



# On the Hunt for Thermal Diversity in the Deshka River Watershed

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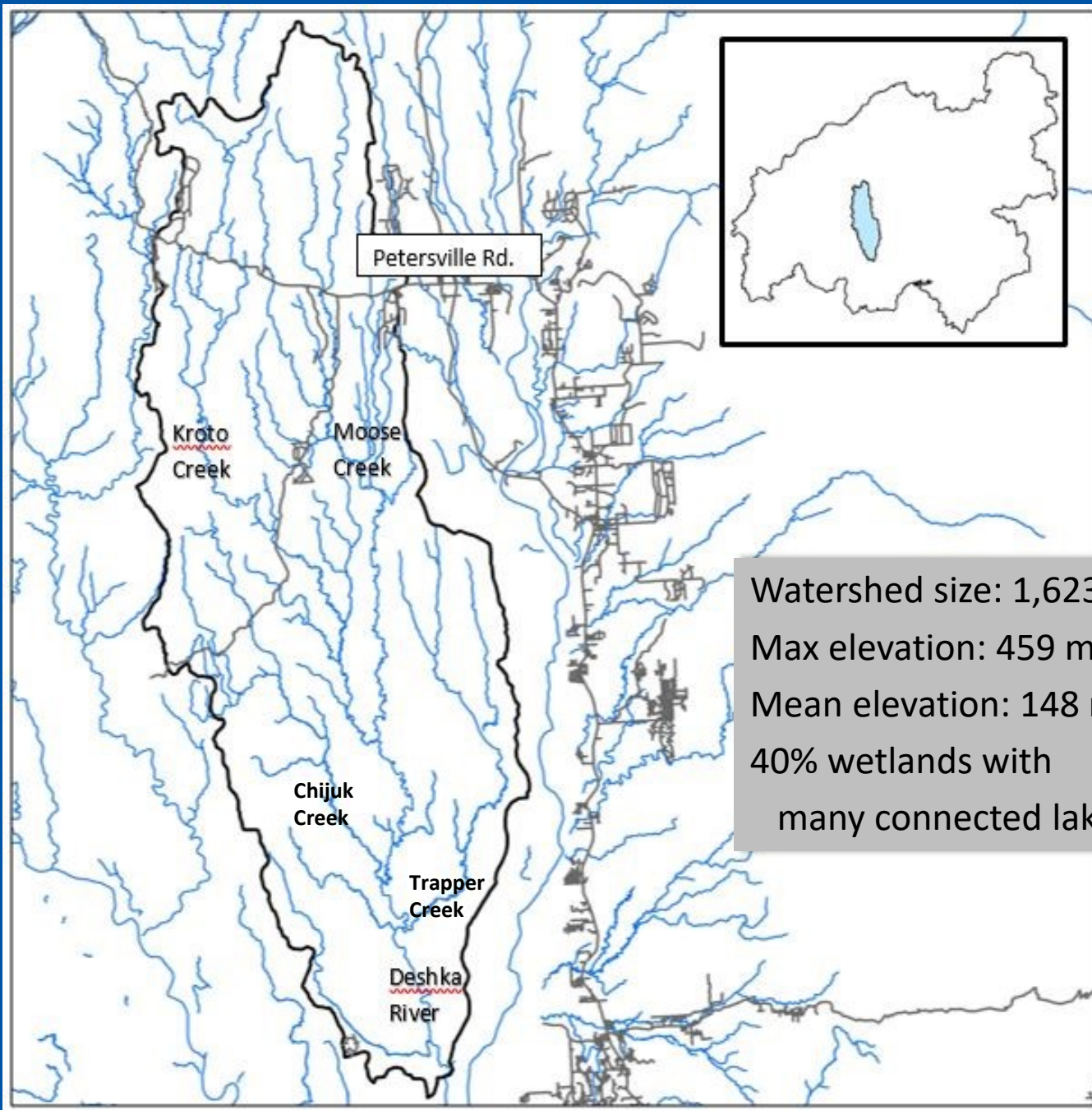


Why the Deshka River?

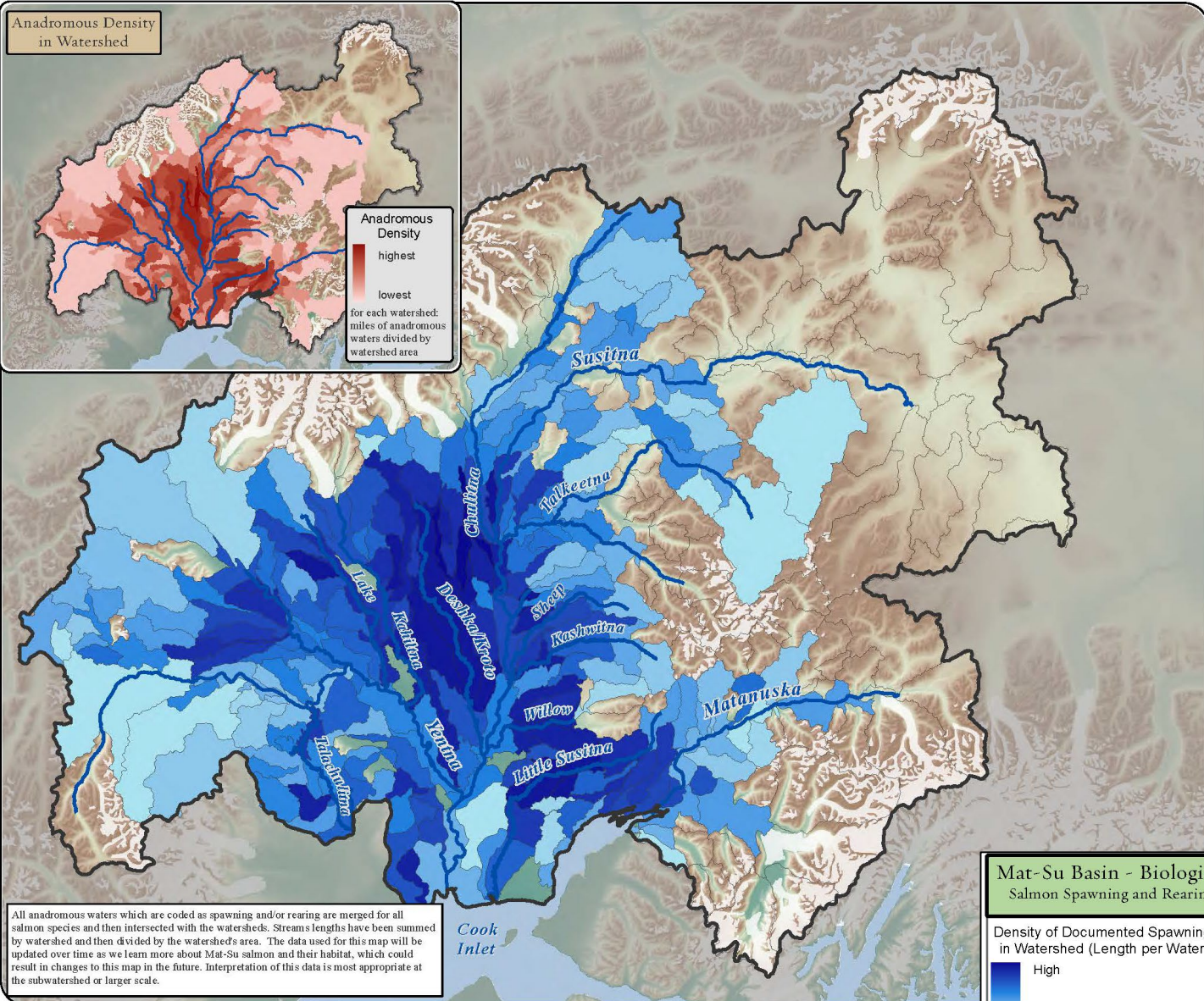
How do you map thermal diversity?

Why does this work matter?





Watershed size: 1,623 km<sup>2</sup>  
Max elevation: 459 meters  
Mean elevation: 148 meters  
40% wetlands with  
many connected lakes



All anadromous waters which are coded as spawning and/or rearing are merged for all salmon species and then intersected with the watersheds. Stream lengths have been summed by watershed and then divided by the watershed's area. The data used for this map will be updated over time as we learn more about Mat-Su salmon and their habitat, which could result in changes to this map in the future. Interpretation of this data is most appropriate at the subwatershed or larger scale.

map by The Nature Conservancy; M. Geist, 2009

Deshka River produces the largest Chinook salmon returns in upper Cook Inlet:  
**21% of Susitna escapement**  
 (ADF&G 2013)

# Mat-Su Salmon Watersheds Map Atlas for Prioritizing Conservation

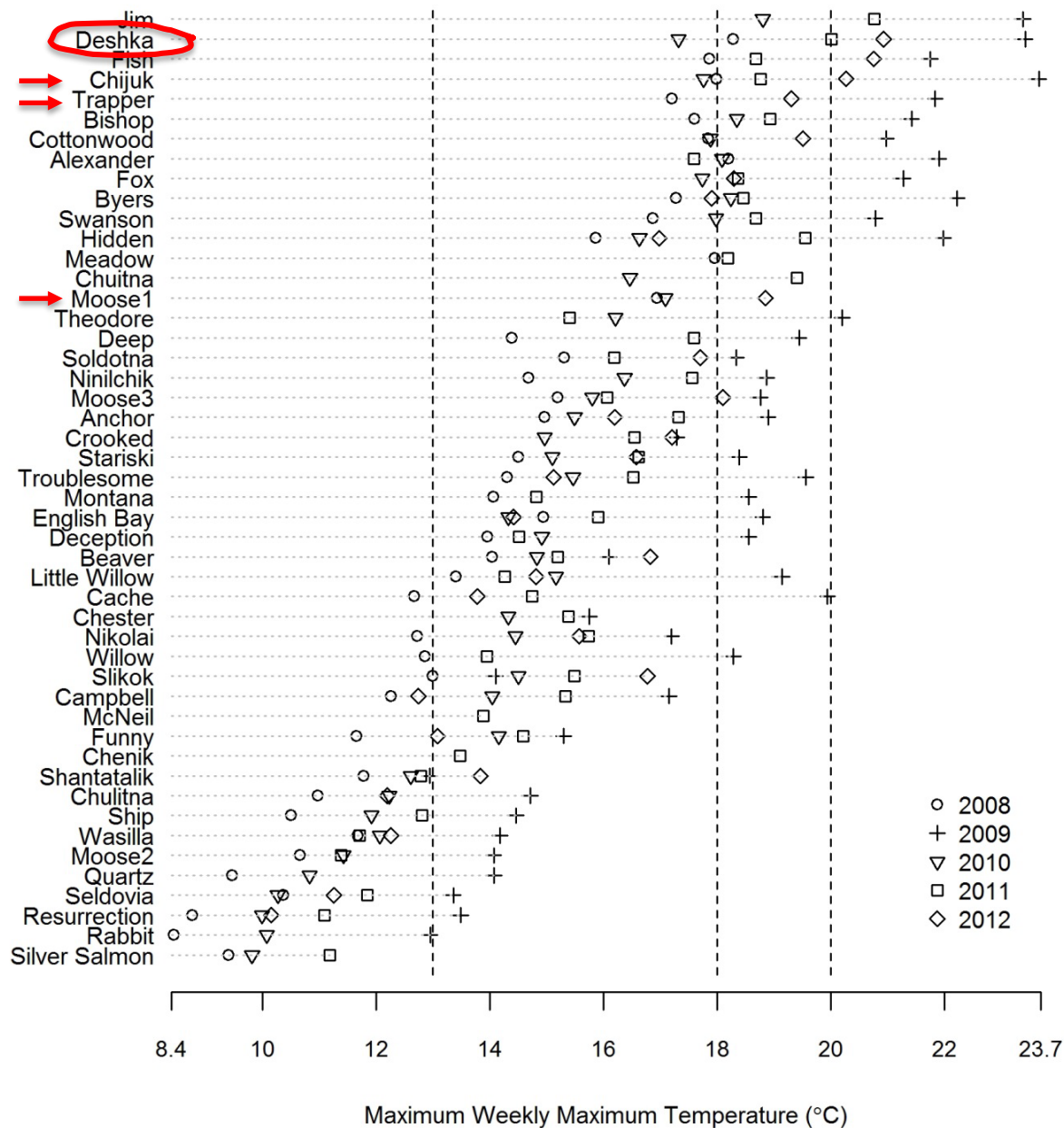
**Mat-Su Basin - Biological Value**  
 Salmon Spawning and Rearing Density

Density of Documented Spawning & Rearing in Watershed (Length per Watershed Area)

High  
 Low

0 10 20 40  
 Miles  
 0 20 40 80  
 Kilometers

DATA SOURCES:  
 Alaska Dept. of Fish and Game - Anadromous Waters Catalog - 2008.  
 Alaska Geographic Data Committee (AGDC) Hydrography Subcommittee.  
<http://agdc.usgs.gov/hydro/> - United States Geological Survey (USGS)

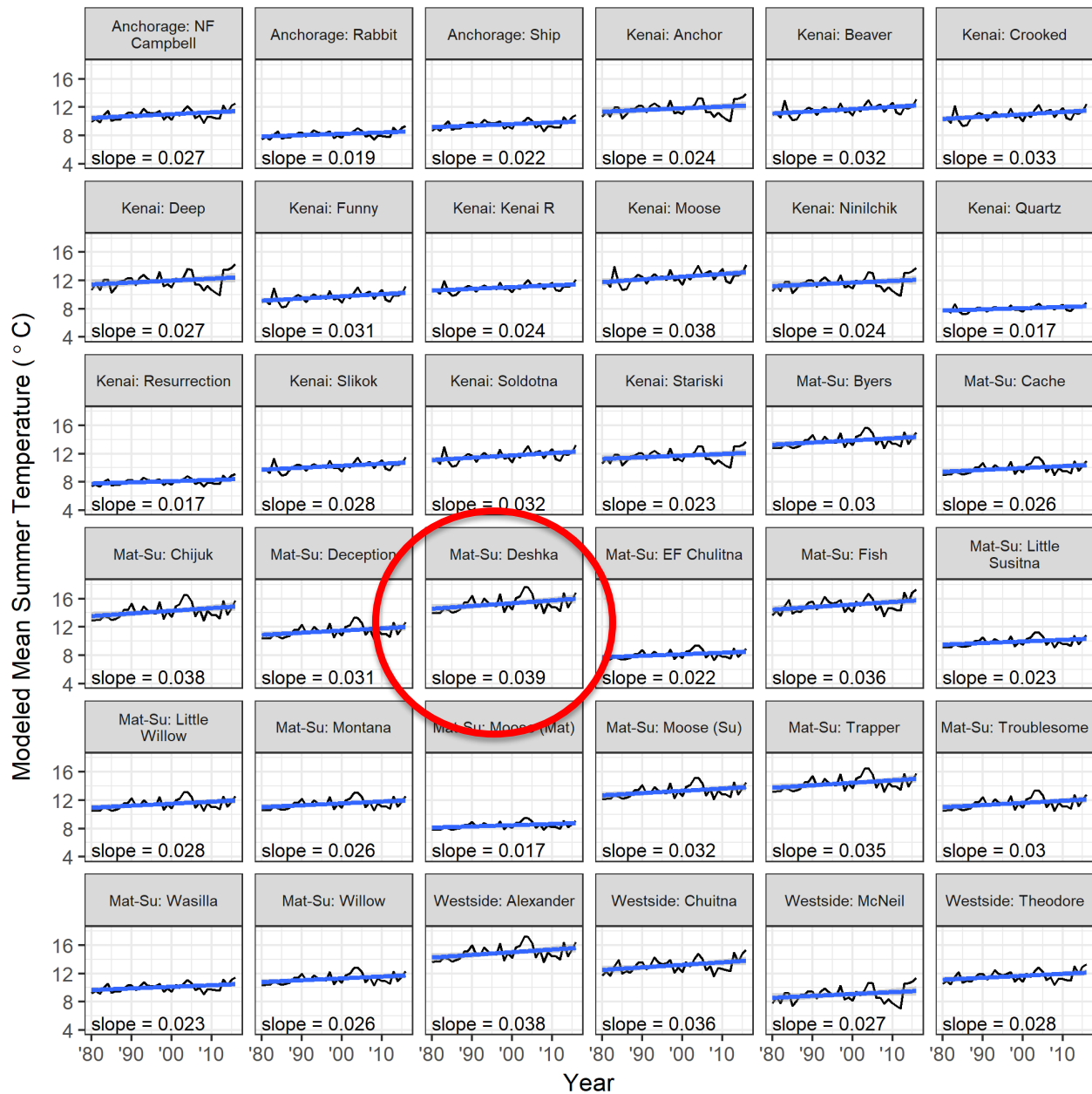


Deshka River and its tributaries regularly exceed thresholds considered stressful for rearing juvenile and spawning adult salmon

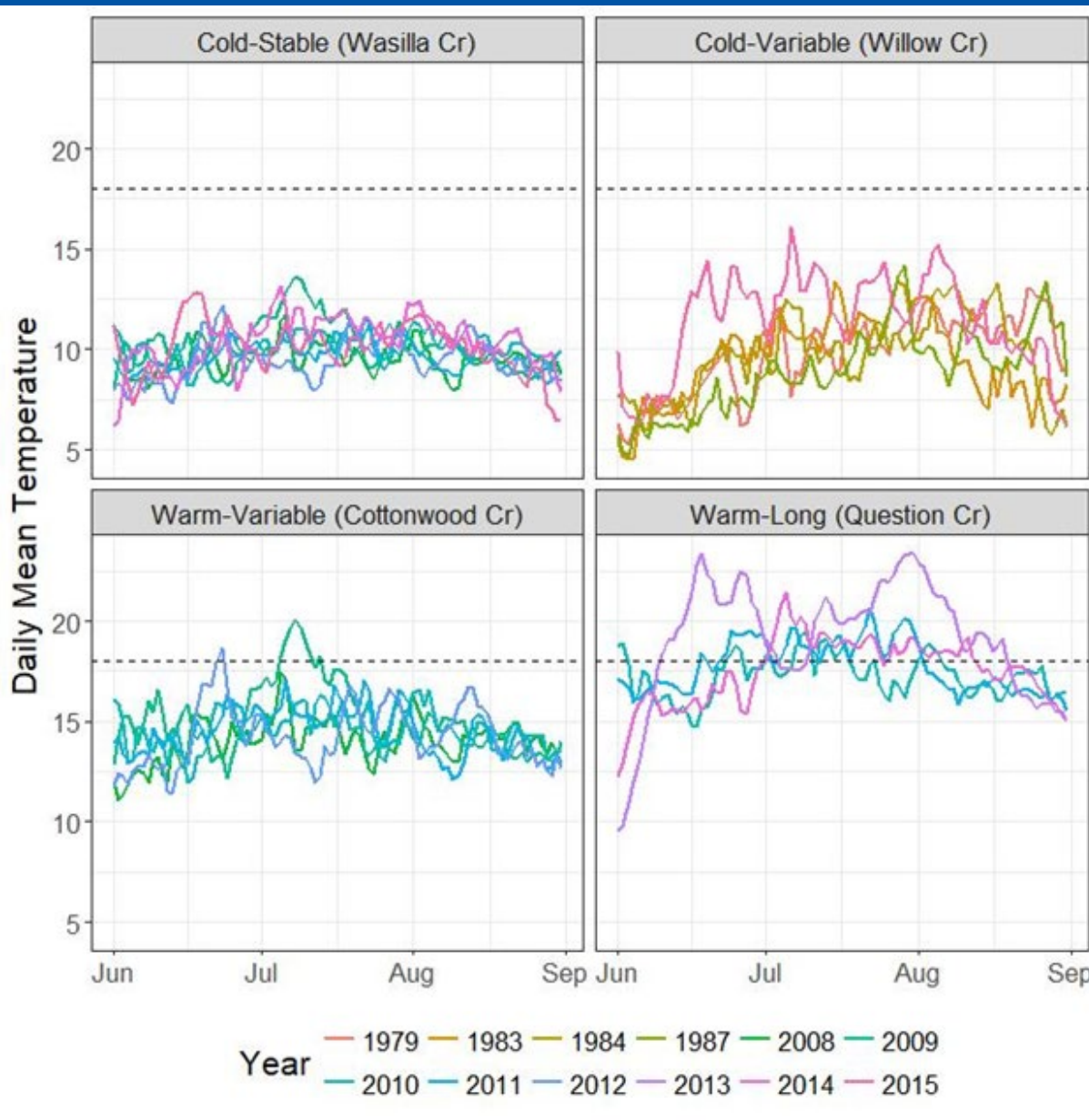
Mauger, S., R. Shaftel, J. C. Leppi, and D. J. Rinella. 2017. Summer temperature regimes in southcentral Alaska streams: watershed drivers of variation and potential implications for Pacific salmon. *Canadian Journal of Fisheries and Aquatic Sciences* 74: 702-715.



Maximum weekly  
water temperatures  
are anticipated to be  
above 24.5°C by 2030  
and 26°C by 2060.



Average summer temperatures have increased by 0.39°C per decade since 1980.



## Thermal Regimes

- magnitude
- variability
- frequency
- duration
- timing

Based on data from 68 Mat-Su streams, more sites will become warm-variable or warm-long in the future like the Deshka and its tributaries are now.

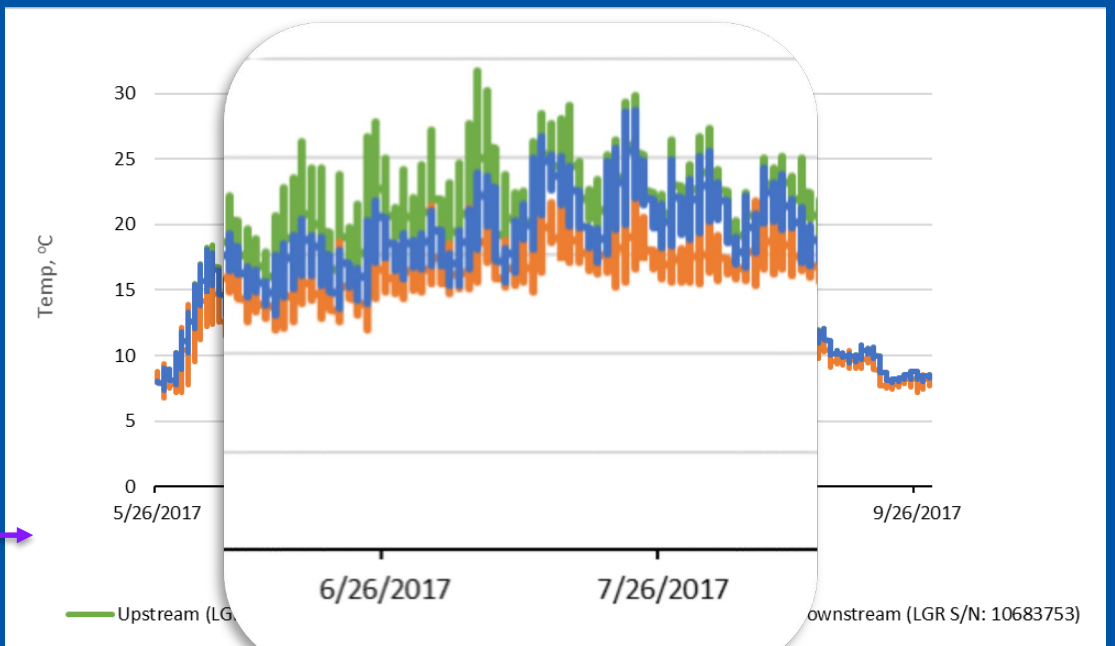
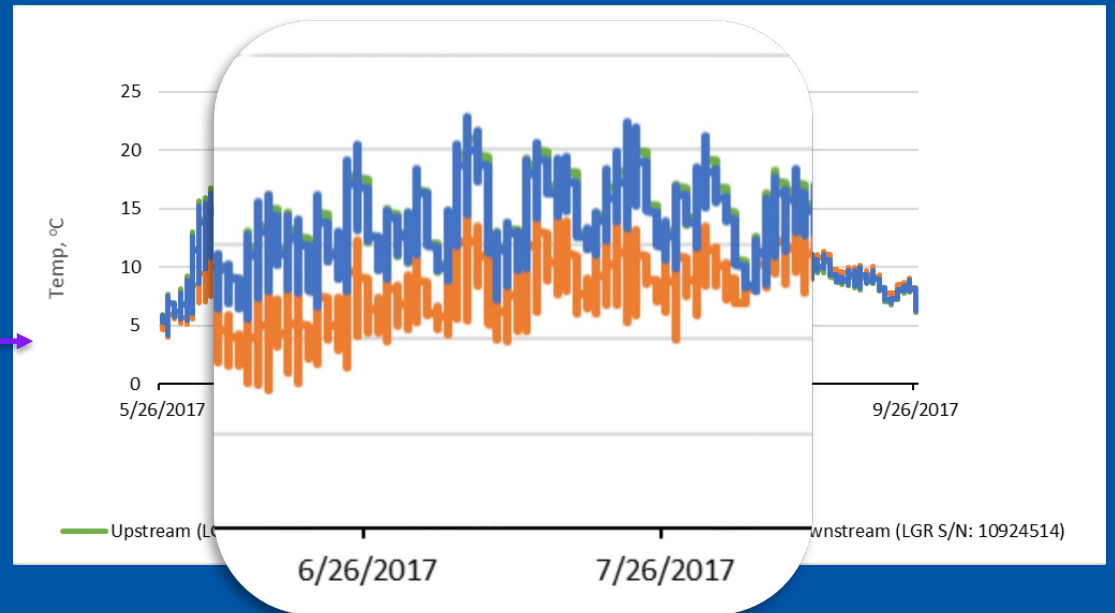
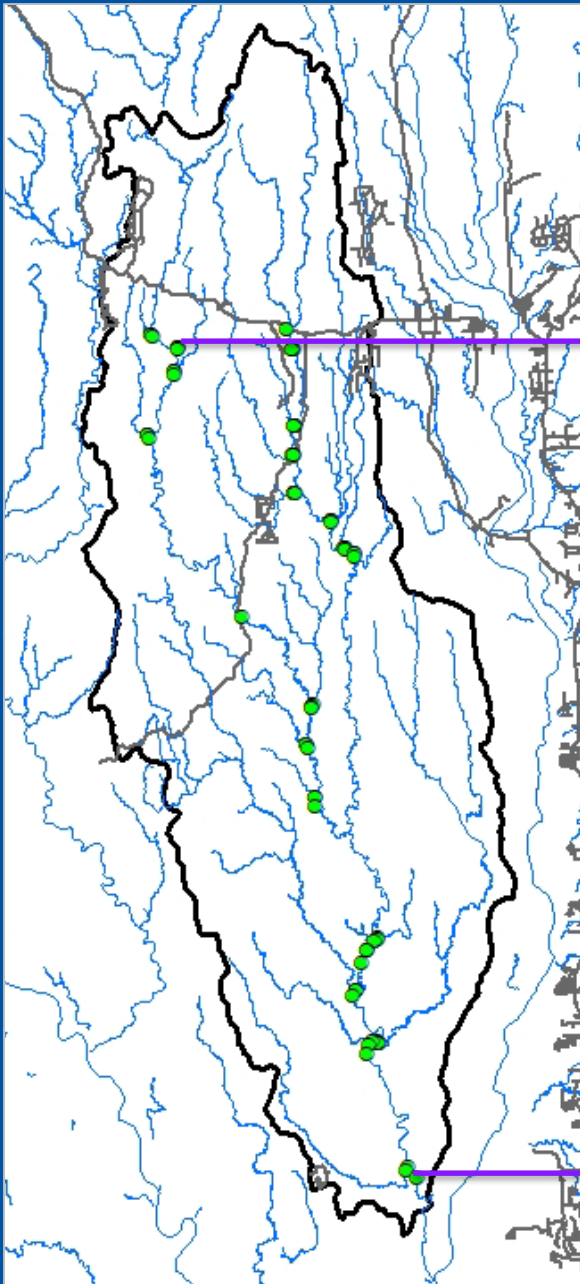
## Why the Deshka River?

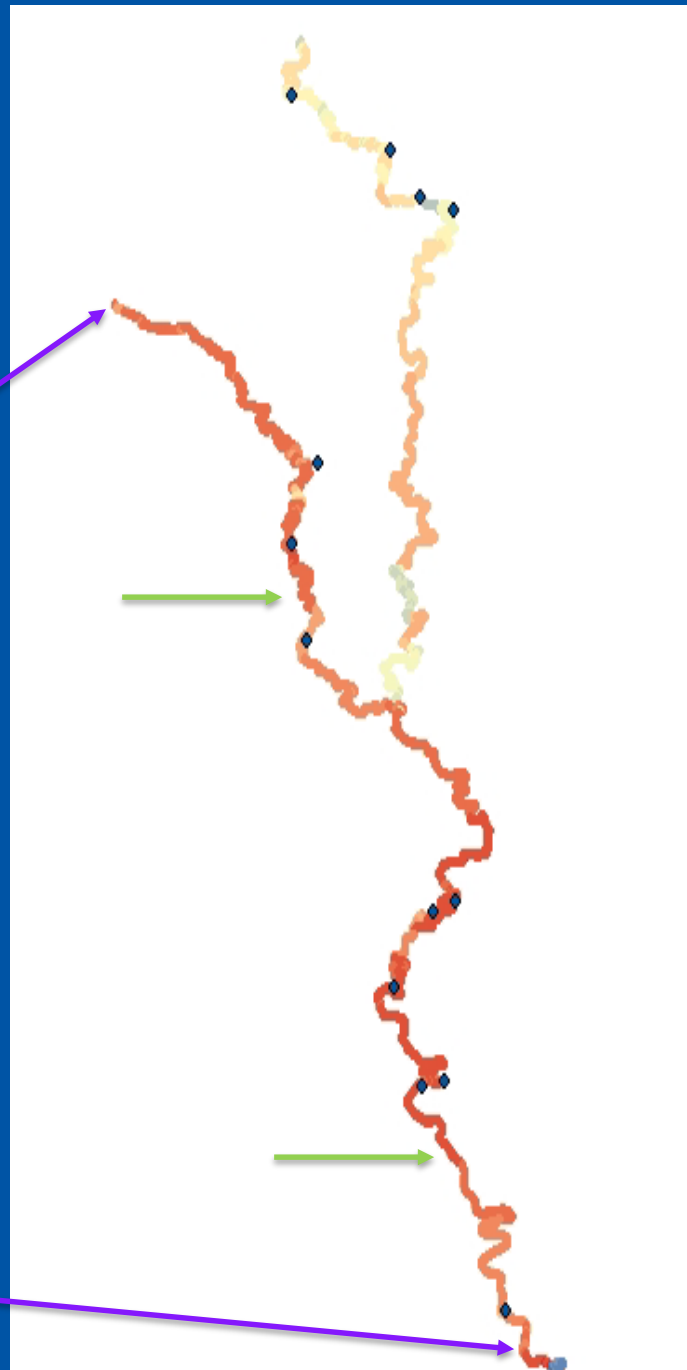
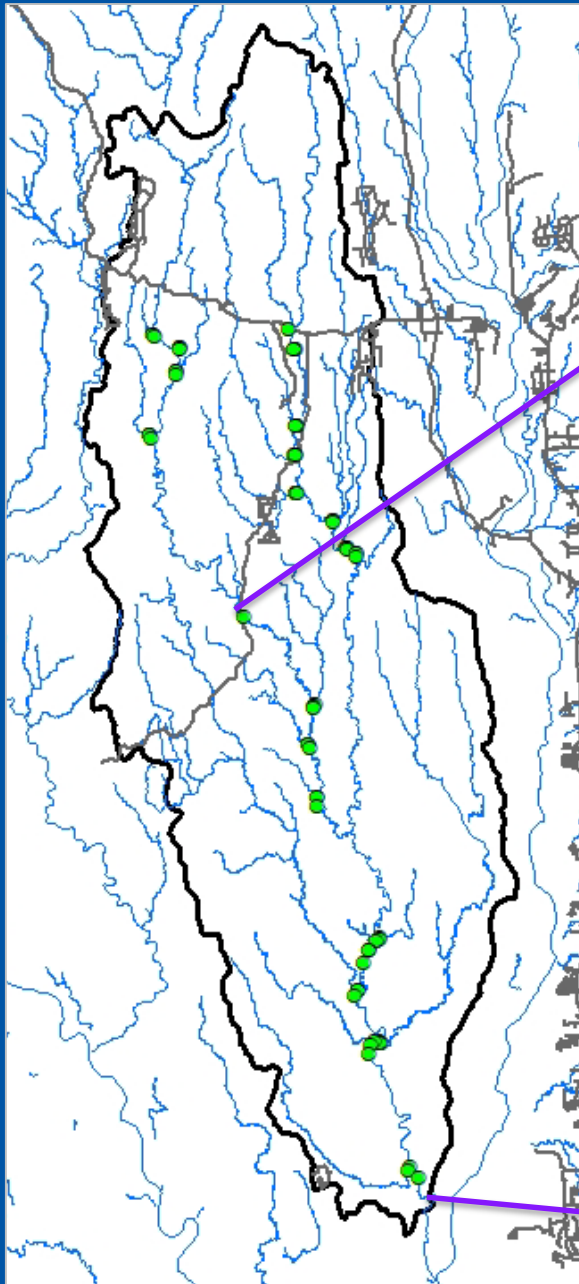
- Significant Chinook producer
- Warm water system
  - average summer temps increased by  $0.39^{\circ}\text{C}$  per decade since 1980
  - current temps stressful for rearing juvenile and spawning adults
  - future weekly temps are anticipated to be above  $26^{\circ}\text{C}$  by 2060
- More systems will be thermally similar to the Deshka in the future

Goal: Map year-round spatial heterogeneity of water temperature within the Deshka River watershed

- 5-year effort (2017 – 2022)
- 62 sites with clusters of data loggers at 20 major tributary junctions







Collecting longitudinal temperature profiles each July by towing GPS-linked temperature loggers programmed to record every minute

## Why does this work matter?

- extending the temperature baseline on a priority watershed
- identifying potential cold-water refugia for conservation actions
- laying the groundwork for future studies relating water temperature to adult and juvenile salmon habitat use
- readily transferable methods for other watersheds



Thanks to the paddlers  
and collaborators!  
Supported provided by:

