Glacier-dammed lakes and their associated jökulhlaups cause severe flooding in downstream areas and substantially impact glacier dynamics. The objective of this dissertation is to identify and characterize glacier-dammed lakes at Brady Glacier in southeast Alaska using ground-truthed remote sensing techniques and dendrochronology. Brady Glacier is well suited for a study of these phenomena because it presently dams ten large (>1 km²) lakes. This dissertation comprises three studies. First, I used interferometric synthetic aperture radar (InSAR) to identify and characterize three previously unknown subglacial lakes. InSAR allowed the quantification of vertical displacement and volume of water discharged from the three lakes through time. In the fall of 1995, subsidence ranged from 4 to 26 cm/day and the volume of water discharged ranged from 22,000 ± 2,000 to 243,000 ± 14,000 m³/day. Subsidence and discharge rates declined significantly during the winter and continued at a lesser rate through March. Second, I used dendrochronology and precise elevation-constrained mapping to date glacially overridden and drowned trees at the glacier margin. Brady Glacier impounded Spur Lake to an elevation of 83 m a.s.l. around AD 1830 and 121 m a.s.l. around 1839. The glacier continued to advance, thickening by at least 77 m between ca. 1844 and 1859 at a site down-glacier of Spur Lake on the opposite glacier margin. Farther down-glacier, North Trick Lake began to form by 1861 and reached its highest elevation at approximately 130 m a.s.l. when Brady Glacier reached its maximum extent around 1880. Third, I georeferenced a variety of maps, airphotos, and optical satellite imagery to characterize the evolution of the glacier and lakes and also created five bathymetric maps. The main terminus of Brady Glacier has changed little since 1880. However, it downwasted at rates of 2-3 m/yr between 1948 and 2000, more than the regional average. The most dramatic retreat (2 km) and downwasting (123 m) occurred adjacent to glacier-dammed lakes. These lakes will continue to evolve and play a pivotal role in the evolution of Brady Glacier. In the coming years, perhaps decades, the glacier will return to a tidewater regimen and retreat catastrophically until it stabilizes in shallow water.