The ice scour and flooding produced by river ice are known to be major reasons for the high biological productivity and diversity found in northern rivers, particularly along their margins and in deltas where break-up events are also the key suppliers of water and nutrients[40,41]. Decreases in the frequency and/or severity of break-up flooding that may arise under future climates could threaten the ecosystem health of such river systems[29,42] (see box on maintaining delta pond ecosystems).

Maintaining delta pond ecosystems

The physical development and ecosystem health of river deltas in cold regions are strongly controlled by ice processes and thus are highly susceptible to the effects of climate change. As an example, the photograph shows a typical lake/pond and river network in the Peace-Athabasca Delta (Canada), one of the largest freshwater deltas in the world. The water budget and sediment-nutrient supply for the multitude of lakes and ponds that dot the riparian zones of such deltas depend strongly on the supply of floodwaters produced by river-ice jams during the spring. These spring floods usually exceed those from open-water flow events, as illustrated in Figure 8.9(a). Studies of future climate conditions for the Peace-Athabasca Delta indicate that a combination of thinner river ice and reduced spring runoff, due to smaller winter snowpack, will lead to decreased ice-jam flooding[42]. This, combined with greater summer evaporation from warmer temperatures, will cause a decline in delta-pond water levels[43].

An adaptation strategy that has been successfully used to counteract the effects of climatic drying of delta ponds involves the use of flow enhancement through water releases from reservoirs. This increases the probability of ice-jam formation and related flooding of the delta ponds (Figure 8.9(b)).



Peace-Athabasca Delta.
Photo: Dörte Köster



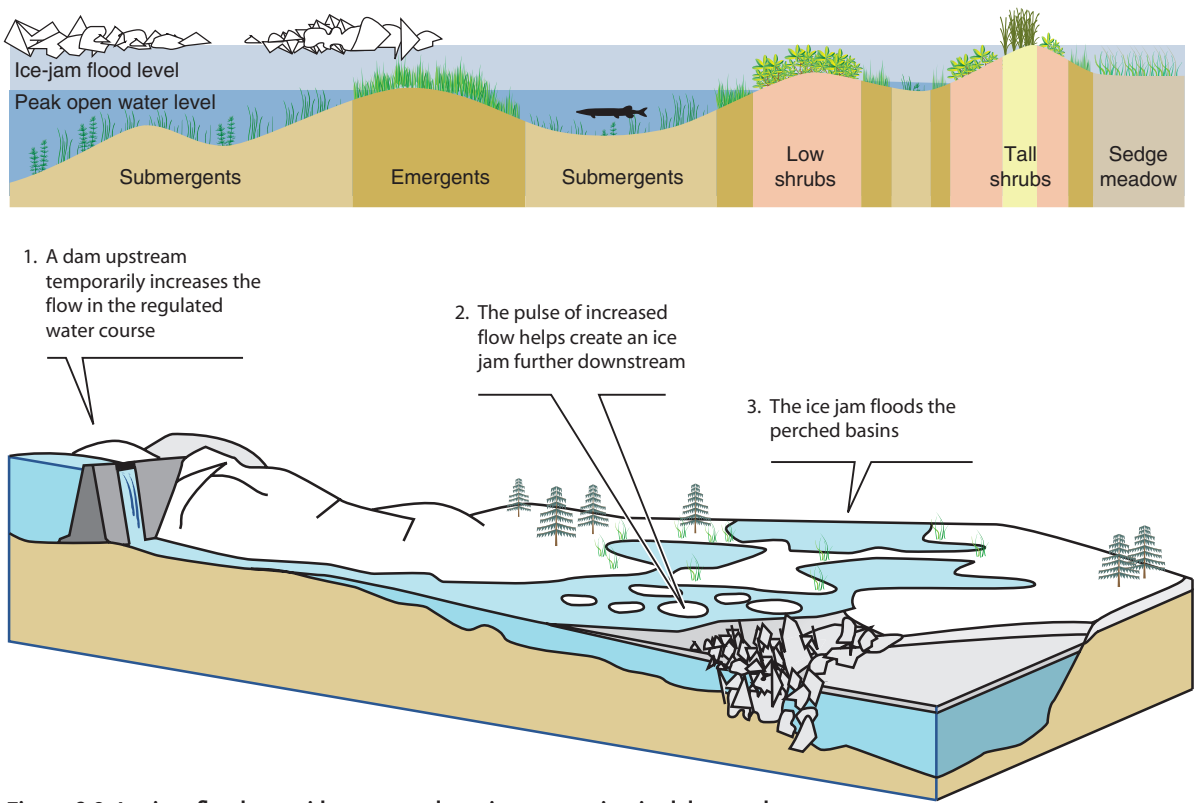


Figure 8.9: Ice-jam floods provide water and nutrients to maintain delta ponds.
(a) Higher flooding levels in spring break up reach the perched basins.
(b) An adaptation strategy: water released from the reservoir on the left increases the probability of ice jams and flooding of the ponds.

Source: Based on Prowse and others 2002b[44]