



Science-based Land Conservation

Cold Water Stepping Stones

Why is temperature important?

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

- * timing of migration*
- * survivorship of eggs*
- * respiration*
- * metabolism*
- * availability of O₂*

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

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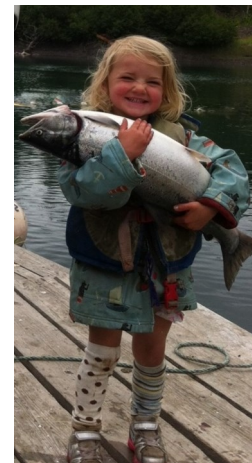
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Anticipating the inevitability of climate-related change to freshwater habitats is essential for the management of Alaska's salmon populations, which contribute substantially to global wild salmon production and are exceedingly important to Alaska's ecology, economy, and societal health of Tribal communities.

As water temperatures get warmer in many of Alaska's streams in the years ahead, cold water refugia – areas within a stream which are persistently colder than adjacent areas – will be critical to the survival and persistence 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) may result in measurably cooler water. Mapping these cold-water stepping stones that are needed for salmon to make their way up and down otherwise warming streams is the first step towards protecting critical salmon habitat in this time of thermal 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.

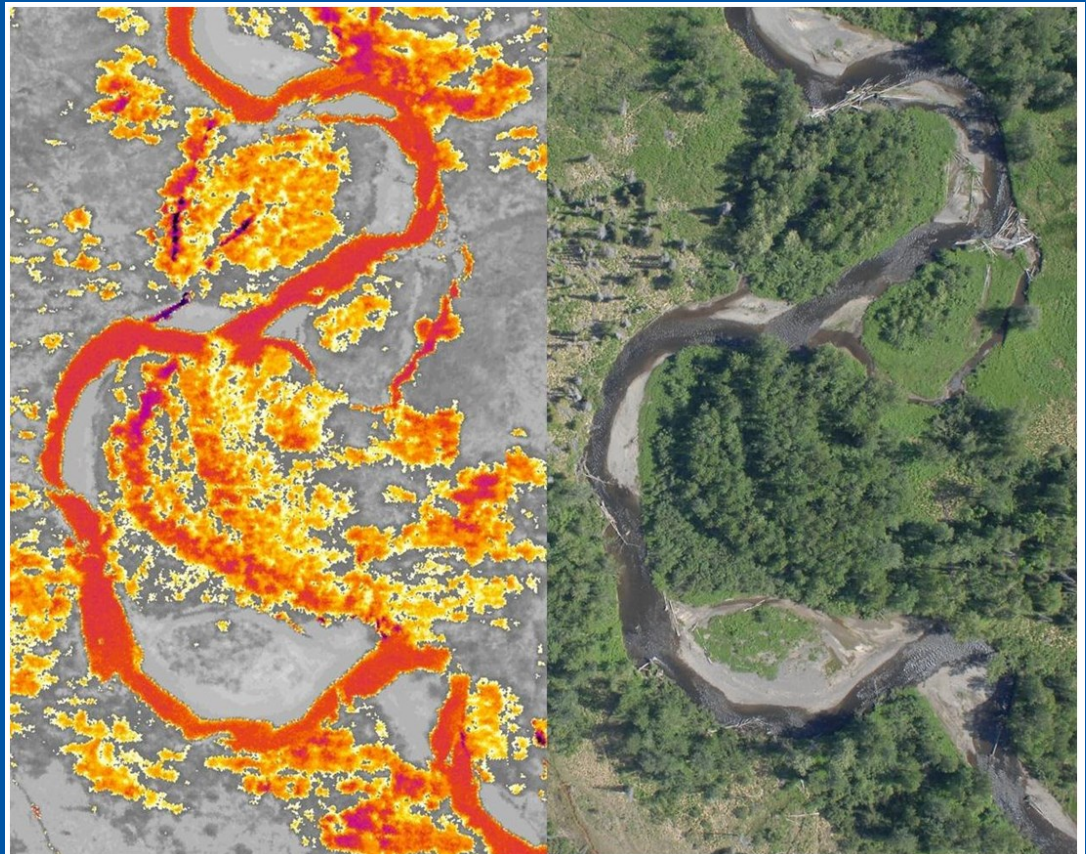


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For more information on this important work, see: www.inletkeeper.org/healthy-habitat/cold-water-refugia

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.