




# WARMING WATERS

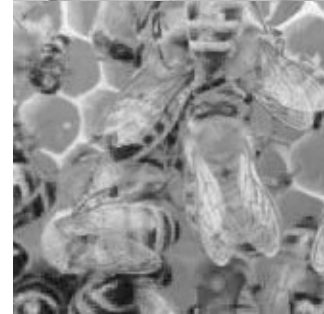
## HOW CLIMATE CHANGE THREATENS COLD WATER FISH



### COLD WATER FISH: AN AMERICAN HERITAGE

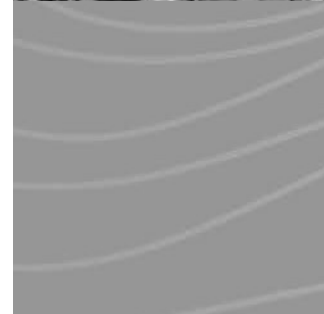


Fishing for trout and salmon in the rushing mountain streams of the United States is both a lively industry and a classic American pastime. These streams originate as melted snow and eventually merge into large rivers that empty out into the ocean. Like highways for fish, these rivers and streams crisscross the United States and fish must navigate them successfully in order to reproduce and feed. For example, every year adult salmon leave the ocean and swim against the current in order to lay eggs in the very same stream in which they were born. However, a number of factors have made it increasingly difficult for these fish to survive.




Cold water fish species, such as trout and salmon, need water that is cold and clean with reliable flow patterns.<sup>1</sup> However, human activities such as logging, agriculture, urban development and dam construction have all contributed to deteriorating water quality and altered stream flows. Climate change will add new stresses and worsen these existing conditions. Cold water fish are likely to face warmer water with changed stream and river flow patterns in future years.

### CLIMATE CHANGE IMPACTS AND COLD WATER FISH

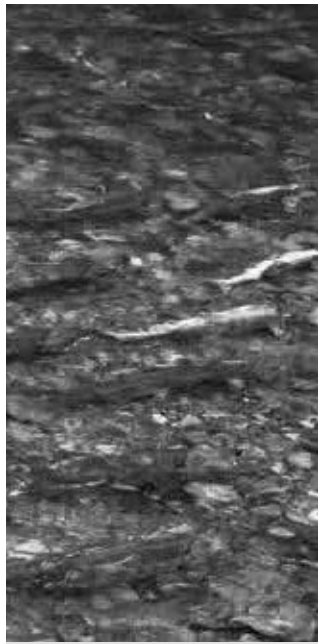


Climate change affects cold water fish by increasing water temperatures beyond what they can tolerate and by changing stream flow patterns. Warm water is dangerous for cold water fish for a number of reasons. First, as the temperature of water increases, the oxygen content decreases, making it difficult for fish to breathe. Secondly, the metabolisms of most cold water fish are directly related to the temperature of the water in which they swim, meaning that the fish must eat more and breathe more in warmer water.<sup>2</sup> In the southern Great Plains and other areas, summer water temperatures already approach the limit for survival of many native stream fish, meaning that a small amount of warming may have disastrous consequences.<sup>3</sup>



It will be especially hard for cold water fish to live with increased water temperatures and altered stream flow patterns when they are already struggling with pollution, overfishing and competition from introduced species. If cold water fish populations decrease, not only will recreational and commercial fishing suffer, but wildlife, such as bald eagles and grizzly bears, also will lose an important source of food.





- Throughout the United States, habitat for cold water fish is likely to shrink by about 50%, assuming a doubling of carbon dioxide concentrations. This loss of habitat will have the greatest effect on species with small distributions and species already near to exceeding their thermal tolerance.
- Research has shown that even a moderate amount of global warming (3 degrees Fahrenheit) could cause the Columbia River System to become too warm for salmon and trout.<sup>1</sup>
- Climate change will cause snow and ice to melt earlier in the spring, meaning that peak spring flows will happen earlier. In addition, changes in seasonal temperatures will reduce summer water flows due to increased evaporation and likelihood of droughts. Each of these changes will make it harder for juvenile fish to swim to the ocean and for adult fish to return.<sup>4</sup>
- As water temperatures rise, cold water fish in the Rocky Mountains may ultimately be restricted to alpine river sources, which will remain cold due to the high altitude.<sup>5</sup>

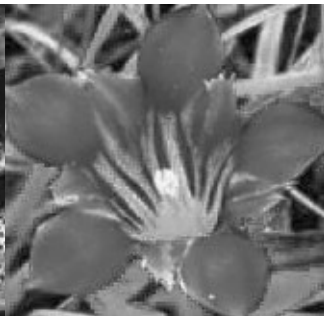
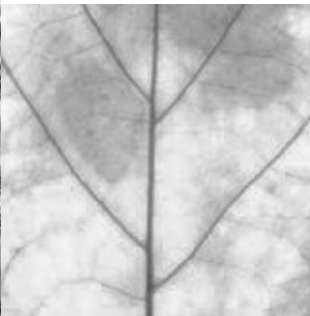
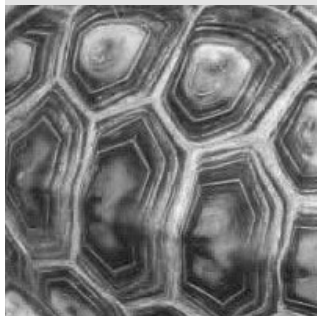
### Did You Know?

Many human activities release carbon dioxide and other greenhouse gases, which trap heat inside of the earth's atmosphere. Greenhouse gases are part of a natural process that keeps the earth warm. However, human activities, such as fossil fuel burning, have increased concentrations of greenhouse gases to unprecedented levels. These high concentrations are likely to effect global and local climates in many ways, and have already been implicated in temperature increases across the world. If we do not alter our behaviors, it is likely that weather patterns and sea levels will continue to change, often resulting in increased stress on local wildlife and ourselves.

## COLD WATER FISH: CANARIES IN THE COLD MINE

Scientists are particularly interested in studying the impacts of climate change on cold water fish because these species are early responders, meaning that they are particularly sensitive to climate change.

It is clear that cold water fish are already beginning to respond to changes in water temperature and water flows and that these impacts are likely to be more severe if climate change continues unabated.



## WHAT YOU CAN DO TO HELP

- Become well-informed about the issues. Visit the U.S. Fish and Wildlife Service's climate change website, which contains more useful information on how climate change will affect fish species, [www.fws.gov/home/climatechange](http://www.fws.gov/home/climatechange). Also check out the Intergovernmental Panel on Climate Change (IPCC) reports, at [www.ipcc.ch/ipccreports/index.htm](http://www.ipcc.ch/ipccreports/index.htm).
- Be aware of the activities you do that release greenhouse gases, such as driving and using electricity. There are simple things you can do, such as unplugging appliances, keeping car tires inflated, and avoiding unnecessary driving, which will reduce your greenhouse gas emissions. Visit the Environmental Protection Agency's climate change website to find more suggestions on what you can do to limit greenhouse gas emissions. [www.epa.gov/climatechange/wycd/index.html](http://www.epa.gov/climatechange/wycd/index.html)
- Help keep rivers, small lakes and streams clean and unobstructed by joining local community efforts—or starting your own!



## REFERENCES

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4. The National Wildlife Federation.
5. Malmqvist, B. and S. Rundle. 2002. Threats to the running water ecosystems of the world. *Environmental Conservation* 29(2): 134-153. Pg. 145.

