Effects of Fire on Stream Temperatures in the Bitterroot River Basin, Montana

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Stream temperature is an important abiotic factor affecting the distribution of native trout. Much of our understanding of the effects of wildfires on stream temperatures is derived from individual case studies. In 2000, major wildfires burned in the Bitterroot River Basin, Montana. We used a Control-Impact design to examine immediate effects of wildfire on maximum stream temperature and a Before-After-Control-Impact design to evaluate recovery of maximum summertime stream temperatures after wildfires. We examined temperature data from 33 streams at three kinds of sites: those in largely unburned watersheds, those downstream of burns, and those within burns. To account for potential seasonal differences in recovery, we analyzed August and September separately. During the fire, there were no significant increases in maximum water temperature in sites located within or downstream of burns. One year after the fire, there was a significant fire effect in August (1.7°C ±0.33) and September (2.3°C ±0.16) at sites located within the burned area compared with reference sites. But, there was no significant increase in temperature in sites downstream of burns compared to reference sites. We saw a significant increase in temperature for all treatment groups over the last 12 years indicating regional warming. Maximum summertime temperature increased 0.4°C (95% CI±0.33), 1.1 °C (95% CI ±0.63), and 2.8 °C (95% CI ±0.87) in reference, below-burn, and within-burn areas, respectively. There was no recovery of stream temperatures in burned areas five years after wildfires. These results are similar to other studies where wildfires have localized, long-term impacts on stream temperatures.