

Supplementary Materials

**Prey supply and predation as potential limitations to feasibility of anadromous salmonid introductions in a reservoir**

Rachelle C. Johnson<sup>1,2†</sup>, Benjamin L. Jensen<sup>1</sup>, Jeffery J. Duda<sup>1</sup>, Tessa J. Code<sup>1,2</sup>, David A. Beauchamp<sup>1</sup>

<sup>1</sup>U.S. Geological Survey, Western Fisheries Research Center, 6505 Northeast 65th Street, Seattle, Washington 98115, USA

<sup>2</sup>School of Aquatic and Fishery Sciences, University of Washington, Box 355020, Seattle, Washington 98195, USA

†Correspondence: [rachellejohnson@usgs.gov](mailto:rachellejohnson@usgs.gov); +1 (206) 526-6560

## Supplementary Materials

Table S1. Diet proportions and energy densities (J/g wet weight) used for sockeye salmon *Oncorhynchus nerka* bioenergetics simulations. These inputs were borrowed from kokanee in Yale Reservoir, WA (Sorel et. al 2016). Winter diet was assumed to contain minimal *Daphnia* due to lower availability. Diet proportions were linearly interpolated through time in the simulation. Energy densities for zooplankton are sourced from Luecke & Brandt (1993), and insects from McCarthy et al. (2009). Note that the energy density for *Daphnia* reflects their compressed form in the gut and is approximately 2x higher in J/g than 'fresh' *Daphnia*.

		<i>Daphnia</i>	Zooplankton other	Immature insect	Adult insect
Simulation day	Season	3860 J/g	2260 J/g	3365 J/g	5000 J/g
1	Spring	0.684	0.084	0.189	0.043
62	Summer	0.755	0.162	0.083	0.000
154	Fall	0.879	0.062	0.000	0.059
274	Winter	0.200	0.400	0.400	0.000
365	Spring	0.684	0.084	0.189	0.043

## Supplementary Materials

Table S2. Length-weight regressions for salmonids in Ross Lake. Bull trout/hybrids include all bull trout and any of their hybrid types. Equations are in the exponential form  $W = a \times FL^b$ .  $N$ : sample size,  $W$ : wet weight (g),  $FL$ : fork length (mm).

Species	$N$	$P$	$R^2$	$a$	$b$
Bull trout/hybrids <i>Salvelinus confluentus</i>	3	< 0.001	0.997	$1.12 \times 10^{-5}$	2.974
Dolly Varden <i>S. malma</i>	1	< 0.001	0.994	$8.26 \times 10^{-6}$	3.048
Brook trout <i>S. fontinalis</i>	1	< 0.001	0.985	$7.79 \times 10^{-6}$	3.076
Rainbow trout <i>Oncorhynchus mykiss</i>	1	< 0.001	0.996	$1.27 \times 10^{-5}$	2.961

## Supplementary Materials

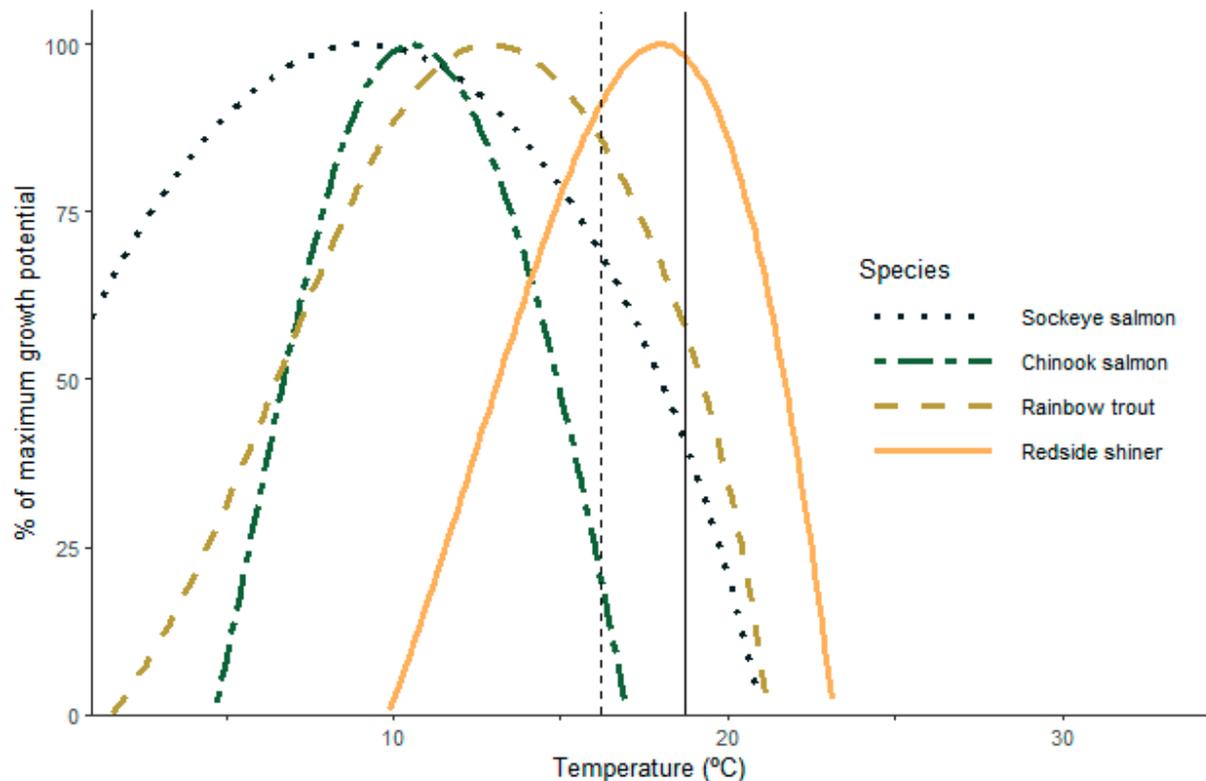


Figure S1. Growth potential as a function of temperature for existing planktivores and anadromous salmonids proposed for introduction into Ross Lake. Species were modeled for their expected body size and %C<sub>max</sub> during stratification in August as follows: sockeye salmon *Oncorhynchus nerka* (%C<sub>max</sub> = 40, weight = 1.5 g), Chinook salmon *O. tshawytscha* (%C<sub>max</sub> = 40, weight = 8 g), rainbow trout *O. mykiss* (%C<sub>max</sub> = 40, weight = 20 g), reidside shiner *Richardsonius balteatus* (%C<sub>max</sub> = 100, weight = 3 g). Rainbow trout weight was based on the typical size of age 2 fish in the tributaries during the summer - the age at which they might begin recruiting to the lake. Vertical lines indicate the mean temperature in Ross Lake (south limnology site) in August 2021 in the epilimnion (0-10 m depth, solid) and the metalimnion (10-20 m depth, dashed).

## References

- Luecke, C., & D. Brandt, 1993. Notes: estimating the energy density of Daphnid prey for use with rainbow trout bioenergetics models. *Transactions of the American Fisheries Society* Wiley 122: 386–389, [https://doi.org/10.1577/1548-8659\(1993\)122<0386:netedo>2.3.co;2](https://doi.org/10.1577/1548-8659(1993)122<0386:netedo>2.3.co;2).
- McCarthy, S. G., J. J. Duda, J. M. Emlen, G. R. Hodgson, & D. A. Beauchamp, 2009. Linking habitat quality with trophic performance of steelhead along forest gradients in the South Fork Trinity River watershed, California. *Transactions of the American Fisheries Society* 138: 506–521.

## Supplementary Materials

Sorel, M. H., A. G. Hansen, K. A. Connelly, & D. A. Beauchamp, 2016. Trophic feasibility of reintroducing anadromous salmonids in three reservoirs on the North Fork Lewis River, Washington: prey supply and consumption demand of resident fishes. *Transactions of the American Fisheries Society* 145: 1331–1347, <https://doi.org/10.1080/00028487.2016.1219678>.