

## The Dispersed Deluge: Freshwater Flow From Glaciers and Coastal Rainforests to the Gulf of Alaska



*Thorne Bay, Alaska. On average, the amount of freshwater flowing from southeast Alaska into the Gulf of Alaska each year would cover the state of Texas in two feet of water. The timing and volume of this freshwater discharge is affected by drivers that may be vulnerable to climate change. USDA Forest Service photo.*

The coastal zone of southeast Alaska contains thousands of rivers that drain into the Gulf of Alaska. This is the wettest and most topographically varied region in North America. The deluge of freshwater plays a critical role in supporting the Gulf of Alaska's terrestrial and aquatic ecosystems as well as regional economies. However, the amount, timing, location, and source of freshwater flows into the ocean throughout the year are not well understood.

Two teams of researchers, including Frances Biles, Dave D'Amore, and Rick Edwards with the USDA Forest Service Pacific Northwest Research Station, and colleagues with the U.S. Geological Survey; University of Alaska; and British Columbia Ministry of Forests, Lands and Natural Resource Operations took complementary approaches to learn more.

The researchers analyzed measured streamflow from gaged streams statewide and created a model to estimate freshwater flow across the drainage basin. The analysis of statewide streamflows revealed that rainfall, snowmelt, and high-elevation snow and ice storage create streamflow patterns that affect the timing and volume of freshwater flowing through a watershed.

Collectively, this information can help managers identify watersheds where streamflow drivers may be vulnerable to climate change and anticipate changes to stream discharge that might affect aquatic resources or infrastructure such as bridges and culverts.

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“We have to think about how streamflow looks today, what streamflow looks like year-round, and what streamflow might look like in the future.”

—Katherine Prussian, hydrologist and the watershed program manager for the Tongass National Forest.

## Key Findings

- The southeast Alaska drainage basin, which contains the rivers in southeast Alaska, parts of northwest British Columbia, and southwest Yukon Territory, discharges about 430 km<sup>3</sup> of freshwater into the Gulf of Alaska each year. This discharge is larger than either the Yukon or Columbia Rivers and greatly influences the hydrology of the Gulf of Alaska and its estuaries.
- Rainfall, snowmelt, and high-elevation snow and ice storage create a range of streamflow patterns that vary in the timing and magnitude of seasonal and peak streamflows.
- Maps of average monthly runoff illustrate the spatial variation in runoff timing by watershed and provide a template for future investigations into how nutrients are moved and cycled along coastal environments from enclosed estuaries to the open ocean.

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*Pictured above: A newly constructed footbridge in the Tongass National Forest. USDA Forest Service photo.*

## About the PNW Research Station

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