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Potential Effects of Fisheries on Aquatic Ecosystems

Fishing can have both direct and indirect impacts on target species and aquatic ecosystems. Direct impacts include overfishing that leads to population declines, while indirect impacts can include disruption of aquatic food webs, when predator/prey interactions are affected by changes in fish populations.

The impacts of fishing on a fish population and the aquatic ecosystem depend on the biological and chemical characteristics (the productivity) of the waterbody, fishing pressure, the amount of fish biomass, and the biology of the fish population, including the age and size distribution, growth rates, spawning success, reproduction rates, and the role of the species within the aquatic ecosystem (Joynt and Sullivan 2003). Management strategies are therefore waterbody- and species-specific. In order to protect fish stocks, managers must determine the **maximum yield**—the maximum catch that can be taken while leaving a self-sustaining population—and allocate it between user groups (i.e., the sport, commercial, and domestic fisheries).

Due to the cold climate in Alberta, fish grow slowly and reach reproductive maturity late. High fishing pressure on species with low biological productivity can lead to collapse of the fish population over time. Lake trout, bull trout, cutthroat trout, walleye, lake sturgeon, northern pike and yellow perch populations have experienced significant collapses in Alberta waters. Some populations, including lake trout in Lesser Slave Lake, walleye in North Buck Lake, and native cutthroat trout in many streams, have been completely eliminated by overfishing (Joynt and Sullivan 2003).

Fisheries management aims to control fishing pressure so that fish are not harvested faster than they can reproduce. Three indications that a fishery has influenced a fish population include (Joynt and Sullivan 2003):

- **A decrease in the size of fish being caught**, indicating that fish are being harvested before they reach their full size.
- **A decrease in the number of adult fish caught**, indicating that fish are being caught before they can spawn. This reduces the rate at which the population can be replaced.
- **Complete elimination of a species** in a waterbody due to harvesting.

Twelve species of fish in Alberta waters have been classified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as threatened, vulnerable or undetermined status due to fishing pressure, habitat loss or other human disturbances. Native species in the boreal region identified as threatened or vulnerable include the shortjaw cisco, the brassy minnow, bull trout, and Arctic grayling (Joynt and Sullivan 2003).

In addition to direct impacts on the targeted fish species, fishing pressure also affects interactions in an [aquatic food chain](#). The balance in a food chain is disrupted when the fishing reduces the number of predator or prey fish. A decrease in the number of individuals in one link of a food chain can affect prey-predator relationships throughout the entire ecosystem.



Small lake in the boreal region.
Source: Hatfield Consultants
(click to enlarge)



Fish sampling on the Athabasca River.
Source: Keith 2007
(click to enlarge)

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