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INSIGHT

Glacial Lake Outburst Floods: Mendenhall Glacier Case Study and Issues for Congress

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On August, 13, 2025, a U.S. Geological Survey (USGS) streamgage on the Mendenhall River north of Juneau, AK, passed its 2024 record level of 15.99 feet, cresting at 16.65 feet. The river's rise was due to a sudden release of glacial water—known as a *glacial lake outburst flood* (GLOF)—from Suicide Basin. Following advance notifications and warnings from the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service (NWS), the City and Borough of Juneau (CBJ) urged residents to evacuate potential flood inundation areas. Ultimately, most of the flooding was mitigated by temporary flood barriers installed by the U.S. Army Corps of Engineers (USACE) earlier in 2025.

The first reported GLOF at Suicide Basin occurred in 2011, and experts anticipate these GLOFs may recur annually while Mendenhall Glacier is present. Although GLOFs may not occur as frequently as weather-event flooding, GLOFs also can threaten life and property. A 2024 GLOF damaged over 300 Juneau homes (**Figure 1**) and was declared a major disaster. As such, Congress may be interested in federal efforts toward addressing GLOF risk and may consider the federal role in mitigating future impacts.

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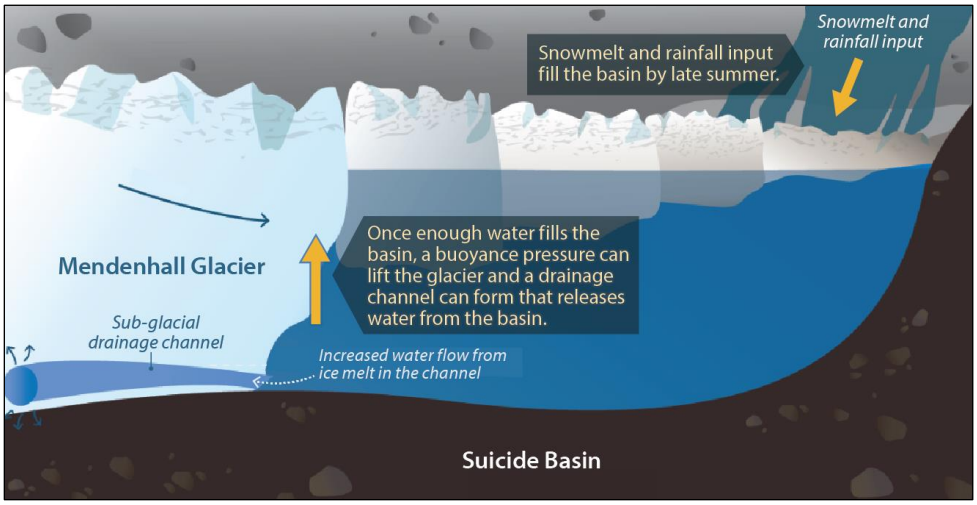
Figure 1. August 2024 Glacial Lake Outburst Flood (GLOF) Inundation in Juneau, AK

Source: Alaska National Guard, "Alaska Guard Assists Juneau Following Glacial Flooding."

Mendenhall GLOFs

GLOFs typically occur when a glacial lake's dam—which may be dammed by ice or glacial sediment deposit—suddenly fails. Continuing climate warming may accelerate ice-dam thinning and generate GLOFs. GLOFs associated with ice-dammed lakes tend to occur in the summer or early autumn, when the water level in a glacial lake reaches a critical threshold (see **Figure 2**). GLOFs also may be triggered by the displacement of the lake's water from mass wasting of unstable slopes (e.g., avalanche, landslide), causing the water to overtop the dam.

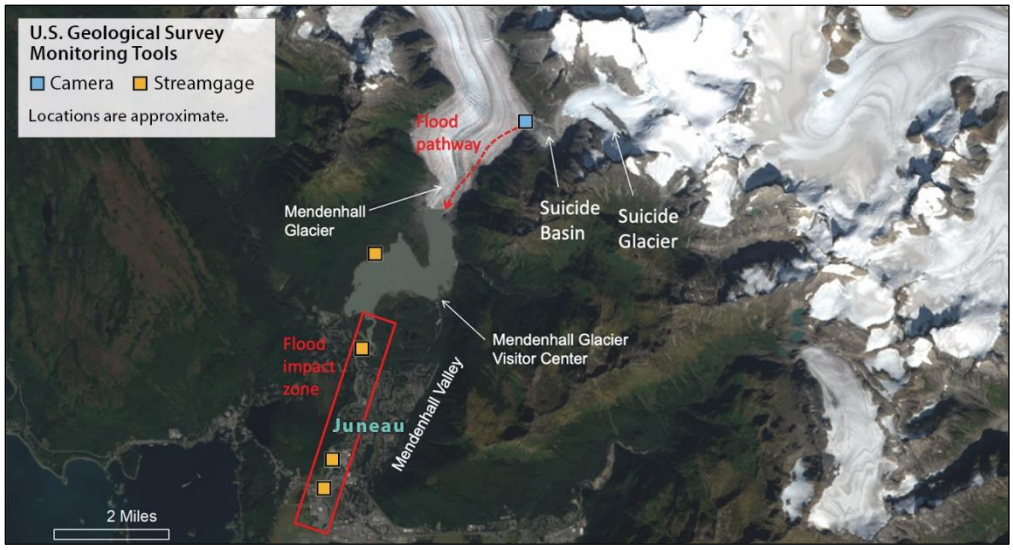
Figure 2. Mechanism of a Mendenhall GLOF



Source: CRS, modified from NOAA, "Glacier Outburst Floods: Mendenhall Glacier."

Mendenhall Glacier sits upstream of Juneau and acts as a natural dam, accumulating meltwater and precipitation in Suicide Basin. Experts estimate that upwards of 15 billion gallons of water could be released from Suicide Basin during a GLOF. The Mendenhall Valley typically experiences flooding within 48 hours of a Mendenhall GLOF (**Figure 3**).

Figure 3. Mendenhall GLOF Pathway and Impact Zone



Source: CRS, modified from NWS, "Suicide Basin Monitoring and Current Conditions."

Research, Monitoring, and Forecasting

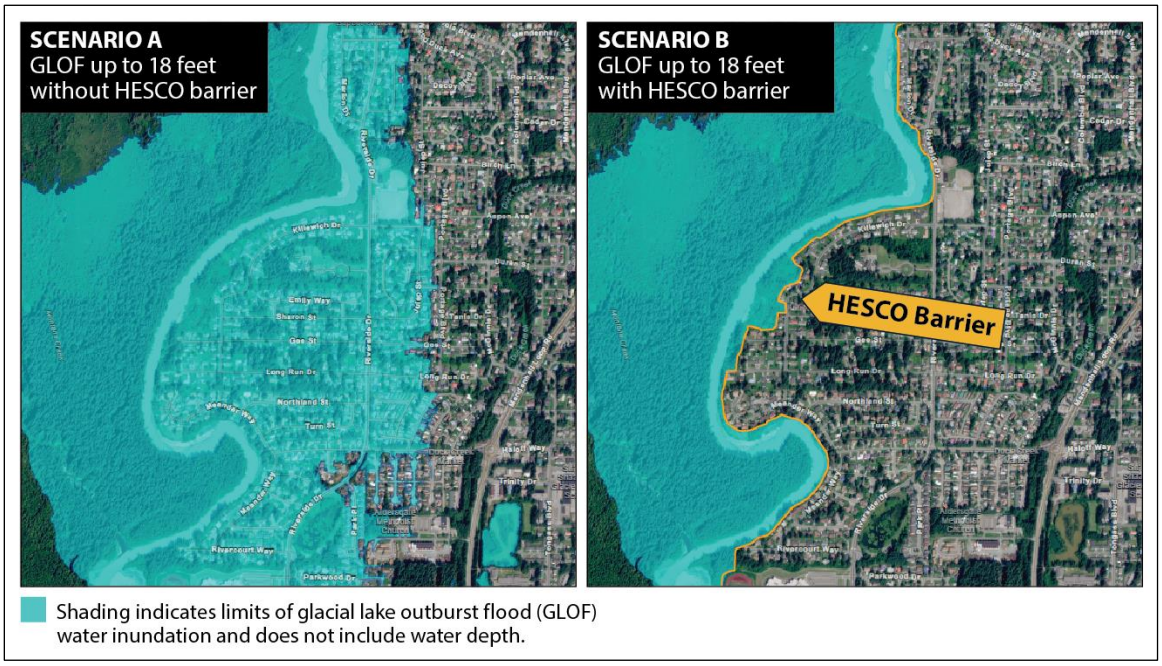
To forecast the timing and magnitude of GLOFs, experts analyze changes in glacial dynamics and annual weather variability. Although GLOFs have been considered unpredictable, the USGS and its partners have advanced science on GLOFs in the Mendenhall Valley. The USGS actively monitors conditions using cameras and a laser to track water and ice levels that inform NWS forecasts. Downstream, the USGS streamgage on Mendenhall Lake measures water temperature and lake elevation every 15 minutes. Working with USACE, the USGS also has installed streamgages at Mendenhall River bridges to measure real-time water height and streamflow. Post-flood, the USGS and academic researchers conduct surveys of high-water marks and basin and riverbed changes to better understand the dynamics of GLOFs for future events.

The NWS's Alaska-Pacific River Forecast Center (APRFC) maintains current and predicted hydrographs and time series of streamflow for downstream GLOF-affected lakes and rivers. APRFC issues flood-related forecasts in Alaska, and NWS Weather Forecast Offices (WFOs) issue local forecasts and outlooks to emergency responders and the public. Juneau WFO also created a webpage for monitoring Suicide Basin.

Flood Risk Reduction Measures

USACE has provided CBJ with technical assistance, including HESCO barriers for short-term protection. These barriers are intended to protect against GLOFs that measure up to 18 feet high on the USGS streamgage (**Figure 4**). Their potential effectiveness was modeled in a study commissioned by CBJ to establish a suite of flood scenarios and create inundation maps of the Mendenhall Valley. The study used NWS hydrographs representing temporarily varied discharge from Suicide Basin with USGS flood frequency estimates and received funding support from the U.S. Forest Service.

Figure 4. Modeled Extent of GLOF Flooding with and Without HESCO Barriers for Juneau, AK



Source: CRS, modified from CBJ, "Mendenhall Valley Flood Fighting Inundation Maps."

In March 2025, USACE shipped to Juneau HESCO barriers and other flood mitigation supplies to install along the Mendenhall River in two phases. Phase 1 & 1A HESCO barrier project, completed July 2025, covered about 2.5 river miles and reduced the impacts of the August 2025 GLOF, according to USACE (**Figure 5**). USACE states that Phase 2 is to provide coverage to the rest of the area.

Figure 5. HESCO Barriers in Juneau, AK, During August 2025 GLOF

Source: USACE, "Temporary Flood Barriers Prove Effective During Flood Event in Juneau."

Section 8315 of the Water Resources Development Act 2022 (WRDA 2022; Title LXXXI of P.L. 117-263) authorized a program for USACE to carry out structural and nonstructural projects for certain hazards, including ice and glacial damage, in Alaska. In March 2025, USACE allocated American Relief

Act, 2025 (P.L. 118-158), funding to "initiate and complete a technical report that will inform a future feasibility study" to address Mendenhall GLOFs. USACE states that the technical report is to help define the parameters of a long-term flood risk mitigation solution. After completing the report, USACE may conduct a feasibility study to analyze project alternatives.

Issues for Congress

GLOFs are hazards unique to regions with glaciers, which in the United States generally have occurred only in Alaska in recent decades. Researchers expect Mendenhall GLOFs to continue for the next few decades (or less) until the glacier becomes too thin to dam Suicide Basin. Congress may consider the federal role, including the costs and benefits, in implementing long-term or alternative flood risk mitigation approaches for GLOFs. Some Members of Congress have expressed concern about the estimated time frame for construction of a long-term federal project. USACE has not published implementation guidance for Section 8315 of WRDA 2022. Publication of implementation guidance and the recently initiated technical report may clarify both the interpretation of the WRDA 2022 authority and the associated federal funding that could be associated with construction of a USACE project.

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