Stream Temperature Regimes in Glacier Bay

What streamwater thermal regimes currently exist in Glacier Bay National Park and Preserve?
What landscape characteristics are responsible for the variation in stream temperature?

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Photo: Scott Harris

Did You Know?

Water temperatures in streams across southeast Alaska have been slowly warming over the past few decades. This may have implications for aquatic organisms in those streams. One example is Auke Creek near Juneau, a low elevation watershed with a large lake. Recent research has shown the timing of adult Pacific salmon spawning migrations in the last 40 years have shifted to avoid the warmest summer stream temperatures.

Introduction

With air temperatures in the coastal temperate rainforest of the southeast Alaska projected to increase by 1.7-3.7°C by the end of the century, researchers from the University of Alaska are seeking to better understand sources of variation in stream temperature regimes in the regions salmon bearing streams. A warming climate will impact landcover and hydrology in southeast Alaska, ultimately having the potential to alter the physical characteristics of aquatic habitats in coastal streams within the region. The goal of this research is to understand how watershed thermal regimes vary spatially across the landscape of southeast Alaska, including Glacier Bay. In particular, we are studying how a stream's thermal regime responds to its environment and localized climate by analyzing how stream temperature is affected by the interaction of air temperature with landscape controls such as forest cover, lake cover, and watershed slope. Beginning in May 2014, researchers deployed stream temperature sensors in selected watersheds throughout the entire panhandle of southeast Alaska, from Ketchikan to Yakutat.

Climate in the Glacier Bay region is projected to change more rapidly than most other regions of southeast Alaska, with pronounced increases in air temperature and precipitation by the end of the century. Understanding relationships between stream temperature and the diverse landscape characteristics encompassed by Glacier Bay watersheds is critical for understanding overall stream temperature variation in Southeast Alaska.

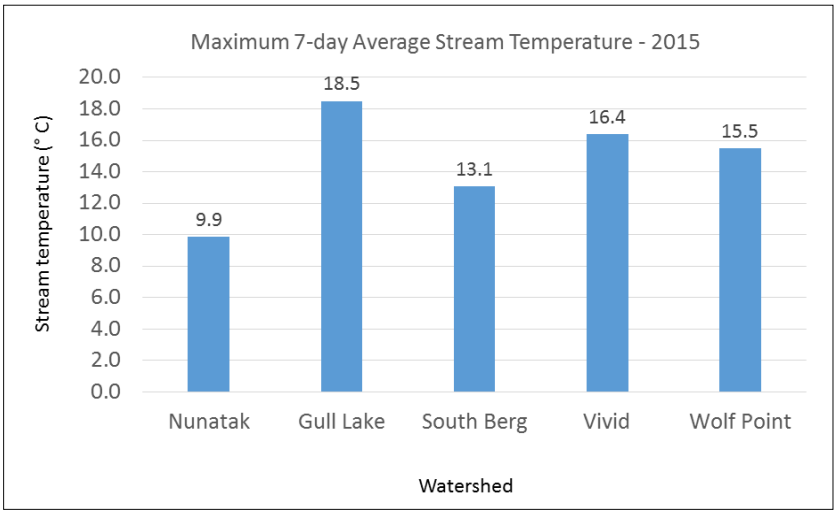
Methods

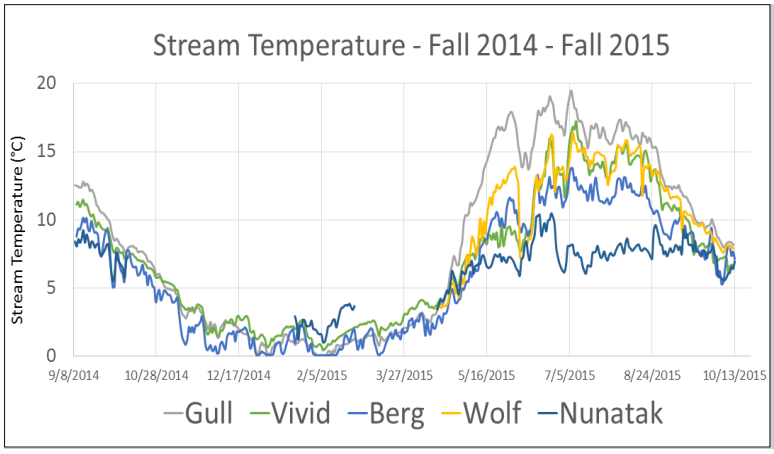
Continuous stream temperature data was collected from fall 2014 through spring 2016. Two temperature sensors were installed in nine streams in fall 2014, with each sensor programmed to take a temperature reading every hour. The monitoring sites were visited twice in 2015 to download data. The sensors will be removed in July 2016.

Left: Temperature sensors in Gull Lake Stream are enclosed in perforated white pvc housings, which act as a solar radiation shield. Right: Michael Winfree downloads data from a temperature sensor.

Findings

Stream temperature for the full duration of the monitoring period was successfully collected in five watersheds. Temperature data from 4 watersheds is not presented due to sensor burial. Stream temperature tended to be warmest in watersheds with lakes as a prominent part of the landscape. The two streams with the warmest 7-day average temperature in 2015 have 1% or greater percentage of lake area within the drainage.





This figure displays the stream temperature from five watershed in Glacier Bay from September 2014 through October 2015.

Learn More

Analysis is currently ongoing for the regional study. Once completed, the thesis will be available from the University of Alaska Fairbanks.

Climate Change workshop– April 13-14, 2016, Juneau Alaska. A presentation given by Michael Winfree can be viewed at the following link: http://www.seakfhp.org/wp-content/uploads/2016/03/4-Winfree_SHORT_presentation_20160414.pdf