

Read the information provided and complete the questions that follow.

North American Fish in Hot Water

Pacific salmon (*Oncorhynchus sp*): Pacific salmon consist of seven different North American species—chum, coho, pink, cutthroat, steelhead, chinook, and spring. Most Pacific salmon divide their lives between a marine and freshwater habitat, although cutthroat and steelhead salmon are mainly freshwater fish. The habitat of Pacific salmon is restricted by water temperature. With recent increases in water temperatures due to global warming, many salmon have been found far outside of their normal habitat. The salmon are now being found in colder, more northerly waters; with coho salmon having been discovered over 2000 km north of their usual range.

Trout: Like salmon, trout make their home in cold water. Being a freshwater fish, the various species live in lakes, streams, and rivers across North America. As the temperatures in these water bodies rise, trout species are becoming threatened. It is estimated that rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), and brown trout (*Salmo trutta*) will lose up to 76% of their aquatic habitat as global warming continues. In Alberta, a reduction in the amount of glacier runoff into lakes and streams in late summer and early fall is already having an impact on the provincial population of bull trout (*Salvelinus confluentus*). Without adequate levels of glacial runoff, low water levels and warm temperatures during trout spawning and migration will further threaten bull trout populations if warming progresses.

Part 1

1. Research the effect global warming may have on the North American population of either of the two fish discussed in the introduction. Use Internet or library resources, or contact an ecologist.

In your research, you may want to consider the effect of global warming on the following:

- Water temperatures in oceans, streams, lakes, and rivers.
- Water flow in rivers and streams during spawning periods.
- Amount of glacier melt supplying cold water to streams and rivers.
- Nutrient upwelling in the ocean.

- Severity and number of floods in freshwater ecosystems.
- Large-scale fish die off due to oxygen depletion caused by the decomposition of organic material in freshwater watersheds and estuaries.
- Movement of warm-water fish species into what was traditionally cold-water fish habitat.
- The amount and timing of snowfall and subsequent snowmelt that enters rivers and streams.
- The survival of these fish at different stages of their development.

Create a Food Web

2. Research the community in which your fish is typically found. What species are found at each trophic level in this community? What role does your fish play in its food web? How might the feeding relationships and energy transfer in its food web change if the fish population declines greatly?

Part 2

1. Write a brief report that summarizes your research findings in part 1.
2. Draw a food web that depicts your fish's current feeding relationships with other species in its community. Based on your research findings, do you think this food web will change in the future? Explain. Draw a new food web that illustrates the changes you predict will occur in the feeding relationships within the community.