | YRTOS-s   | Toppenish ans Satus Creeks              | 7   | 5       | 2          | X                         |
|                                  | YRNAC-s   | Naches River                            | 9   | 9       | 0          |                           |
|                                  | YRUMA-s   | Yakima River upper mainstem             | 11  | 8       | 3          | X                         |
| <b>Snake River Steelhead</b>     |           |   |   |         |            |                           |
|                                  | SNTUC-s   | Tucannon River                          | 9   | 8       | 1          | X                         |
|                                  | SNASO-s   | Asotin Creek                            | 10  | 5       | 5          | X                         |
|                                  | CRLMA-s   | Clearwater lower mainstem               | 15  | 12      | 3          | X                         |
|                                  | CRNFC-s   | North Fork Clearwater (historic)        | 6   | 0       | 6          | X                         |
|                                  | CRLOL-s   | Lolo Creek                              | 4   | 6       | -2         |                           |
|                                  | CRLOC-s   | Lochsa River                            | 7   | 7       | 0          |                           |
|                                  | CRSEL-s   | Selway Reiver                           | 7   | 7       | 0          |                           |
|                                  | CRSFC-s   | South Fork Clearwater River             | 1   | 1       | 0          |                           |
|                                  | GRLMT-s   | Grande Rone lower mainstem tribs        | 8   | 5       | 3          | X                         |
|                                  | GRJOS-s   | Joseph Creek                            | 6   | 6       | 0          |                           |
|                                  | GRWAL-s   | Wallowa River                           | 9   | 9       | 0          |                           |
|                                  | GRUMA-s   | Grande Ronde Upper Mainstem             | 9   | 9       | 0          |                           |
|                                  | SRLSR-s   | Little Salmon and Rapid Rivers          | 8   | 10      | -2         |                           |
|                                  | SRCHA-s   | Chamberlain Creek                       | 6   | 6       | 0          |                           |
|                                  | SFSEC-s   | Secesh River                            | 2   | 4       | -2         |                           |
|                                  | SFMAI-s   | South Fork Salmon River                 | 4   | 4       | 0          |                           |
|                                  | SRPAN-s   | Panther Creek                           | 6   | 6       | 0          |                           |
|                                  | MFBIG-s   | Big, Camas, and Loon Creeks             | 4   | 4       | 0          |                           |
|                                  | MFUMA-s   | Middle Fork Salmon River Upper Mainstem | 4   | 4       | 0          |                           |
|                                  | SRNFS-s   | North Fork Salmon River                 | 8   | 8       | 0          |                           |
|                                  | SRLEM-s   | Lemhi River                             | 7   | 7       | 0          |                           |
|                                  | SRPAH-s   | Pahsimeroi River                        | 8   | 4       | 4          | X                         |
|                                  | SREFS-s   | East Fork Salmon River                  | 8   | 5       | 3          | X                         |
|                                  | SRUMA-s   | Salmon River upper mainstem             | 5   | 5       | 0          |                           |
|                                  | SNHCT-s   | snake River Hells Canyon Tributaries    | 4   | 1       | 3          | X                         |
|                                  | IRMAI-s   | Imnaha River                            | 8   | 6       | 2          | X                         |

Diversity Metrics for Interior Columbia chinook populations, cont.

| ESU                             | Pop. Code          | Population Name           | Diversity Score based on Level 4 Ecoregions |         |            | Impaired (Difference >=1) |
|---------------------------------|--------------------|---------------------------|---|---------|------------|---------------------------|
|                                 |                    |                           | Historic                                    | Current | Difference |                           |
| <b>Upper Columbia Steelhead</b> |                    |                           |   |         |            |                           |
|                                 | UCWEN-s            | Wenatchee River           | 7   | 5       | 2          | X                         |
|                                 | UCENT-s            | Entiat River              | 6   | 2       | 4          | X                         |
|                                 | UCMET-s            | Methow River              | 7   | 5       | 2          | X                         |
|                                 | UCOKA-s            | Okanogan River            | 9   | 1       | 8          | X                         |
| <b>Columbia River Chum</b>      |                    |                           |   |         |            |                           |
|                                 |                    | Youngs Bay                | 1   | 5       | 4          | X                         |
|                                 |                    | Grays & Chinook Rivers    | 8   | 7       | -1         |                           |
|                                 |                    | Big Creek                 | 1   | 4       | 3          | X                         |
|                                 |                    | Elochoman River           | 5   | 5       | 0          |                           |
|                                 |                    | Clatskanie River          | 6   | 5       | -1         |                           |
|                                 |                    | Mill Creek                | 5   | 6       | 1          | X                         |
|                                 |                    | Scappoose River           | 5   | 6       | 1          | X                         |
|                                 |                    | Cowlitz River             | 7   | 8       | 1          | X                         |
|                                 |                    | Kalama River              | 4   | 5       | 1          | X                         |
|                                 |                    | Lewis River               | 5   | 6       | 1          | X                         |
|                                 |                    | Salmon Creek              | 1   | 6       | 5          | X                         |
|                                 |                    | Clackamas River           | 1   | 5       | 4          | X                         |
|                                 |                    | Sandy River               | 6   | 7       | 1          | X                         |
|                                 |                    | Washougal River           | 4   | 5       | 1          | X                         |
|                                 |                    | Lower Gorge Tribs         | 6   | 5       | -1         |                           |
|                                 |                    | Upper Gorge Tribs         | 6   | 6       | 0          |                           |
| <b>Snake River Sockeye</b>      |                    |                           |   |         |            |                           |
|                                 | SRRED <sup>1</sup> | Redfish Lake <sup>1</sup> |   |         |            | X                         |

<sup>1</sup> Sockeye are maintained in captive propagation and therefore have room to improve in all areas.

**DRAFT**