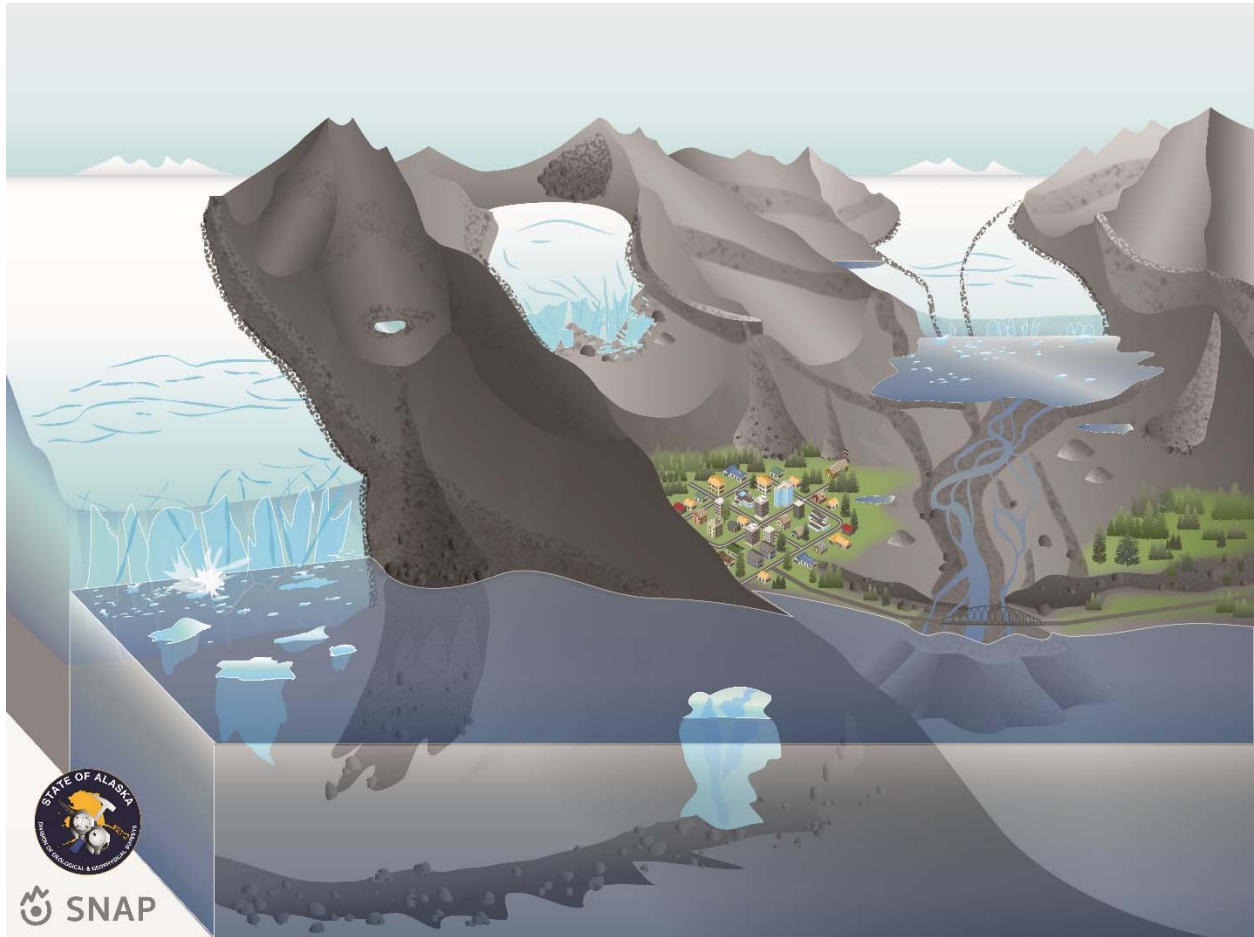


DEGLACIERIZATION AND THE DEVELOPMENT OF GLACIER-RELATED HAZARDS

Kristin Timm and Gabriel J. Wolken

Information Circular 63



Schematic illustration of deglaciation in a fjord setting, and the development of common glacier-related hazards.

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DEGLACIERIZATION AND THE DEVELOPMENT OF GLACIER-RELATED HAZARDS

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Alaska is currently host to thousands of glaciers, and much of the state has been modified by the advance and retreat of glaciers resulting in a dynamic landscape with many types of glacier-related geologic hazards. For example, deep glacier-carved valleys with oversteepened walls, once buttressed by thick glacier ice, are now unstable due to the absence of lateral pressure imposed by glaciers. Glacier deposits, such as ice-cored moraines and till perched on steep valley walls, are susceptible to movement as ice that once provided stability is now either reduced or absent. Deltas formed by rivers transporting large amounts of sediment from melting glaciers are susceptible to submarine slope failure in deep, steep-walled lakes and fjords. Many Alaska communities are in areas still responding to large-scale glacier change, and recent increases in temperature are causing an acceleration in glacier melt that is adding to the dynamic nature of Alaska's landscape, threatening public safety and infrastructure, and challenging future development efforts. Figures 1-3 illustrate the process of deglaciation in a fjord setting and the development of glacier-related hazards that are common in many areas in Alaska. These figures are intended to be used individually or in series, to illustrate deglaciation and the development of glacier-related hazards. Labels on the figures are deliberately omitted so the user can customize these figures for multiple purposes and audiences. The Alaska Division of Geological & Geophysical Surveys authorizes public use of these figures, but requests accurate citation when used.

Figure 1: Full glacial conditions. The Cordilleran ice sheet covers most of the land and carves the rugged terrain in southern Alaska (i.e. the last glacial maximum).

Figure 2: Deglaciation. The Cordilleran ice sheet has transitioned to icefields and mountain glaciers following extensive glacier retreat, exposing terrain and land resources. Tidewater glaciers persist in some areas and mountain glaciers terminate below treeline in many locations. Possible hazards include those related to unstable slopes (e.g. debris flow, landslide, rock fall, rock/ice avalanche, and near-field tsunami), iceberg calving, glacial lake outburst floods, and glacier surges.

Figure 3: Advanced deglaciation. Increasing temperatures and accelerated melt cause large-scale glacier downwasting and retreat. Tidewater glaciers are few, many small mountain glaciers have disappeared, and more land is exposed. Possible hazards include those related to unstable slopes (e.g. debris flow, landslide, rock fall, rock/ice avalanche, and near-field tsunami), glacial lake outburst floods, and water resource modifications (losing streams and stream piracy).

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