**Supplemental Information**

|  |  |  |  |
| --- | --- | --- | --- |
| **Table S1.** Coordinates of fish sampling sites. | | | |
| River | Reach | Latitude | Longitude |
| Beaver Creek (Lowland) | Lower | 60.560500 | -151.125556 |
| Middle | 60.570139 | -151.103444 |
| Upper | 60.615139 | -151.086194 |
| Russian River (Montane) | Lower | 60.484611 | -149.993639 |
| Middle | 60.450028 | -149.987472 |
| Upper | 60.368250 | -149.934889 |
| Ptarmigan Creek (Glacial) | Lower | 60.403750 | -149.369806 |
| Middle | 60.409472 | -149.356833 |
| Kenai River (Mainstem) | Lower | 60.483389 | -151.125972 |
| Middle | 60.485750 | -149.996250 |

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| **Table S2.** Summaries of juvenile Chinook and Coho Salmon fork length (FL) and weight (g) from the Kenai River, Alaska. Values are summarized as means (standard deviations). Starred (\*) fish count data indicates that fewer than three individuals of that population were captured in a sampling event and data were not used to calculate mean weight inputs for bioenergetics simulations (page 1 of 5). | | | | | | | | | | | |
| Watershed | Reach | Species | Age | Year | Sample Event | Sample Event Date | Fork Length (mm) | Weight (g) | Back- calculated Weight (g) | Fish Count | Diets Collected |
| Lowland (Beaver Creek) | Lower | Chinook | 0 | 2015 | 2 | 6/29/2015 | 54.0 (NA) | 2.0 (NA) | 1.8 (NA) | 1\* | 1 |
| 2016 | 2 | 6/21/2016 | 50.1 (4.0) | 1.5 (0.4) | 1.5 (0.4) | 73 | 12 |
| 2016 | 3 | 7/19/2016 | 54.8 (6.8) | 1.9 (0.8) | 1.9 (0.8) | 59 | 9 |
| 2016 | 4 | 8/15/2016 | 54.6 (6.1) | 2.0 (0.8) | 1.9 (0.6) | 16 | 8 |
| Coho | 0 | 2015 | 2 | 6/29/2015 | 41.3 (1.2) | 0.9 (0.1) | 0.8 (0.1) | 6 | 0 |
| 2015 | 3 | 8/6/2015 | 46.1 (4.7) | 1.3 (0.5) | 1.1 (0.4) | 19 | 1 |
| 2016 | 2 | 6/21/2016 | 53.8 (8.1) | 1.9 (0.6) | 1.9 (0.7) | 9 | 1 |
| 2016 | 3 | 7/19/2016 | 51.9 (7.8) | 1.7 (0.9) | 1.7 (0.8) | 26 | 4 |
| 2016 | 4 | 8/15/2016 | 56.3 (7.2) | 2.1 (0.9) | 2.1 (0.9) | 119 | 8 |
| 1 | 2015 | 1 | 6/4/2015 | 69.0 (7.7) | 3.4 (1.4) | 3.9 (1.4) | 46 | 14 |
| 2015 | 2 | 6/29/2015 | 71.2 (7.7) | 4.4 (1.5) | 4.2 (1.4) | 68 | 16 |
| 2015 | 3 | 8/6/2015 | 80.3 (13.0) | 6.6 (2.9) | 6.3 (3.0) | 38 | 15 |
| 2016 | 1 | 5/24/2016 | 69.4 (9.5) | 3.6 (1.9) | 4.0 (2.0) | 48 | 15 |
| 2016 | 2 | 6/21/2016 | 78.4 (11.1) | 5.8 (2.7) | 5.8 (2.7) | 93 | 8 |
| 2016 | 3 | 7/19/2016 | 89.2 (11.3) | 7.6 (3.2) | 8.4 (3.4) | 18 | 7 |
| 2016 | 4 | 8/15/2016 | 92.4 (5.6) | 9.2 (1.7) | 9.0 (1.8) | 17 | 2 |
| Middle | Chinook | 0 | 2016 | 2 | 6/20/2016 | 52.3 (4.4) | 1.6 (0.4) | 1.6 (0.4) | 12 | 7 |
| 2016 | 3 | 7/20/2016 | 59.3 (6.0) | 2.5 (0.9) | 2.4 (0.8) | 20 | 11 |
| 2016 | 4 | 8/16/2016 | 61.8 (4.7) | 2.7 (0.6) | 2.7 (0.6) | 13 | 11 |
| Coho | 0 | 2015 | 3 | 8/10/2015 | 45.0 (NA) | 1.2 (NA) | 1.0 (NA) | 1\* | 0 |
| 2016 | 3 | 7/20/2016 | 64.3 (7.5) | 3.0 (0.9) | 3.1 (1.0) | 15 | 3 |
| 2016 | 4 | 8/16/2016 | 62.5 (9.2) | 2.9 (1.3) | 2.9 (1.3) | 35 | 5 |
| 1 | 2015 | 1 | 6/7/2015 | 76.1 (9.2) | 5.5 (2.1) | 5.2 (2.0) | 19 | 8 |
| 2015 | 2 | 7/13/2015 | 77.7 (11.9) | 6.1 (2.6) | 5.7 (2.4) | 33 | 16 |
| 2015 | 3 | 8/10/2015 | 80.0 (11.1) | 6.2 (2.6) | 6.1 (2.5) | 69 | 16 |
| 2016 | 1 | 5/25/2016 | 74.6 (9.3) | 4.8 (1.7) | 4.9 (2.2) | 50 | 14 |
| 2016 | 2 | 6/20/2016 | 79.6 (9.3) | 6.0 (2.2) | 6.0 (2.2) | 108 | 10 |

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| **Table S2.** Continued, (page 2 of 5) | | | | | | | | | | | |
| Watershed | Reach | Species | Age | Year | Sample Event | Sample Event Date | Fork Length (mm) | Weight (g) | Back- calculated Weight (g) | Fish Count | Diets Collected |
| Lowland (Beaver Creek) | Upper | Coho | 1 | 2016 | 3 | 7/20/2016 | 85.1 (6.2) | 7.3 (1.7) | 7.1 (1.5) | 70 | 6 |
| 2016 | 4 | 8/16/2016 | 93.3 (8.7) | 9.1 (3.1) | 9.5 (2.9) | 43 | 4 |
| Chinook | 0 | 2016 | 3 | 7/22/2016 | 64.5 (2.5) | 3.1 (0.3) | 3.0 (0.3) | 4 | 4 |
| 2016 | 4 | 8/17/2016 | 66.8 (6.8) | 3.3 (0.9) | 3.4 (1.1) | 5 | 5 |
| Coho | 0 | 2016 | 3 | 7/22/2016 | 68.0 (NA) | 4.0 (NA) | 3.5 (NA) | 1\* | 1 |
| 2016 | 4 | 8/17/2016 | 71.3 (9.3) | 4.2 (1.5) | 4.2 (1.4) | 26 | 4 |
| 1 | 2015 | 1 | 6/6/2015 | 87.1 (7.0) | 8.0 (1.9) | 7.6 (1.8) | 20 | 5 |
| 2015 | 2 | 7/2/2015 | 80.7 (8.2) | 6.4 (2.1) | 6.1 (1.9) | 38 | 15 |
| 2015 | 3 | 8/7/2015 | 83.4 (9.0) | 6.9 (2.3) | 6.8 (2.2) | 68 | 14 |
| 2016 | 1 | 5/26/2016 | 82.4 (10.1) | 6.6 (2.8) | 6.6 (2.7) | 14 | 9 |
| 2016 | 2 | 6/22/2016 | 87.8 (7.8) | 8.2 (2.2) | 7.9 (2.0) | 91 | 10 |
| 2016 | 3 | 7/22/2016 | 90.7 (8.2) | 9.0 (2.7) | 8.7 (2.4) | 102 | 9 |
| 2016 | 4 | 8/17/2016 | 94.9 (8.0) | 9.8 (2.5) | 9.9 (2.5) | 79 | 6 |
| Montane (Russian River) | Lower | Chinook | 0 | 2015 | 1 | 6/8/2015 | 51.4 (5.7) | 1.7 (0.6) | 1.6 (0.6) | 23 | 7 |
| 2015 | 2 | 7/14/2015 | 54.5 (6.2) | 2.0 (0.7) | 1.9 (0.6) | 4 | 3 |
| 2015 | 3 | 8/11/2015 | 71.0 (NA) | 4.3 (NA) | 4.0 (NA) | 1\* | 0 |
| 2016 | 1 | 5/31/2016 | 48.6 (4.4) | 1.3 (0.4) | 1.3 (0.4) | 30 | 5 |
| 2016 | 2 | 7/18/2016 | 65.6 (5.5) | 3.2 (0.9) | 3.2 (0.8) | 19 | 8 |
| 2016 | 3 | 8/9/2016 | 63.5 (3.5) | 2.9 (0.1) | 2.9 (0.5) | 2\* | 2 |
| 2016 | 4 | 9/2/2016 | 71.8 (8.9) | 4.2 (1.6) | 4.3 (1.5) | 5 | 5 |
| Coho | 0 | 2015 | 1 | 6/8/2015 | 40.5 (2.1) | 0.8 (0.1) | 0.8 (0.1) | 2\* | 0 |
| 2015 | 2 | 7/14/2015 | 50.1 (4.8) | 1.4 (0.4) | 1.5 (0.4) | 58 | 14 |
| 2015 | 3 | 8/11/2015 | 55.9 (8.0) | 2.1 (0.9) | 2.1 (0.9) | 58 | 17 |
| 2016 | 1 | 5/31/2016 | 40.5 (0.7) | 0.9 (0.1) | 0.8 (0.0) | 2\* | 0 |
| 2016 | 2 | 7/18/2016 | 53.5 (4.9) | 1.7 (0.5) | 1.8 (0.5) | 86 | 8 |
| 2016 | 3 | 8/9/2016 | 56.5 (4.8) | 2.0 (0.5) | 2.1 (0.5) | 71 | 10 |
| 2016 | 4 | 9/2/2016 | 53.3 (7.1) | 1.7 (0.9) | 1.8 (0.8) | 44 | 10 |

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| **Table S2.** Continued, (page 3 of 5) | | | | | | | | | | | |
| Watershed | Reach | Species | Age | Year | Sample Event | Sample Event Date | Fork Length (mm) | Weight (g) | Back- calculated Weight (g) | Fish Count | Diets Collected |
| Montane (Russian River) | Lower | Coho | 1 | 2015 | 1 | 6/8/2015 | 66.8 (6.8) | 3.5 (1.0) | 3.5 (1.1) | 10 | 6 |
| 2015 | 2 | 7/14/2015 | 84.0 (NA) | 6.0 (NA) | 6.7 (NA) | 1\* | 1 |
| 2016 | 1 | 5/31/2016 | 68.1 (5.7) | 3.8 (0.9) | 3.7 (0.9) | 33 | 8 |
| 2016 | 2 | 7/18/2016 | 79.5 (6.7) | 5.8 (1.5) | 5.8 (1.5) | 6 | 4 |
| Chinook | 0 | 2016 | 1 | 6/1/2016 | 48.0 (0.0) | 1.4 (0.3) | 1.3 (0.0) | 2\* | 0 |
| 2016 | 2 | 6/30/2016 | 68.0 (NA) | 3.6 (NA) | 3.5 (NA) | 1\* | 1 |
| 2016 | 3 | 8/6/2016 | 68.5 (6.4) | 3.8 (1.0) | 3.6 (1.0) | 2\* | 2 |
| 2016 | 4 | 9/3/2016 | 62.0 (8.2) | 2.8 (0.6) | 2.8 (1.0) | 3 | 3 |
| Coho | 0 | 2015 | 1 | 6/19/2015 | 46.1 (3.1) | 1.4 (0.3) | 1.1 (0.2) | 29 | 1 |
| 2015 | 2 | 7/15/2015 | 49.2 (7.5) | 1.4 (0.7) | 1.4 (0.8) | 50 | 9 |
| 2015 | 3 | 8/12/2015 | 54.9 (7.0) | 1.9 (0.7) | 2.0 (0.7) | 56 | 8 |
| 2016 | 1 | 6/1/2016 | 50.0 (NA) | 1.6 (NA) | 1.4 (NA) | 1\* | 0 |
| 2016 | 2 | 6/30/2016 | 48.9 (5.7) | 1.4 (0.6) | 1.4 (0.6) | 43 | 4 |
| 2016 | 3 | 8/6/2016 | 62.7 (7.0) | 2.9 (1.0) | 2.9 (0.9) | 65 | 12 |
| 2016 | 4 | 9/3/2016 | 60.8 (7.3) | 2.5 (0.8) | 2.6 (0.9) | 25 | 10 |
| 1 | 2015 | 1 | 6/19/2015 | 72.8 (15.9) | 5.8 (3.5) | 5.0 (3.1) | 11 | 11 |
| 2015 | 2 | 7/15/2015 | 90.3 (6.7) | 7.8 (1.3) | 8.5 (1.8) | 3 | 3 |
| 2015 | 3 | 8/12/2015 | 97.3 (2.5) | 10.3 (0.9) | 10.5 (0.8) | 8 | 8 |
| 2016 | 1 | 6/1/2016 | 73.5 (7.8) | 4.5 (1.6) | 4.7 (1.6) | 45 | 11 |
| 2016 | 2 | 6/30/2016 | 83.4 (9.3) | 6.9 (2.3) | 6.8 (2.4) | 16 | 6 |
| 2016 | 3 | 8/6/2016 | 93.4 (6.8) | 8.9 (1.9) | 9.4 (2.1) | 10 | 2 |
| Upper | Chinook | 0 | 2015 | 1 | 6/16/2015 | 54.0 (2.8) | 1.8 (0.3) | 1.8 (0.3) | 2\* | 2 |
| 2015 | 2 | 7/21/2015 | 62.0 (7.1) | 2.7 (1.0) | 2.7 (0.9) | 2\* | 1 |
| 2016 | 1 | 6/8/2016 | 57.0 (2.8) | 2.3 (0.6) | 2.1 (0.3) | 5 | 4 |
| 2016 | 3 | 8/4/2016 | 70.0 (NA) | 3.7 (NA) | 3.8 (NA) | 1\* | 1 |
| Coho | 0 | 2015 | 1 | 6/16/2015 | 44.2 (2.3) | 1.5 (0.8) | 1.0 (0.2) | 6 | 0 |
| 2015 | 2 | 7/21/2015 | 51.4 (6.7) | 1.6 (0.7) | 1.6 (0.7) | 36 | 12 |

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| **Table S2.** Continued, (page 4 of 5) | | | | | | | | | | | |
| Watershed | Reach | Species | Age | Year | Sample Event | Sample Event Date | Fork Length (mm) | Weight (g) | Back- calculated Weight (g) | Fish Count | Diets Collected |
| Glacial (Ptarmigan Creek) | Lower | Coho | 1 | 2016 | 3 | 8/10/2016 | 87.2 (9.0) | 7.6 (2.6) | 7.7 (2.4) | 59 | 7 |
| Middle | Coho | 0 | 2015 | 1 | 6/24/2015 | 48.5 (0.7) | 1.6 (0.5) | 1.3 (0.1) | 2\* | 0 |
| 2015 | 2 | 7/16/2015 | 55.0 (NA) | 2.1 (NA) | 1.9 (NA) | 1\* | 1 |
| 2015 | 3 | 8/26/2015 | 65.6 (1.9) | 3.2 (0.3) | 3.2 (0.3) | 7 | 3 |
| 2016 | 3 | 8/11/2016 | 65.0 (NA) | 3.1 (NA) | 3.1 (NA) | 1\* | 0 |
| 1 | 2015 | 1 | 6/24/2015 | 86.6 (9.9) | 7.7 (2.7) | 7.6 (2.6) | 23 | 16 |
| 2015 | 2 | 7/16/2015 | 78.1 (7.9) | 5.5 (1.8) | 5.6 (1.7) | 19 | 19 |
| 2015 | 3 | 8/26/2015 | 85.5 (10.4) | 7.0 (2.5) | 7.4 (2.8) | 45 | 13 |
| 2016 | 1 | 6/6/2016 | 92.0 (NA) | 8.6 (NA) | 8.8 (NA) | 1\* | 1 |
| 2016 | 2 | 7/2/2016 | 87.8 (10.8) | 7.4 (2.5) | 8.0 (3.1) | 11 | 10 |
| 2016 | 3 | 8/11/2016 | 92.6 (10.4) | 9.0 (3.1) | 9.4 (3.2) | 25 | 10 |
| 2016 | 1 | 5/26/2016 | 109.0 (NA) | 11.4 (NA) | 14.7 (NA) | 1\* | 0 |
| Main Stem (Kenai River) | Lower | Chinook | 0 | 2015 | 1 | 6/22/2015 | 49.2 (4.1) | 1.3 (0.4) | 1.4 (0.4) | 86 | 13 |
| 2015 | 2 | 7/23/2015 | 51.4 (8.7) | 1.8 (1.0) | 1.7 (0.9) | 17 | 9 |
| 2015 | 3 | 8/13/2015 | 42.0 (NA) | 0.9 (NA) | 0.8 (NA) | 1\* | 0 |
| 2016 | 1 | 5/30/2016 | 47.0 (2.0) | 1.4 (0.1) | 1.2 (0.1) | 3 | 0 |
| 2016 | 2 | 6/28/2016 | 57.1 (5.7) | 2.3 (0.7) | 2.2 (0.6) | 86 | 11 |
| 2016 | 3 | 8/1/2016 | 57.3 (5.7) | 2.2 (0.8) | 2.2 (0.7) | 115 | 10 |
| 2016 | 4 | 8/31/2016 | 65.6 (8.4) | 3.4 (1.3) | 3.3 (1.2) | 120 | 10 |
| Coho | 0 | 2015 | 2 | 7/23/2015 | 46.5 (4.2) | 1.2 (0.4) | 1.2 (0.3) | 27 | 4 |
| 2015 | 3 | 8/13/2015 | 48.8 (4.7) | 1.4 (0.5) | 1.3 (0.4) | 67 | 10 |
| 2016 | 3 | 8/1/2016 | 49.4 (8.1) | 1.5 (0.9) | 1.5 (0.8) | 8 | 2 |
| 2016 | 4 | 8/31/2016 | 49.8 (6.5) | 1.4 (0.6) | 1.5 (0.6) | 34 | 9 |
| 1 | 2015 | 1 | 6/22/2015 | 55.0 (NA) | 1.9 (NA) | 1.9 (NA) | 1\* | 1 |
| 2015 | 2 | 7/23/2015 | 85.0 (NA) | 6.9 (NA) | 7.0 (NA) | 1\* | 1 |
| 2016 | 1 | 5/30/2016 | 72.0 (NA) | 5.3 (NA) | 4.2 (NA) | 1\* | 1 |
| 2016 | 3 | 8/1/2016 | 85.5 (0.7) | 7.1 (1.1) | 7.1 (0.2) | 2\* | 2 |

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| **Table S2.** Continued, (page 5 of 5) | | | | | | | | | | | |
| Watershed | Reach | Species | Age | Year | Sample Event | Sample Event Date | Fork Length (mm) | Weight (g) | Back- calculated Weight (g) | Fish Count | Diets Collected |
| Main Stem (Kenai River) | Lower | Coho | 1 | 2016 | 4 | 8/31/2016 | 96.0 (NA) | 9.7 (NA) | 10.0 (NA) | 1\* | 1 |
| Middle | Chinook | 0 | 2015 | 1 | 6/9/2015 | 53.0 (1.4) | 1.9 (0.0) | 1.7 (0.1) | 2\* | 0 |
| 2015 | 2 | 7/24/2015 | 56.4 (6.4) | 2.1 (0.8) | 2.1 (0.7) | 39 | 16 |
| 2015 | 3 | 8/17/2015 | 62.0 (6.2) | 2.8 (0.7) | 2.7 (0.8) | 5 | 5 |
| 2016 | 1 | 6/2/2016 | 45.3 (3.0) | 1.0 (0.2) | 1.1 (0.2) | 52 | 4 |
| 2016 | 2 | 6/29/2016 | 51.6 (4.1) | 1.5 (0.4) | 1.6 (0.4) | 168 | 10 |
| 2016 | 3 | 8/2/2016 | 58.9 (8.3) | 2.5 (1.0) | 2.4 (1.0) | 108 | 9 |
| 2016 | 4 | 9/4/2016 | 59.2 (7.4) | 2.4 (0.9) | 2.4 (0.9) | 38 | 10 |
| Coho | 0 | 2015 | 2 | 7/24/2015 | 45.0 (1.0) | 1.0 (0.1) | 1.0 (0.1) | 3 | 0 |
| 2015 | 3 | 8/17/2015 | 47.7 (4.1) | 1.3 (0.4) | 1.3 (0.4) | 63 | 6 |
| 2016 | 3 | 8/2/2016 | 46.1 (8.0) | 1.3 (0.7) | 1.2 (0.7) | 11 | 2 |
| 2016 | 4 | 9/4/2016 | 48.7 (3.9) | 1.3 (0.4) | 1.3 (0.3) | 63 | 9 |
| 1 | 2015 | 2 | 7/24/2015 | 72.0 (NA) | 4.5 (NA) | 4.2 (NA) | 1\* | 1 |
| 2015 | 3 | 8/17/2015 | 104.0 (NA) | 11.6 (NA) | 12.8 (NA) | 1\* | 1 |
| 2016 | 1 | 6/2/2016 | 68.5 (9.2) | 3.8 (1.1) | 3.7 (1.5) | 2\* | 1 |
| 2016 | 3 | 8/2/2016 | 84.0 (NA) | 6.0 (NA) | 6.7 (NA) | 1\* | 1 |

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| **Table S3.** Input weight values for 2015-2016 bioenergetics simulations and resultant P-values (proportion of maximum consumption) used for modeling future scenarios (page 1 of 2). | | | | | | | | | |
| **Watershed** | **Reach** | **Age** | **Species** | **Year** | **Season** | **Start Day** | **End Day** | **Initial Weight (g)** | **End Weight (g)** | | **P-value** |
| Lowland (Beaver Creek) | Lower | 0 | Chinook | 2016 | Mid-Summer | 173 | 201 | 1.45 | 1.94 | | 0.35 |
|  |  |  |  | 2016 | Late Summer | 201 | 228 | 1.94 | 1.89 | | 0.22 |
|  |  |  | Coho | 2016 | Mid-Summer | 173 | 201 | 1.85 | 1.68 | | 0.22 |
|  |  |  |  | 2015 | Mid-Summer | 180 | 218 | 0.81 | 1.14 | | 0.33 |
|  |  |  |  | 2016 | Late Summer | 201 | 228 | 1.68 | 2.11 | | 0.37 |
|  |  | 1 |  | 2016 | Early Summer | 145 | 173 | 4.02 | 5.80 | | 0.43 |
|  |  |  |  | 2015 | Early Summer | 155 | 180 | 3.86 | 4.24 | | 0.30 |
|  |  |  |  | 2016 | Mid-Summer | 173 | 201 | 5.80 | 8.42 | | 0.49 |
|  |  |  |  | 2015 | Mid-Summer | 180 | 218 | 4.24 | 6.32 | | 0.41 |
|  |  |  |  | 2016 | Late Summer | 201 | 228 | 8.42 | 9.04 | | 0.32 |
|  | Middle | 0 | Chinook | 2016 | Mid-Summer | 172 | 202 | 1.65 | 2.41 | | 0.38 |
|  |  |  |  | 2016 | Late Summer | 202 | 229 | 2.41 | 2.68 | | 0.28 |
|  |  | 1 | Coho | 2016 | Early Summer | 146 | 172 | 4.93 | 5.96 | | 0.34 |
|  |  |  |  | 2015 | Early Summer | 158 | 194 | 5.21 | 5.67 | | 0.28 |
|  |  |  |  | 2016 | Mid-Summer | 172 | 202 | 5.96 | 7.11 | | 0.35 |
|  |  |  |  | 2015 | Mid-Summer | 194 | 222 | 5.67 | 6.15 | | 0.30 |
|  |  |  |  | 2016 | Late Summer | 202 | 229 | 7.11 | 9.47 | | 0.44 |
|  | Upper | 0 | Chinook | 2016 | Late Summer | 204 | 230 | 3.01 | 3.41 | | 0.31 |
|  |  | 1 | Coho | 2016 | Early Summer | 147 | 174 | 6.63 | 7.87 | | 0.35 |
|  |  |  |  | 2016 | Mid-Summer | 174 | 204 | 7.87 | 8.67 | | 0.32 |
|  |  |  |  | 2016 | Late Summer | 204 | 230 | 8.67 | 9.91 | | 0.36 |
| Montane (Russian River) | Lower | 0 | Chinook | 2016 | Early Summer | 152 | 200 | 1.33 | 3.22 | | 0.31 |
|  |  | Coho | 2016 | Mid-Summer | 200 | 222 | 1.77 | 2.07 | | 0.27 |
|  |  |  | 2016 | Late Summer | 222 | 246 | 2.07 | 1.80 | | 0.12 |
|  | 1 |  | 2016 | Early Summer | 152 | 200 | 3.66 | 5.80 | | 0.37 |
| Middle | 0 |  | 2015 | Early Summer | 170 | 196 | 1.12 | 1.44 | | 0.31 |
|  |  |  | 2016 | Mid-Summer | 182 | 219 | 1.38 | 2.86 | | 0.46 |
|  |  |  | 2015 | Mid-Summer | 196 | 224 | 1.44 | 1.95 | | 0.37 |
|  |  |  | 2016 | Late Summer | 219 | 247 | 2.86 | 2.63 | | 0.20 |
|  | 1 |  | 2016 | Early Summer | 153 | 182 | 4.65 | 6.81 | | 0.45 |
|  |  |  | 2015 | Early Summer | 170 | 196 | 4.96 | 8.46 | | 0.63 |
|  |  |  | 2016 | Mid-Summer | 182 | 219 | 6.81 | 9.38 | | 0.47 |
|  |  |  | 2015 | Mid-Summer | 196 | 224 | 8.46 | 10.46 | | 0.48 |

**Table S3.** Continued (page 2 of 2)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Age** | **Species** | **Year** | **Season** | **Start Day** | **End Day** | **Initial Weight (g)** | **End Weight (g)** | **P-value** |
| Russian River (Montane) | Upper | 0 | Coho | 2015 | Early Summer | 167 | 202 | 0.99 | 1.61 | 0.35 |
|  |  |  |  | 2016 | Mid-Summer | 190 | 217 | 1.58 | 2.15 | 0.35 |
|  |  |  |  | 2015 | Mid-Summer | 202 | 232 | 1.61 | 1.89 | 0.32 |
|  |  |  |  | 2016 | Late Summer | 217 | 255 | 2.15 | 2.53 | 0.25 |
|  |  | 1 |  | 2015 | Early Summer | 167 | 202 | 3.68 | 7.43 | 0.58 |
|  |  |  |  | 2016 | Mid-Summer | 190 | 217 | 9.72 | 8.29 | 0.21 |
| Ptarmigan Creek (Glacial) | Lower | 0 | Chinook | 2016 | Mid-Summer | 183 | 223 | 3.20 | 4.53 | 0.37 |
|  |  |  | Coho | 2016 | Late Summer | 223 | 261 | 3.07 | 3.12 | 0.13 |
|  |  | 1 |  | 2016 | Early Summer | 157 | 183 | 3.92 | 5.53 | 0.39 |
|  |  |  |  | 2015 | Early Summer | 174 | 211 | 4.22 | 5.04 | 0.28 |
|  |  |  |  | 2016 | Mid-Summer | 183 | 223 | 5.53 | 7.75 | 0.35 |
|  |  |  |  | 2015 | Mid-Summer | 211 | 237 | 5.04 | 6.19 | 0.35 |
|  | Middle | 1 | Coho | 2015 | Early Summer | 175 | 197 | 7.64 | 5.56 | 0.01 |
|  |  |  |  | 2016 | Mid-Summer | 184 | 224 | 8.01 | 9.36 | 0.30 |
|  |  |  |  | 2015 | Mid-Summer | 197 | 238 | 5.56 | 7.42 | 0.40 |
| Kenai River (Main stem) | Lower | 0 | Chinook | 2016 | Early Summer | 151 | 180 | 1.18 | 2.15 | 0.48 |
|  |  |  |  | 2015 | Early Summer | 173 | 204 | 1.37 | 1.66 | 0.28 |
|  |  |  |  | 2016 | Mid-Summer | 180 | 214 | 2.15 | 2.18 | 0.25 |
|  |  |  |  | 2016 | Late Summer | 214 | 244 | 2.18 | 3.31 | 0.42 |
|  |  |  | Coho | 2015 | Mid-Summer | 204 | 225 | 1.17 | 1.35 | 0.18 |
|  |  |  |  | 2016 | Late Summer | 214 | 244 | 1.46 | 1.46 | 0.13 |
|  | Middle |  | Chinook | 2015 | Mid-Summer | 205 | 229 | 2.10 | 2.73 | 0.38 |
|  |  |  |  | 2016 | Late Summer | 215 | 248 | 2.42 | 2.44 | 0.24 |
|  |  |  | Coho | 2015 | Mid-Summer | 205 | 229 | 1.04 | 1.26 | 0.17 |
|  |  |  |  | 2016 | Late Summer | 215 | 248 | 1.20 | 1.33 | 0.15 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table S4.** Model output for linear regressions used to generate air-water sensitivity values for each site. Temperature values were summed to weekly means. | | | | | | | | |
| Watershed | Reach | Term | Estimate | Std. Error (Term) | p-value (Term) | F-statistic (Term) | R2adj (Fit) | p-value (Fit) |
| Beaver Creek (Lowland) | Lower | (Intercept) | 2.75 | 1.41 | 0.07 | 1.95 | 0.70 | 0.00 |
| Air | 0.74 | 0.10 | 0.00 | 7.20 |
| Middle | (Intercept) | 3.77 | 1.39 | 0.01 | 2.71 | 0.63 | 0.00 |
| Air | 0.64 | 0.10 | 0.00 | 6.27 |
| Upper | (Intercept) | 2.97 | 1.75 | 0.11 | 1.70 | 0.61 | 0.00 |
| Air | 0.71 | 0.13 | 0.00 | 5.44 |
| Russian River (Montane) | Lower | (Intercept) | 4.81 | 2.71 | 0.09 | 1.78 | 0.19 | 0.03 |
| Air | 0.45 | 0.19 | 0.03 | 2.35 |
| Middle | (Intercept) | 5.54 | 1.98 | 0.01 | 2.81 | 0.48 | 0.00 |
| Air | 0.68 | 0.15 | 0.00 | 4.64 |
| Upper | (Intercept) | 5.05 | 2.65 | 0.07 | 1.90 | 0.32 | 0.00 |
| Air | 0.67 | 0.20 | 0.00 | 3.35 |
| Ptarmigan Creek (Glacial) | Lower | (Intercept) | 7.86 | 1.76 | 0.00 | 4.46 | 0.17 | 0.03 |
| Air | 0.32 | 0.14 | 0.03 | 2.30 |
| Middle | (Intercept) | 9.37 | 1.83 | 0.00 | 5.11 | 0.04 | 0.18 |
| Air | 0.20 | 0.14 | 0.18 | 1.38 |
| Main Stem (Kenai River) | Lower | (Intercept) | 2.25 | 2.70 | 0.41 | 0.83 | 0.35 | 0.00 |
| Air | 0.72 | 0.20 | 0.00 | 3.65 |
| Middle | (Intercept) | 0.62 | 3.14 | 0.84 | 0.20 | 0.20 | 0.01 |
| Air | 0.68 | 0.23 | 0.01 | 2.96 |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 1 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Beaver Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | -20% | -5.15% |
| Beaver Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | 20% | -3.56% |
| Beaver Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | Mean | -4.27% |
| Beaver Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | -20% | -6.00% |
| Beaver Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | 20% | -3.80% |
| Beaver Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | Mean | -4.79% |
| Beaver Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | -20% | -11.49% |
| Beaver Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | 20% | -8.25% |
| Beaver Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | Mean | -9.70% |
| Beaver Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | -20% | -19.50% |
| Beaver Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | 20% | -14.65% |
| Beaver Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | Mean | -16.85% |
| Beaver Creek | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | -20% | -5.58% |
| Beaver Creek | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | 20% | -3.96% |
| Beaver Creek | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | Mean | -4.65% |
| Beaver Creek | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | -20% | -6.64% |
| Beaver Creek | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | 20% | -4.34% |
| Beaver Creek | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | Mean | -5.34% |
| Beaver Creek | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | -20% | -12.39% |
| Beaver Creek | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | 20% | -9.08% |
| Beaver Creek | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | Mean | -10.54% |
| Beaver Creek | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | -20% | -20.87% |
| Beaver Creek | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | 20% | -15.93% |
| Beaver Creek | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | Mean | -18.14% |
| Beaver Creek | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -4.40% |
| Beaver Creek | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | -3.03% |
| Beaver Creek | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | -3.66% |
| Beaver Creek | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -5.10% |
| Beaver Creek | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | -3.18% |
| Beaver Creek | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | -4.05% |
| Beaver Creek | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -9.91% |
| Beaver Creek | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | -7.10% |
| Beaver Creek | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -8.39% |
| Beaver Creek | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -16.97% |
| Beaver Creek | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | -12.75% |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 2 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Beaver Creek | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -14.67% |
| Beaver Creek | Middle | Age 0 Chinook | 2030-2039 | RCP 6.0 | -20% | -4.15% |
| Beaver Creek | Middle | Age 0 Chinook | 2030-2039 | RCP 6.0 | 20% | -2.76% |
| Beaver Creek | Middle | Age 0 Chinook | 2030-2039 | RCP 6.0 | Mean | -3.39% |
| Beaver Creek | Middle | Age 0 Chinook | 2030-2039 | RCP 8.5 | -20% | -4.41% |
| Beaver Creek | Middle | Age 0 Chinook | 2030-2039 | RCP 8.5 | 20% | -2.59% |
| Beaver Creek | Middle | Age 0 Chinook | 2030-2039 | RCP 8.5 | Mean | -3.41% |
| Beaver Creek | Middle | Age 0 Chinook | 2060-2069 | RCP 6.0 | -20% | -9.03% |
| Beaver Creek | Middle | Age 0 Chinook | 2060-2069 | RCP 6.0 | 20% | -6.17% |
| Beaver Creek | Middle | Age 0 Chinook | 2060-2069 | RCP 6.0 | Mean | -7.48% |
| Beaver Creek | Middle | Age 0 Chinook | 2060-2069 | RCP 8.5 | -20% | -15.22% |
| Beaver Creek | Middle | Age 0 Chinook | 2060-2069 | RCP 8.5 | 20% | -10.94% |
| Beaver Creek | Middle | Age 0 Chinook | 2060-2069 | RCP 8.5 | Mean | -12.89% |
| Beaver Creek | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -3.55% |
| Beaver Creek | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | -2.35% |
| Beaver Creek | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | -2.89% |
| Beaver Creek | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -3.75% |
| Beaver Creek | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | -2.17% |
| Beaver Creek | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | -2.89% |
| Beaver Creek | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -7.75% |
| Beaver Creek | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | -5.30% |
| Beaver Creek | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -6.42% |
| Beaver Creek | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -13.14% |
| Beaver Creek | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | -9.48% |
| Beaver Creek | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -11.16% |
| Beaver Creek | Upper | Age 0 Chinook | 2030-2039 | RCP 6.0 | -20% | -4.45% |
| Beaver Creek | Upper | Age 0 Chinook | 2030-2039 | RCP 6.0 | 20% | -3.08% |
| Beaver Creek | Upper | Age 0 Chinook | 2030-2039 | RCP 6.0 | Mean | -3.69% |
| Beaver Creek | Upper | Age 0 Chinook | 2030-2039 | RCP 8.5 | -20% | -5.00% |
| Beaver Creek | Upper | Age 0 Chinook | 2030-2039 | RCP 8.5 | 20% | -3.18% |
| Beaver Creek | Upper | Age 0 Chinook | 2030-2039 | RCP 8.5 | Mean | -4.00% |
| Beaver Creek | Upper | Age 0 Chinook | 2060-2069 | RCP 6.0 | -20% | -9.88% |
| Beaver Creek | Upper | Age 0 Chinook | 2060-2069 | RCP 6.0 | 20% | -7.09% |
| Beaver Creek | Upper | Age 0 Chinook | 2060-2069 | RCP 6.0 | Mean | -8.36% |
| Beaver Creek | Upper | Age 0 Chinook | 2060-2069 | RCP 8.5 | -20% | -17.20% |
| Beaver Creek | Upper | Age 0 Chinook | 2060-2069 | RCP 8.5 | 20% | -12.97% |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 3 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Beaver Creek | Upper | Age 0 Chinook | 2060-2069 | RCP 8.5 | Mean | -14.90% |
| Beaver Creek | Upper | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -3.82% |
| Beaver Creek | Upper | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | -2.60% |
| Beaver Creek | Upper | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | -3.16% |
| Beaver Creek | Upper | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -4.24% |
| Beaver Creek | Upper | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | -2.62% |
| Beaver Creek | Upper | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | -3.37% |
| Beaver Creek | Upper | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -8.59% |
| Beaver Creek | Upper | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | -6.08% |
| Beaver Creek | Upper | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -7.23% |
| Beaver Creek | Upper | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -15.08% |
| Beaver Creek | Upper | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | -11.29% |
| Beaver Creek | Upper | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -13.04% |
| Kenai River | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | -20% | -3.34% |
| Kenai River | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | 20% | -1.63% |
| Kenai River | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | Mean | -2.40% |
| Kenai River | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | -20% | -3.52% |
| Kenai River | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | 20% | -1.36% |
| Kenai River | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | Mean | -2.33% |
| Kenai River | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | -20% | -7.59% |
| Kenai River | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | 20% | -4.21% |
| Kenai River | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | Mean | -5.71% |
| Kenai River | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | -20% | -14.30% |
| Kenai River | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | 20% | -9.10% |
| Kenai River | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | Mean | -11.47% |
| Kenai River | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | -20% | -3.66% |
| Kenai River | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | 20% | -1.98% |
| Kenai River | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | Mean | -2.73% |
| Kenai River | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | -20% | -3.98% |
| Kenai River | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | 20% | -1.80% |
| Kenai River | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | Mean | -2.76% |
| Kenai River | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | -20% | -8.30% |
| Kenai River | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | 20% | -4.92% |
| Kenai River | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | Mean | -6.43% |
| Kenai River | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | -20% | -15.46% |
| Kenai River | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | 20% | -10.26% |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 4 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Kenai River | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | Mean | -12.58% |
| Kenai River | Middle | Age 0 Chinook | 2030-2039 | RCP 6.0 | -20% | 0.45% |
| Kenai River | Middle | Age 0 Chinook | 2030-2039 | RCP 6.0 | 20% | 2.39% |
| Kenai River | Middle | Age 0 Chinook | 2030-2039 | RCP 6.0 | Mean | 1.51% |
| Kenai River | Middle | Age 0 Chinook | 2030-2039 | RCP 8.5 | -20% | 1.13% |
| Kenai River | Middle | Age 0 Chinook | 2030-2039 | RCP 8.5 | 20% | 3.56% |
| Kenai River | Middle | Age 0 Chinook | 2030-2039 | RCP 8.5 | Mean | 2.45% |
| Kenai River | Middle | Age 0 Chinook | 2060-2069 | RCP 6.0 | -20% | 0.48% |
| Kenai River | Middle | Age 0 Chinook | 2060-2069 | RCP 6.0 | 20% | 4.41% |
| Kenai River | Middle | Age 0 Chinook | 2060-2069 | RCP 6.0 | Mean | 2.60% |
| Kenai River | Middle | Age 0 Chinook | 2060-2069 | RCP 8.5 | -20% | -1.36% |
| Kenai River | Middle | Age 0 Chinook | 2060-2069 | RCP 8.5 | 20% | 4.72% |
| Kenai River | Middle | Age 0 Chinook | 2060-2069 | RCP 8.5 | Mean | 1.94% |
| Kenai River | Middle | Age 0 Coho | 2030-2039 | RCP 6.0 | -20% | 0.55% |
| Kenai River | Middle | Age 0 Coho | 2030-2039 | RCP 6.0 | 20% | 2.59% |
| Kenai River | Middle | Age 0 Coho | 2030-2039 | RCP 6.0 | Mean | 1.70% |
| Kenai River | Middle | Age 0 Coho | 2030-2039 | RCP 8.5 | -20% | 1.29% |
| Kenai River | Middle | Age 0 Coho | 2030-2039 | RCP 8.5 | 20% | 3.85% |
| Kenai River | Middle | Age 0 Coho | 2030-2039 | RCP 8.5 | Mean | 2.72% |
| Kenai River | Middle | Age 0 Coho | 2060-2069 | RCP 6.0 | -20% | 0.62% |
| Kenai River | Middle | Age 0 Coho | 2060-2069 | RCP 6.0 | 20% | 4.79% |
| Kenai River | Middle | Age 0 Coho | 2060-2069 | RCP 6.0 | Mean | 2.92% |
| Kenai River | Middle | Age 0 Coho | 2060-2069 | RCP 8.5 | -20% | -1.36% |
| Kenai River | Middle | Age 0 Coho | 2060-2069 | RCP 8.5 | 20% | 5.11% |
| Kenai River | Middle | Age 0 Coho | 2060-2069 | RCP 8.5 | Mean | 2.19% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | -20% | -1.35% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | 20% | -0.78% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | Mean | -1.04% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | -20% | -1.45% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | 20% | -0.79% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | Mean | -1.09% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | -20% | -2.99% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | 20% | -1.80% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | Mean | -2.33% |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 5 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | -20% | -5.11% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | 20% | -3.24% |
| Ptarmigan Creek | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | Mean | -4.08% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | -20% | -1.73% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | 20% | -1.19% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | Mean | -1.45% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | -20% | -1.89% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | 20% | -1.26% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | Mean | -1.54% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | -20% | -3.79% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | 20% | -2.65% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | Mean | -3.18% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | -20% | -6.35% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | 20% | -4.57% |
| Ptarmigan Creek | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | Mean | -5.38% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -1.44% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | -0.89% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | -1.15% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -1.55% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | -0.92% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | -1.21% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -3.15% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | -2.03% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -2.54% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -5.37% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | -3.58% |
| Ptarmigan Creek | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -4.40% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -0.85% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | -0.56% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | -0.70% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -0.91% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | -0.59% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | -0.74% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -1.91% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | -1.27% |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 6 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Ptarmigan Creek | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -1.56% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -3.11% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | -2.11% |
| Ptarmigan Creek | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -2.57% |
| Russian River | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | -20% | 0.04% |
| Russian River | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | 20% | 1.07% |
| Russian River | Lower | Age 0 Chinook | 2030-2039 | RCP 6.0 | Mean | 0.63% |
| Russian River | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | -20% | 0.32% |
| Russian River | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | 20% | 1.58% |
| Russian River | Lower | Age 0 Chinook | 2030-2039 | RCP 8.5 | Mean | 1.03% |
| Russian River | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | -20% | -0.23% |
| Russian River | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | 20% | 1.84% |
| Russian River | Lower | Age 0 Chinook | 2060-2069 | RCP 6.0 | Mean | 0.94% |
| Russian River | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | -20% | -1.41% |
| Russian River | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | 20% | 1.86% |
| Russian River | Lower | Age 0 Chinook | 2060-2069 | RCP 8.5 | Mean | 0.42% |
| Russian River | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | -20% | -1.05% |
| Russian River | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | 20% | 0.01% |
| Russian River | Lower | Age 0 Coho | 2030-2039 | RCP 6.0 | Mean | -0.47% |
| Russian River | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | -20% | -1.02% |
| Russian River | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | 20% | 0.28% |
| Russian River | Lower | Age 0 Coho | 2030-2039 | RCP 8.5 | Mean | -0.30% |
| Russian River | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | -20% | -2.41% |
| Russian River | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | 20% | -0.27% |
| Russian River | Lower | Age 0 Coho | 2060-2069 | RCP 6.0 | Mean | -1.23% |
| Russian River | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | -20% | -4.77% |
| Russian River | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | 20% | -1.44% |
| Russian River | Lower | Age 0 Coho | 2060-2069 | RCP 8.5 | Mean | -2.94% |
| Russian River | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -0.44% |
| Russian River | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | 0.55% |
| Russian River | Lower | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | 0.10% |
| Russian River | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -0.31% |
| Russian River | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | 0.91% |
| Russian River | Lower | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | 0.36% |
| Russian River | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -1.16% |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 7 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Russian River | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | 0.83% |
| Russian River | Lower | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -0.07% |
| Russian River | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -2.78% |
| Russian River | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | 0.34% |
| Russian River | Lower | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -1.06% |
| Russian River | Middle | Age 0 Coho | 2030-2039 | RCP 6.0 | -20% | -7.32% |
| Russian River | Middle | Age 0 Coho | 2030-2039 | RCP 6.0 | 20% | -5.76% |
| Russian River | Middle | Age 0 Coho | 2030-2039 | RCP 6.0 | Mean | -6.45% |
| Russian River | Middle | Age 0 Coho | 2030-2039 | RCP 8.5 | -20% | -7.90% |
| Russian River | Middle | Age 0 Coho | 2030-2039 | RCP 8.5 | 20% | -6.14% |
| Russian River | Middle | Age 0 Coho | 2030-2039 | RCP 8.5 | Mean | -6.90% |
| Russian River | Middle | Age 0 Coho | 2060-2069 | RCP 6.0 | -20% | -14.57% |
| Russian River | Middle | Age 0 Coho | 2060-2069 | RCP 6.0 | 20% | -11.69% |
| Russian River | Middle | Age 0 Coho | 2060-2069 | RCP 6.0 | Mean | -12.97% |
| Russian River | Middle | Age 0 Coho | 2060-2069 | RCP 8.5 | -20% | -22.82% |
| Russian River | Middle | Age 0 Coho | 2060-2069 | RCP 8.5 | 20% | -18.64% |
| Russian River | Middle | Age 0 Coho | 2060-2069 | RCP 8.5 | Mean | -20.50% |
| Russian River | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -5.87% |
| Russian River | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | -4.70% |
| Russian River | Middle | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | -5.23% |
| Russian River | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -6.29% |
| Russian River | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | -4.96% |
| Russian River | Middle | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | -5.56% |
| Russian River | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -11.82% |
| Russian River | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | -9.59% |
| Russian River | Middle | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -10.60% |
| Russian River | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -18.72% |
| Russian River | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | -15.48% |
| Russian River | Middle | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -16.94% |
| Russian River | Upper | Age 0 Coho | 2030-2039 | RCP 6.0 | -20% | -4.95% |
| Russian River | Upper | Age 0 Coho | 2030-2039 | RCP 6.0 | 20% | -3.61% |
| Russian River | Upper | Age 0 Coho | 2030-2039 | RCP 6.0 | Mean | -4.18% |
| Russian River | Upper | Age 0 Coho | 2030-2039 | RCP 8.5 | -20% | -5.45% |
| Russian River | Upper | Age 0 Coho | 2030-2039 | RCP 8.5 | 20% | -3.86% |
| Russian River | Upper | Age 0 Coho | 2030-2039 | RCP 8.5 | Mean | -4.58% |

**Table S5.** Percent change in fish mass relative to corresponding 2010 – 2019 simulation period (page 8 of 8).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Watershed** | **Reach** | **Population** | **Simulation Period** | **Climate Scenario** | **Food Consumption Scenario** | **Percent Change in Mass** |
| Russian River | Upper | Age 0 Coho | 2060-2069 | RCP 6.0 | -20% | -10.81% |
| Russian River | Upper | Age 0 Coho | 2060-2069 | RCP 6.0 | 20% | -8.06% |
| Russian River | Upper | Age 0 Coho | 2060-2069 | RCP 6.0 | Mean | -9.25% |
| Russian River | Upper | Age 0 Coho | 2060-2069 | RCP 8.5 | -20% | -18.32% |
| Russian River | Upper | Age 0 Coho | 2060-2069 | RCP 8.5 | 20% | -14.09% |
| Russian River | Upper | Age 0 Coho | 2060-2069 | RCP 8.5 | Mean | -15.95% |
| Russian River | Upper | Age 1 Coho | 2030-2039 | RCP 6.0 | -20% | -3.89% |
| Russian River | Upper | Age 1 Coho | 2030-2039 | RCP 6.0 | 20% | -2.83% |
| Russian River | Upper | Age 1 Coho | 2030-2039 | RCP 6.0 | Mean | -3.30% |
| Russian River | Upper | Age 1 Coho | 2030-2039 | RCP 8.5 | -20% | -4.26% |
| Russian River | Upper | Age 1 Coho | 2030-2039 | RCP 8.5 | 20% | -2.95% |
| Russian River | Upper | Age 1 Coho | 2030-2039 | RCP 8.5 | Mean | -3.54% |
| Russian River | Upper | Age 1 Coho | 2060-2069 | RCP 6.0 | -20% | -8.59% |
| Russian River | Upper | Age 1 Coho | 2060-2069 | RCP 6.0 | 20% | -6.37% |
| Russian River | Upper | Age 1 Coho | 2060-2069 | RCP 6.0 | Mean | -7.37% |
| Russian River | Upper | Age 1 Coho | 2060-2069 | RCP 8.5 | -20% | -14.77% |
| Russian River | Upper | Age 1 Coho | 2060-2069 | RCP 8.5 | 20% | -11.32% |
| Russian River | Upper | Age 1 Coho | 2060-2069 | RCP 8.5 | Mean | -12.87% |

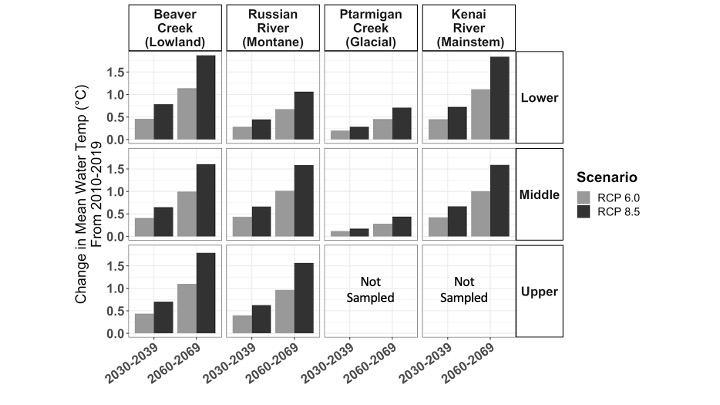


Figure S1. Change (°C) in mean summer water temperature relative to 2010-2019 simulations for each site, time period, and emission scenario.

Supplemental Information Section A. The Wisconsin Bioenergetics Model

*The Model*

The Wisconsin Model includes mathematical algorithms designed to mimic physiological processes in fish. The Wisconsin Model assumes that inputs, gains and losses of energy can be balanced. In the balanced energy equation, consumption is the energy input, growth is the net energy gain, and all other uses are losses. The balanced energy equation is represented by the following formula (Hanson et al. 1997):

C = B + R + A + S + F + U

where,

C = rate of energy consumption

B = somatic tissue growth

R = standard metabolic rate

A = active metabolism

S = metabolic rate from specific dynamic action (heat increment)

F = waste losses due to egestion (feces)

U = waste losses due to excretion (urine)

Rearranged to calculate growth:

B = C – (R+A+S) – (F+U)

The Wisconsin model accounts for the energy intake by fish, which are simulated by species-specific algorithms that balance the equation as the fish grows over time (Brandt and Hartman 1993)The model calculates each component of the energy budget based on species-specific growth coefficients and parameters that have been derived by previous laboratory experimentation and physiological research. The model also accounts for the non-linear effects on these parameters and coefficients due to variables such as temperature and food intake (Hanson et al. 1997). Among many benefits of the Wisconsin model, only a few inputs are required to run this model after physiological responses have been identified. The Wisconsin Model simulates the average growth of a fish within a population and population data are then projected from that average individual.

*Development and Parameter Selection*

Model development is accomplished by first selecting equations that mathematically represent energetic processes occurring in juvenile Chinook and Coho Salmon. Rates of energy consumption, respiration, egestion and excretion can all be expressed as non-linear functions of fish weight and water temperature. Temperature is an important factor in all energetic processes and all the equations used to represent the energetic components of the Wisconsin Model are regulated by temperature. When algorithms representing the individual components of consumption, respiration, excretion, egestion and energy density are combined, they define the flow of energy through a fish. Most parameters used in the bioenergetics model are species-specific physiological parameters that are dependent on fish size and water temperature

For input parameters not measured directly in the field, data pertaining to juvenile Chinook and Coho Salmon energetics were obtained from values included with Fishbioenergetics 4.0 software (Deslauriers et al. 2017). Indigestibility values of 17% and 3% were assigned, respectively, to invertebrate and fish diet items (Beauchamp et al. 2007).

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