



# Deshka River Thermal Mapping



## Why temperature?

*Water temperature affects all phases of the salmon lifecycle, including :*

- \* *egg/embryo survival*
- \* *juvenile growth*
- \* *timing of seaward migration*
- \* *migration rate of returning adults*

*Warm water temperature induces stress in salmon and makes them more vulnerable to pollution, predation and disease.*

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## Deshka River

The Deshka River watershed is among the warmest salmon systems in the Mat-Su basin, with summer water temperatures regularly exceeding thresholds considered stressful for rearing juvenile and spawning adult salmon, yet it often produces the largest Chinook salmon returns in upper Cook Inlet. In 2017, Cook Inletkeeper and U.S. Fish and Wildlife Service began a 5-year effort to map the variation in water temperature across the Deshka River watershed.

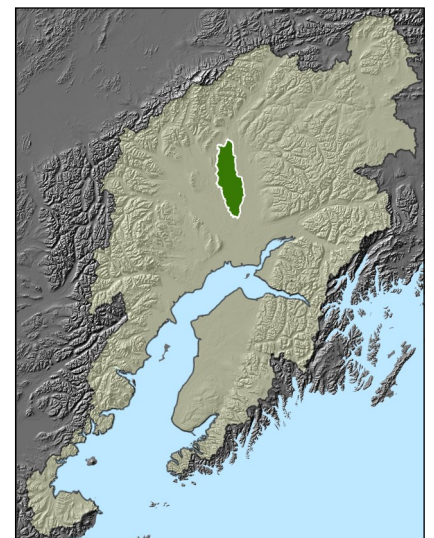


**We are monitoring year-round water temperature at 62 sites with clusters of data loggers at 20 major tributary junctions, like the one pictured above.**

## Watershed Facts

The Deshka River watershed (highlighted in green on the Cook Inlet basin map) flows into the west side of the Susitna River.

Watershed size	625 square miles
Maximum elevation	1,504 feet
Mean elevation	485 feet
Percent wetlands	40%
Connected lakes	Yes



Adult salmon returning to freshwater streams to spawn are stressed by temperatures above 15°C (59°F), while juvenile growth is diminished by temperatures above 13°C (55.4°F).



<sup>i</sup> ADF&G. 2013. [http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative\\_susitna.ain#adultabundance](http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative_susitna.ain#adultabundance)

<sup>ii</sup> Schoen, E., R. Shaftel, C. Cunningham, L. Jones, S. Mauger, D. Rinella, and A. St. Saviour. In prep. Freshwater drivers of Chinook salmon in Cook Inlet, Alaska. Prepared for the Pacific Marine States Fisheries Commission. Alaska Center for Conservation Science, Anchorage, AK.

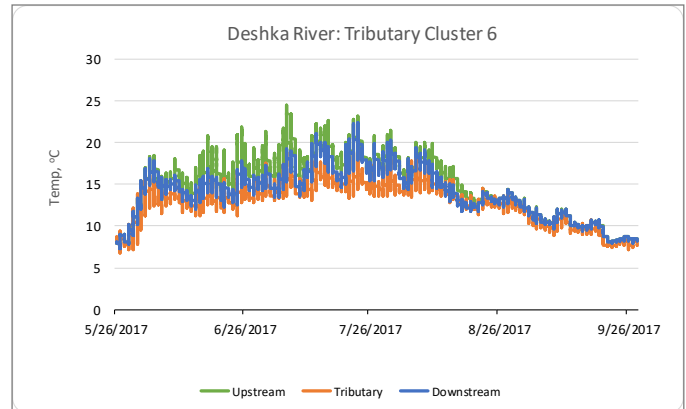
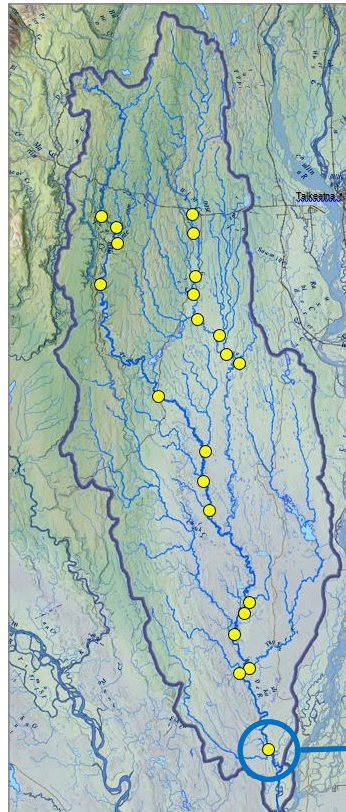
<sup>iii</sup> Mauger, S., R. Shaftel, J. C. Leppi, and D. J. Rinella. 2017. Summer temperature regimes in southcentral Alaska streams: watershed drivers of variation and potential implications for Pacific salmon. *Canadian Journal of Fisheries and Aquatic Sciences* 74: 702-715.

<sup>iv</sup> Shaftel, R., S. Mauger, J. A. Falke, D. J. Rinella, J. Davis, and L. Jones. 2018. Classification of stream thermal regimes in the Matanuska-Susitna Basin, Alaska. *Freshwater Biology*. In prep.

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## Why the Deshka River?

- Produces 21% of the Chinook salmon escapement for the Susitna River basin<sup>i</sup>
- Summer water temperatures have increased by 1.5°C (2.7°F) since 1980<sup>ii</sup>
- Water temperatures as high as 24.5°C (76.1°F) have been recorded in recent years<sup>iii</sup>
- Weekly water temperatures are projected to exceed 26.0°C (78.8°F) by 2060<sup>iii</sup>
- In the future, we expect other Mat-Su basin streams to become as warm as the Deshka River<sup>iv</sup>



The map above shows the temperature monitoring locations with clusters of data loggers at 20 major tributary junctions (yellow dots) across the Deshka River watershed. The influence of a cold-water tributary on the mainstem temperature is illustrated in the chart, where the downstream temperature is lower than the upstream temperature. Cool inputs from this tributary (photo) likely provide important refuge from warm summer temperatures for spawning and rearing Chinook salmon.

## Why does this work matter?

This project will extend the temperature baseline for this important Chinook salmon-producing watershed, identify cold-water refugia for conservation actions, lay the groundwork for future planned studies relating water temperature to adult and juvenile salmon habitat use, and generate readily transferable methods for additional thermal mapping projects in Alaska.