Note: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Supplemental Information

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Supplemental Information Sections

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Supplemental Information Section A – Stream and Air Temperature Monitoring Methods

General

We collected water and air temperature data at a minimum of three sites per tributary along a longitudinal gradient from lower to upper reaches. We recorded data at 15-minute intervals from May to August 2015 and May to September 2016 using water temperature data loggers (HOBO® Temp Pro v2, Onset Corp, Bourne, MA) or Hydrolab sondes (Hydrolab MS-5 Sonde, OTT, Loveland CO) (Fig. B1). For the main stem Kenai River, we acquired data from U.S. Geological Survey (USGS) gauge station sites at Soldotna (station ID 15266300) and Cooper Landing (station ID 15258000; USGS 2021), and National Weather Service (NWS) archives for the Kenai Airport. Coordinates and period of deployment for all sensors are summarized in Table A1. Temperature field data were summarized to weekly and daily means.

We checked all loggers for accuracy using methods outlined in (Mauger et al. 2015) prior to and post field deployment. We downloaded data at regular intervals (24 - 36 days for the HOBO logger and 10 days for the Hydrolabs), inspected them for anomalies that would suggest malfunction or exposure to air and removed them if so, and replaced loggers as needed. Hydrolab probes were maintained and calibrated in a laboratory on a 10-day scheduled interval according to a manufacturer recommended quality assurance plan on file with the Kenai Watershed Forum (Soldotna, AK).

Water Temperature Logger Deployment

To ensure that water temperature logger sites were not influenced by local thermal anomalies, we selected sites in accordance with standards published in Mauger et al. (2015). At potential monitoring sites we performed channel transects of at least five points to verify that surface (0.1 m depth) and benthic temperatures did not vary greater than 0.25 °C upon logger deployment, retrieval, and opportunistic site visits. At one site where current was too swift to safely perform a channel transect (Middle Ptarmigan Creek) we performed a circular transect in a three meter radius around the logger. We used a Cooper-Atkins AquaTuff Instant Read® Bare Wire thermocouple or YSI® 556 instrument for instantaneous water temperature measurements.

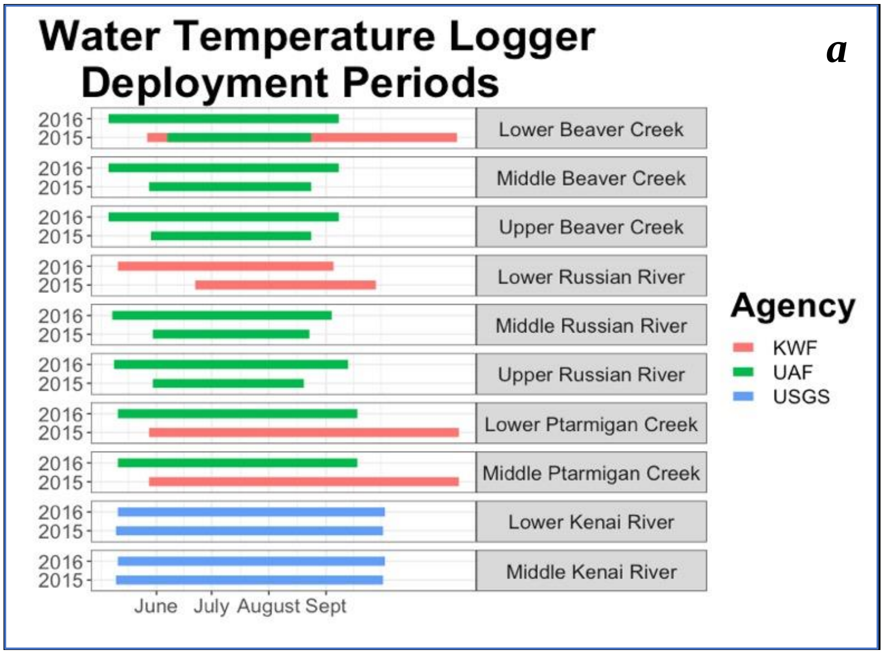
Air temperature Logger Deployment

To understand relationships between air temperature and water temperature, at most sites we installed one logger (HOBO® Water Temp Pro v2) to record air temperature at 15-minute intervals onshore. Loggers were housed in Onset® M-RSA solar radiation shields to block direct solar radiation and maximize airflow. We secured the shields approximately 2 m above the ground to a sturdy tree, out of direct sunlight and in areas of adequate air mixing. We located air temperature monitoring sites well upslope of the stream where possible to minimize air temperature anomalies often associated with riparian zones. We calculated straight-line distance between water temperature logger sites and the nearest air temperature logger site using QGIS 3.4.11 (QGIS Development Team 2019). Distances ($n = 19$) ranged from 3.1 to 14330.0 m, averaging 2486.4 ± 4058.6 (mean ± SD).

Merging Data from Multiple Sites

Some water temperature datasets had missing intervals due to exposed or malfunctioning loggers. To achieve datasets of greater continuous length, nearby sites were evaluated as potential sources of replacement data. To fill in data gaps we used data from the nearest available logger if datasets were sufficiently similar: we calculated absolute difference values for all concurrent observations between the two sites and considered them sufficiently similar if overall mean absolute difference was < 0.2 °C, which is the same level of precision as the HOBO® TempPro v2 loggers

Extent of logger deployment and composition of final datasets is summarized in Fig. A1.



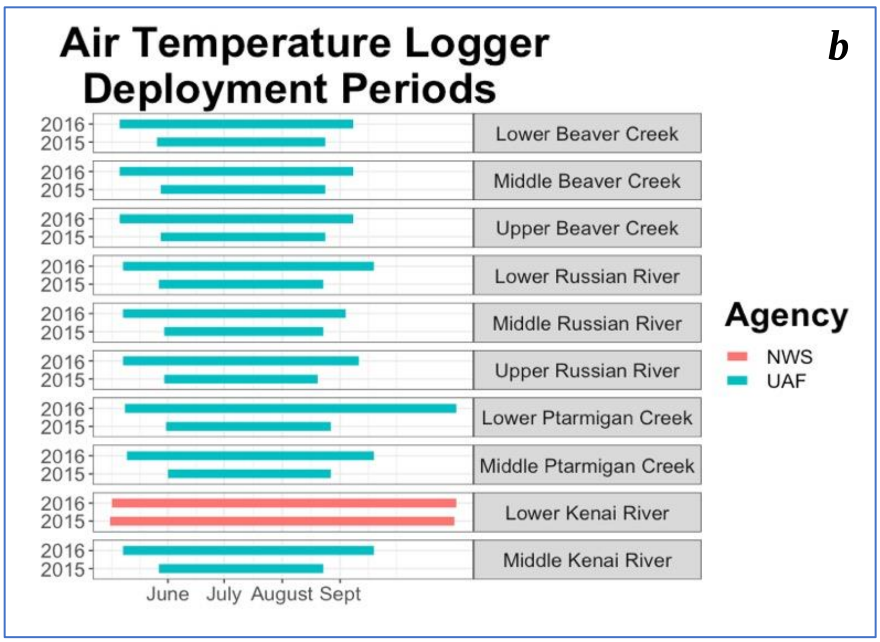


Figure A1. Deployment lengths for all temperature loggers. Water temperature data (a) was acquired from sites maintained by University of Alaska Fairbanks (UAF), Kenai Watershed Forum (KWF), and United States Geological Service (USGS). Air temperature data (b) was acquired from sites maintained by UAF and the National Weather Service (NWS).

Table A1. Locations and coordinates for temperature sensors from 2015 and 2016.

Stream Name	Stream Reach	Data Type	Sensor Model	No. of Sensors	Coordinates		Years Deployed		Agency
					N	W	2015	2016	
Beaver Creek (Lowland)	Lower	Air	HOv2	1	60.560472	-151.125556	X	X	UAF
		Water	HOv2	1	60.560500	-151.125556	X	X	UAF
		Water	HY	2	60.560300	-151.125767	X	X	KWF
	Middle	Air	HOv2	1	60.574528	-151.094944	X	X	UAF
		Water	HOv2	1	60.575639	-151.095750	X	X	UAF
	Upper	Air	HOv2	1	60.614917	-151.086528	X	X	UAF
		Water	HOv2	1	60.615083	-151.085972	X	X	UAF
Russian River (Montane)	Lower	Air	HOv2	1	60.485139	-149.996500	X	X	UAF
		Water	HOv2	1	60.485222	-149.996500	X	X	UAF
		Water	HY	2	60.453000	-149.986767	X	X	KWF
	Middle	Air	HOv2	1	60.450389	-149.989139	X	X	UAF
		Water	HOv2	1	60.450250	-149.987917	X	X	UAF
	Upper	Air	HOv2	1	60.359556	-149.898222	X	X	UAF
		Water	HOv2	1	60.359500	-149.898722	X	X	UAF
Ptarmigan Creek (Glacial)	Lower	Air	HOv2	1	60.404167	-149.369333	X	X	UAF
		Water	HOv2	1	60.403722	-149.369611	X	X	UAF
		Water	HY	2	60.404833	-149.307611	X	X	KWF
	Middle	Air	HOv2	1	60.414000	-149.347194	X	X	UAF
		Water	HOv2	1	60.414056	-149.346639	X	X	UAF
	Upper	Air	HOv2	1	60.412417	-149.306167	X	X	UAF
		Water	HOv2	1	60.412000	-149.307611	X	X	UAF
Kenai River (Main Stem)	Lower	Air	-	1	60.579700	-149.239100	X	X	NWS
		Water	GS	1	60.477500	-149.079444	X	X	USGS
	Middle	Air	HOv2	1	60.485139	-149.996500	X	X	UAF
		Water	GS	1	60.497778	-149.807778	X	X	USGS

Sensor Model: HOv2 = HOBO TempPro v2; HY = Hach Hydrolab, GS = USGS Gauge Station.

Agency: UAF = University of Alaska Fairbanks, KWF = Kenai Watershed Forum, USGS = U.S. Geological Survey, NWS = National Weather Service.

Supplemental Information Section B – Summary of Fish Sampling Periods

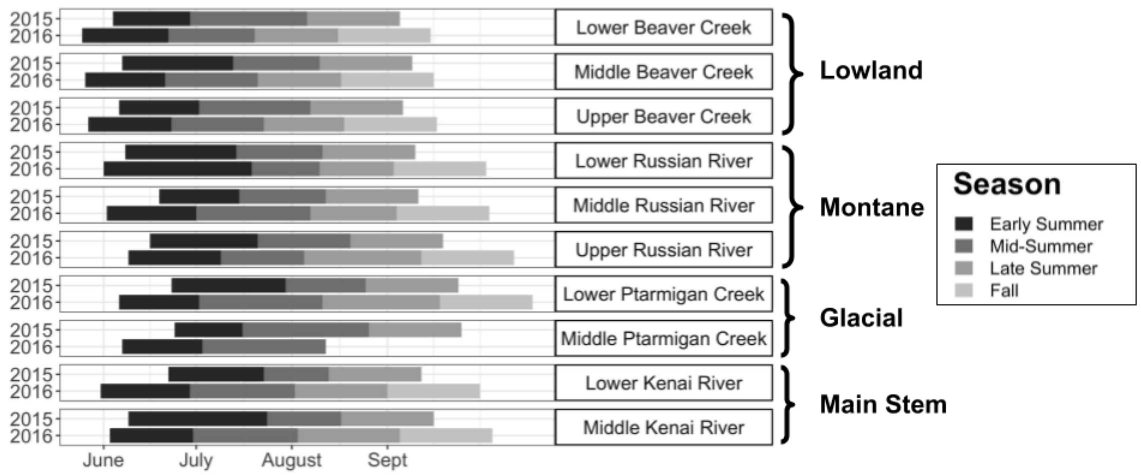


Figure B1. Temporal extent of sampling periods, defined as the period of days between fish sampling events (31 ± 5 days, mean ± standard error) days). The transition point between seasons denotes a fish sampling event. Three sampling events per site occurred in summer 2015 and four at most sites in summer 2016.

Supplemental Information Section C – Age Assignment and Assumptions

Scales Collection and Processing

We collected five to ten scales from the mesoderm above the lateral line and below the dorsal fin (Minard and Dye 1988) of all fish that were sampled for stomach contents, using forceps to gently scrape against the grain. We examined scales selected for analysis under 6.0x magnification with a stereomicroscope and photographed them pressed beneath a glass slipcover. To reduce interpretation bias, two readers estimated the age of juvenile salmon independently without access to information on fish size or time of year of collection. A scale annulus was defined using the criteria of circuli crowding and "cutting over" described by (Beamish and McFarlane 1983). Scales to which readers did not assign a consensus age were eliminated from further analysis. Individual ages for salmon from which scales were not collected were assigned through visual inspection of fork length frequency histograms. We generated plots of fork length frequency distribution for fish segregated by year, watershed, species, and sampling event. We used fork length data from fish with manually aged scales to verify the fork length/age threshold values by plotting manually aged scales below the frequency distribution on the horizontal axis.

Age Assignment from Scales

We assigned ages to individuals from which scales were not collected by visual inspection of fork length frequency histograms. We created separate plots for each iteration of species, watershed, year, and season (see Fig. C1 for example). We plotted aged scales below the x-axis to visualize how the age threshold lined up with their distribution. We manually identified the threshold and assigned ages above and below accordingly.

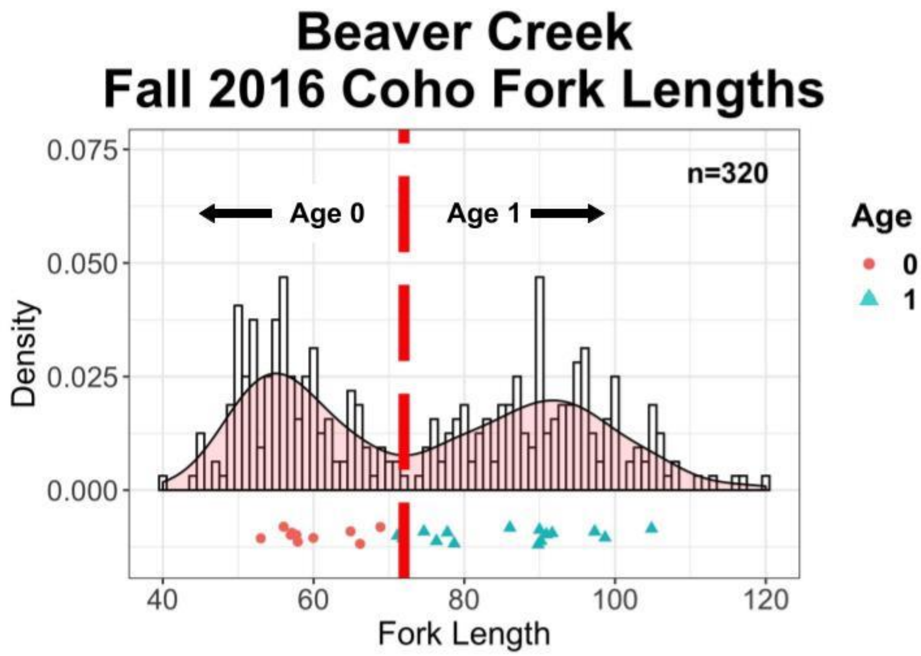


Figure C1. Example density histogram of fork lengths from Coho Salmon captured from Beaver Creek (Lowland watershed) in Fall 2016 (n = 320). Threshold between age 0 and age 1 is indicated by the red dashed line. Manually aged scales are plotted below the x-axis.

Growth rate estimates from chronological fork length distribution modes

The progression of fork length modes through time may be used to estimate growth within fish populations (Isely and Grabowski 2007). Use of this method requires several assumptions:

Assumption 1- Each mode represents a distinct age class. Fork length data partitioned into distinct modes, each of which we assumed was composed primarily a single age class (ages 0, 1, and 2 for Coho Salmon, and ages 0 and 1 for Chinook Salmon). In order to verify the age composition of each mode we aged scales from individuals within each mode as available and verified the age assignment.

Assumption 2- Growth rates across age classes is similar through time. Somatic growth rates for each year (partitioned by age, year, species, and site) was drawn from a sample size sufficiently large so as to minimize the likelihood of uneven growth rates among age classes.

Assumption 3- The sample is drawn at random with respect to size. We used minnow traps as the exclusive gear type used in this study, and mesh size and trap entrance diameter were consistent across all sampling events. A fixed trap entrance diameter may bias against capture of larger fish, while mesh size may bias against retention of smaller fish. For the particular species and age classes of interest in this study it is anticipated that these biases were minimal.

Supplemental Information Section D – Linear mixed model assessment of temporal/spatial scales of growth

We used a linear mixed modeling approach to assess how spatial and temporal predictors relate to growth rate metrics. We fit three models, each with a different response, to sets of predictor variables. We used year, species, and age as fixed variables and site as a random variable (Table D1).

Table D1. Variables and levels for linear mixed model to determine spatial and temporal scales of growth simulations.

Species (Fixed)	Age (Fixed)	Year (Fixed)	Site (Random)
Chinook	0	2015	Lower Beaver Creek
Coho	1	2016	Lower Russian River
			Lower Ptarmigan Creek
			Lower Kenai River
			Middle Beaver Creek
			Middle Russian River
			Middle Ptarmigan Creek
			Middle Kenai River
			Upper Beaver Creek
			Upper Russian River

The three models considered are as follows:

A. Individual Weight ~ (1 | Site) + Julian Day + Species + Age + Year
    - (n = 4275 total fish weights)
B. Mass-Specific Growth Rate ~ (1 | Site) + Season + Species + Age + Year
    - (n = 55 seasonal mass-specific growth rate values ($g \cdot g^{-1} \cdot d^{-1}$). A season is

defined as the interval of days between two sampling events at a site, approximately monthly intervals. Specific growth rate (SGR) values were calculated using the equation

$$G = \frac{\ln(W_{t2}) - \ln(W_{t1})}{t2 - t1} \tag{1}$$

where W_{t2} is the mean weight of a fish population from a sampling event on Julian day t2, and W_{t1} is the mean weight of fish from the site's prior sample event.

C. Final Weight (Weight on Aug. 6th) ~ (1 | Site) + Species + Age + Year
   - (n = 45 available values for fish weight on the Julian day of earliest final site visit across all sites and years).

For all approaches, we used fish weights calculated from age-segregated back-transformations of length and weight data as described in (Ogle 2016). We used back-transformed weight rather than raw values as a response variable because stomach content mass can introduce error especially for small fish like those of our study population. A log transformation was applied to the back-transformed weight values to improve linearity of the relationship with time. Residual plots were visually inspected to verify random distribution. For the third approach, we used interpolated weight values acquired from a linear trend between mean weight values of last two sequential site visits of each field season. August 6th (Julian Day 218) was the earliest day for a final site visit among both years and all sites, and we calculated interpolated weight values for this date.

Model results from the three relationships are arranged in Table D2. After controlling for site-level variation, all predictors were significant covariates ($p < 0.05$) in Approach A (individual fish weight vs. Julian day). Only season was a significant covariate in Approach B (mean daily growth rate vs. season). Year and age were significant covariates in Approach C (growth potential; or size at end of summer). We retained all variables as factors by which to segregate fish size and growth data as inputs in bioenergetics models that used observed field data. Approach C offered the best correlation between predictors and response ($R^2 = 0.86$) and was selected as the response for which to compare in future scenarios.

Table D2. Three linear mixed model results used to identify effect sizes of spatial and temporal predictor variables on growth and size responses.

	Mass[a]	Seasonal Growth Rate[b]	Final Size[c]
Julian day	0.0071 ***		
	(0.0002)		
Year (2016)	0.2085 ***	0.0015	0.8599 *
	(0.0126)	(0.0015)	(0.338)
Species (Coho)	-0.3551 ***	0.0003	-0.6249
	(0.0193)	(0.0019)	(0.4136)
Age (Age 1)	1.3027	-0.0017	5.8631 ***
	(0.0190)	(-0.0017)	(0.3772)
Season		-0.0037 ***	
		(0.0010)	
N	4226	55	45
N (Site)	10	10	10
AIC	3517.8110	-362.3963	146.0357
BIC	3562.2541	-348.3450	156.8757
R^2 (fixed)	0.6356	0.1984	0.8604
R^2 (total)	0.7097	0.2076	0.8645

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

a.) Individual fish mass; b.) Slope of the line between mean fish sizes between two site visits; c.) Fish mass on August 6th.

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

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

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

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

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

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

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)	R^2_{adj} (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%

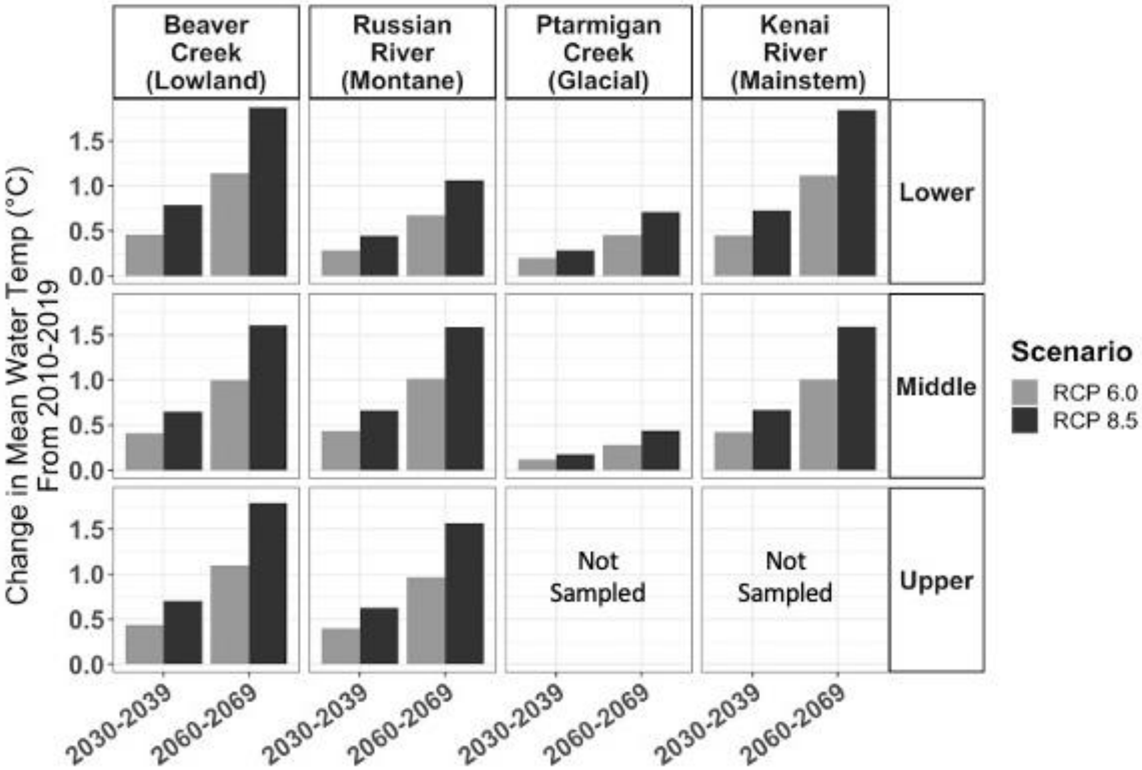


Figure S1. Change (°C) in mean summer water temperature relative to 2010-2019 simulations for each site, time period, and emission scenario.

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