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TITLE: GLACIER OUTBURST POTENTIAL IN ALASKA

ABSTRACT

Glacier dammed lakes and glacier-clad volcanoes are abundant in Alaska, especially in the mountains adjacent to the Gulf of Alaska. Some glaciers accumulate large amounts of water with high potential energy. Outbursts of this water due to instability processes can cause severe flooding. Soon after an outburst, glacier flow usually reseals the breach in the ice dam, so outbursts from a single source can occur periodically. Most glacier outburst floods in Alaska are caused by lakes. Outbursts from volcanoes are less common but are potentially very dangerous because they contain large amounts of volcanic sediments.

Glacier dammed lake instability and volcanic activity are transient events. As glaciers change size or ice is redistributed within them by surges, new lakes can form, lakes that had existed for decades can begin outbursting abruptly, or lakes can cease to exist. For this reason, statistical interpretations, alone, of long-term data on floods at glacier-fed rivers cannot be used reliably for predicting the frequency and magnitude of future flooding events.

Examples of changing glacier dammed lake situations are common in Alaska. After decades of flowing safely over bedrock ridges, Summit Lake at Salmon Glacier near Hyder began outbursting in 1961, and Berg Lake at Bering Glacier near Yakataga began outbursting in 1981. Russell Lake at Hubbard Glacier near Yakutat existed before about 1860, became a fiord when Hubbard Glacier retreated, then reformed in 1986 as the glacier readvanced. The October 1986 outburst from Russell Lake produced a peak discharge of 105,000 cubic meters per second, which may be the greatest historical discharge rate in North America. Lake George at Knik Glacier near Palmer outburst annually from about 1918 to 1966, except 1963, but has remained empty since 1966, causing a growing, but unjustified, sense of security about the Knik River floodplain. Chakachatna Lake at Barrier Glacier near Spurr Volcano outbursts at about 20-year intervals. Redoubt Volcano produced an outburst during the 1966 eruption.

Three important glacier dammed lakes in Alaska are observed regularly. Snow Lake, which empties into Kenai Lake, has lake height markers installed by the U.S. Geological Survey that are observed from aircraft. The National Weather Service accurately predicts the time and magnitude of flood peak from this lake several days in advance, after an outburst begins. Russell Fiord/Lake has a U.S. Geological Survey telemetering reservoir gage that reports water stage each 15 minutes. Strandline Lake at Triumvirate Glacier near Beluga Lake is observed by the Chevron Corp. and the University of Alaska as it becomes full.

Recently inactive ice dammed lakes potentially can reactivate. For example, a glacier flowing into the Drift River near Redoubt Volcano has increased activity since the 1966 eruption and could dam the river. Knik Glacier will dam Lake George again if it advanced only about 50 meters. An ancient lake in the Delta River valley could fill again if Black Rapids Glacier surges strongly. Surging glaciers in the Alsek River valley could reactivate recent lakes there. If Taku Glacier near Juneau continues to advance, it will dam the Taku River.