



Science-based Land Conservation

Cold Water Stepping Stones

Why is temperature important?

Water temperature affects all parts of the salmon lifecycle, including :

- * *migration timing*
- * *egg survival*
- * *respiration*
- * *metabolism*
- * *Oxygen availability*

Warm water temperature can stress salmon and make them more vulnerable to pollution, predation and disease.

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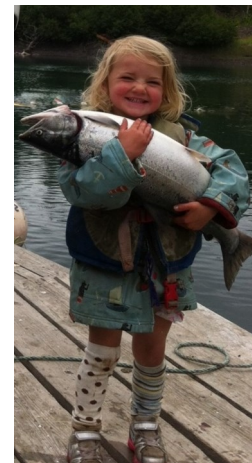
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Wild salmon are a keystone of Alaskan ecosystems, economy, and culture. Anticipating how salmon respond to climate change is important for understanding how they may adapt to coming shifts in their habitat. As one of the world's largest producers of wild salmon, the Gulf of Alaska is a focus for innovative research on best practices for conserving wild salmon habitat in a warming world.

As water temperatures continue to warm in many of Alaska's streams and lakes, cold water refugia – areas within a stream which are persistently colder than adjacent areas – will be critical to the survival of salmon. Deep pools, overhanging vegetation, and undercut banks can be important cold-water habitats; however, stream reaches with groundwater interactions (i.e. springs and seeps) often result in much cooler water. Salmon need these cold-water stepping stones to make their way up and down otherwise warming streams, and mapping these places is the first step towards protecting their habitat in this time of change.



We have discovered springs and seeps that are contributing cold water to the main stem, sometimes as much as 9°F colder. These areas often are rust colored as the iron-rich groundwater reaches the surface and is oxidized.

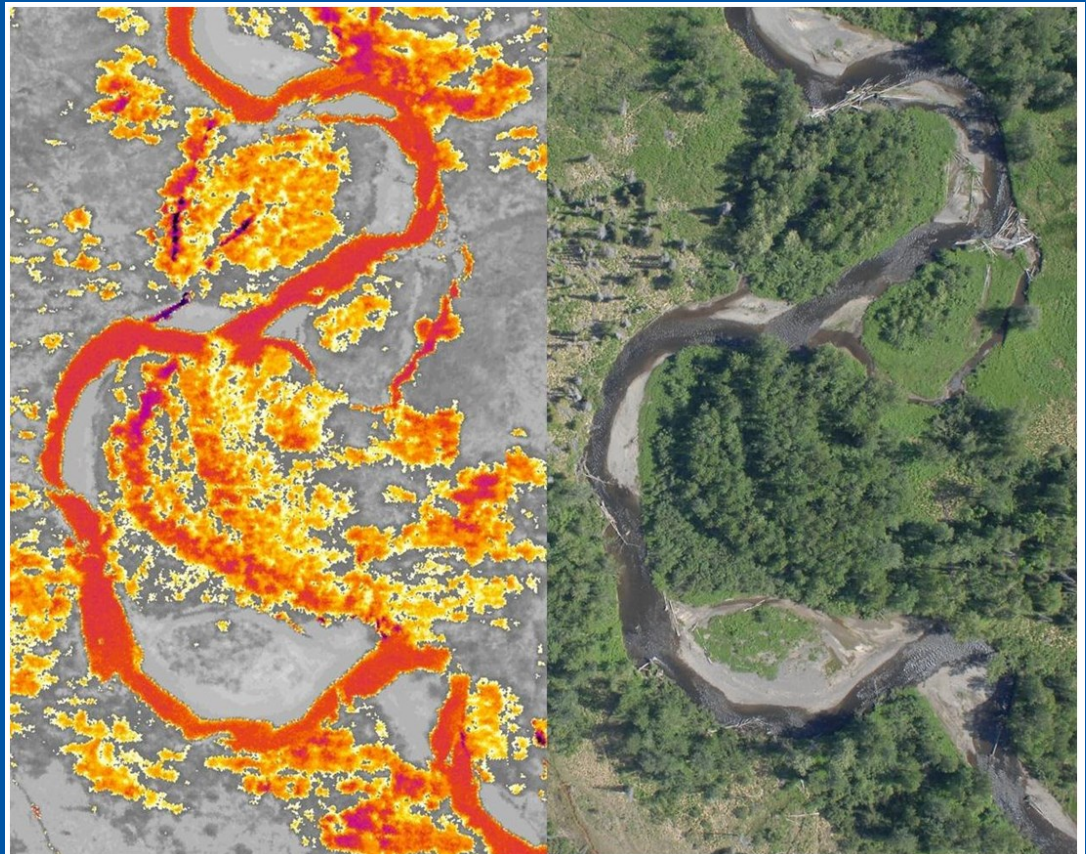


This project is supported in part by the U.S. Fish and Wildlife Service, Kenai Peninsula Fish Habitat Partnership and the Alaska Sustainable Salmon Fund. Project partners include Cook Inletkeeper, Kenai Watershed Forum, and Kachemak Heritage Land Trust.

For more information on this important work, see: www.inletkeeper.org/healthy-habitat/cold-water-refugia

Thermal Infrared Imagery

We use thermal infrared imagery (TIR) to map these cold water habitats in key watersheds in Southcentral Alaska. This exciting technology is an effective method for mapping small-scale temperature patterns in streams. The TIR imagery provides a snapshot of stream temperatures at the time of the survey. And although temperature values change year-to-year, groundwater-fed cool water refugia remain persistent over time. In addition to providing a blast of cold water in the summer, these groundwater areas are relatively warm in the winter creating ice-free nooks for overwintering juvenile salmon.



Thermal infrared imagery (left), with corresponding aerial image (right), showing cold water inputs (purple) to the mainstem of the Anchor river (orange).

With this treasure map of summer cold spots and warm winter nooks, Kachemak Heritage Land Trust can work with private land-owners for permanent conservation of key salmon habitat.

This partnership of local organizations working together provides a unique opportunity to link state-of-the-art science with conservation planning and land protection strategies designed for perpetual habitat conservation to benefit salmon.