



Water Quality 2021

Water quality is an important and sensitive indicator of aquatic and terrestrial ecosystem health. Monitoring river conditions helps scientists and park managers detect environmental patterns driven by human activity, climate change and watershed dynamics, then use that information to make better-informed decisions. The Southeast Alaska Inventory & Monitoring Network ([SEAN](#)) has prioritized continuous water quality monitoring in Glacier Bay National Park and Preserve since 2010. Data collected thus far suggest good river health with rare exceedances of Alaska Department of Environmental Conservation ([ADEC](#)) water quality standards; no exceedances occurred in 2021.

Methods

This research program (1) tracks hourly conditions at a single fixed site in the park from early spring to late fall, (2) examines seasonal and interannual variability, and (3) evaluates observations against state standards indicating optimal or hazardous conditions for fishes. Continuously collected data include:

- **Water temperature (°C)** reflects air temperature patterns and snow or glacial melt.
- **Dissolved oxygen concentration (mg/L)** quantifies microscopic oxygen bubbles essential to aquatic organisms. Mainly regulated by temperature, oxygen fluctuations can also be caused by enhanced biological respiration or decomposition and water aeration.
- **pH** is a unitless measure indicating relative acidity or alkalinity. The chemistry of local rocks, soils, and rain impact observed pH levels.
- **Specific conductance (mS/cm)** describes the ability of water to conduct an electrical current. In Southeast Alaska, higher values represent groundwater influence and lower values reflect rain and snow runoff.

During the ice-free season, a water quality sonde sampled the river hourly at a fixed location. Once a month, park staff visited the site to check sensor calibrations, download data, and resolve any problems. Dissolved oxygen sensor and central wiper brush issues resulted in data gaps. The SEAN's certified annual water quality data are publicly [available](#), as is the peer-reviewed [protocol](#) guiding this monitoring program.

2021 Weather Conditions

A substantial winter snowpack (175% of the long-term median; [Alaska Snow Survey](#)) combined with summer temperatures 0.5-1°C warmer than usual ([Alaska Climate Center](#)) to yield significant melt-driven flooding. The Salmon River experienced record-setting high streamflows in 2021. An August atmospheric river and series of fall storms impacted the entire region.

Results

Glacier Bay National Park and Preserve has more than 300 streams flowing over 3,380 km through a diversity of glacially shaped landscapes. The SEAN monitors the Salmon River, whose watershed primarily drains Excursion Ridge to the east and features mature wetlands and forests. This system is strongly groundwater influenced, reflecting greater transport and storage capacity in wetlands and the local aquifer. The sonde is located at river km 9.0, just upstream from the park boundary ([map](#)). Since 2014, a U.S. Geological Survey (USGS) streamflow [gage](#) has operated about one km downstream from the monitoring site; no significant tributaries exist between the two stations. The Salmon River is home to many productive anadromous fish populations. Although their life histories vary, especially with respect to spawning location and amount of time spent in the stream, all are vulnerable to environmental shifts due to climate processes. Tracking temporal changes in water temperature and flow patterns offers insight to these risks and is an established focus for Glacier Bay National Park and Preserve. 2021 April to November data are here compared to the 2010-2020 historical record.

2021 Observations

- Water temperatures were near normal throughout the sampling interval and followed the typical seasonal pattern. Peak summer conditions remained below the 13°C ADEC standard.
- Dissolved oxygen was above or near average during spring and summer, always above the ADEC threshold for anadromous fish (above 7 mg/L).
- pH values dropped slightly during storm events but were consistently well within ADEC optimums (between 6.5 and 8).
- Specific conductance fluctuations were driven by precipitation (low values) and stabilized during a mid-summer dry interval (high values, indicating greater groundwater influence).
- Discharge was well above normal during the spring and early fall. At the Salmon River gaging station, 2021 set record monthly mean discharge levels in April, May, and June, plus reached a record high for peak streamflow. Discharge peaks lag rainfall due to wetland storage.

Salmon River freshwater data summary, 2021.

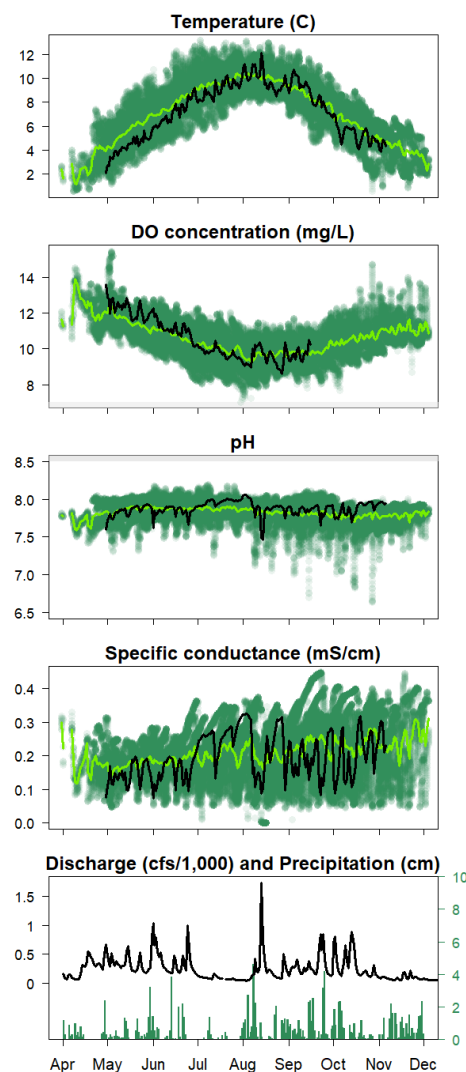
Parameter	Mean	Min	Max
Temperature (°C)	7.33	1.66	12.66
DO concentration (mg/L)	10.57	8.30	13.97
pH	7.88	6.93	8.26
Specific conductance (mS/cm)	0.20	0.05	0.33
Discharge (cfs)	279.79	48.80	1,730.00

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Daily mean water quality parameters for the Salmon River in 2021 (black lines) relative to 2010-2020 daily means (green lines) and hourly measurements (green points). Bottom panel shows daily mean discharge rates (black lines) from the nearby stream gage and precipitation (green bars) from the closest weather station. Shaded regions denote ADEC thresholds for unsuitable fish habitat for temperature (above 13°C), dissolved oxygen (below 7 mg/L), and pH (below 6.5 or above 8.5).

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Southeast Alaska Inventory & Monitoring Network
<https://www.nps.gov/im/sean/streamflow.htm>