Alaska Climate Change Adaptation Series

Wildfires in Alaska

Who we are

The Scenarios Network for Alaska + Arctic Planning links university researchers with communities and resource managers. SNAP uses data sharing, research, modeling, and interpretation of model results to help others address the complex challenges of adapting to future conditions. **Visit SNAP**

The Alaska Center for Climate Assessment and Policy assesses socioeconomic and biophysical impacts of climate variability in Alaska, provides this information to decision makers, and helps Alaskans adapt to a changing climate. **Visit ACCAP**

The Alaska Fire Science Consortium strengthens the link between fire science research and practical application by promoting communication and collaboration between managers and scientists, and providing an organized fire science delivery platform. **Visit AFSC**

The UAF Cooperative Extension Service interprets and extends relevant university, research-based knowledge in an understandable and usable form to the public. **Visit Cooperative Extension**

Together, we provide services that may assist you in meeting your community planning needs.

Wildfires are a natural part of the boreal ecosystem. Wildfires help maintain vegetation diversity, providing suitable habitats for wildlife, but wildfires can also present a threat to human values. Alaska has seen the frequency of large wildfire seasons increase recently, with four of the top 10 largest years (since 1940) occurring since 2004.

How could changes in wildfire impact the ecosystems in Alaska? First, it is important to understand how and why the changes that are already underway are happening.

Wildfires in Alaska

The area burned each year in Alaska varies widely, ranging from a few hundred thousand to several million acres. Since 2004, wildfires have burned more than 38,000 square miles in Alaska — an area larger than the state of Indiana.

Most wildfires in Alaska occur in Interior Alaska, the area between the Brooks Range and the Alaska Range. This boreal region features black spruce and white spruce along with alder, aspen, birch, poplar, and willow. Tundra wildfires are fairly common in western Alaska but less frequent in the Arctic tundra north of the Brooks Range. Tundra vegetation includes grasses, low shrubs, mosses, and lichens.

Much of this region is underlain by permafrost. Because the low temperatures typical of polar regions limit the decay of dead plant material, both tundra and boreal ecosystems have deep soils that are rich in organic carbon.

Fire in Alaska is closely linked to climate

Climate factors that promote wildfire include warm weather, little or no precipitation, low relative humidity, and high winds. Longer summers and higher temperatures create an environment that is conducive to large wildfires.

Since 1949, the average summer temperature in Alaska has increased 2.3°F, while the average annual temperature has risen 3.7°F — which is twice the global average increase of 1.4°F. This is consistent with the scientific consensus that effects of climate warming are happening and are more pronounced at high latitudes.

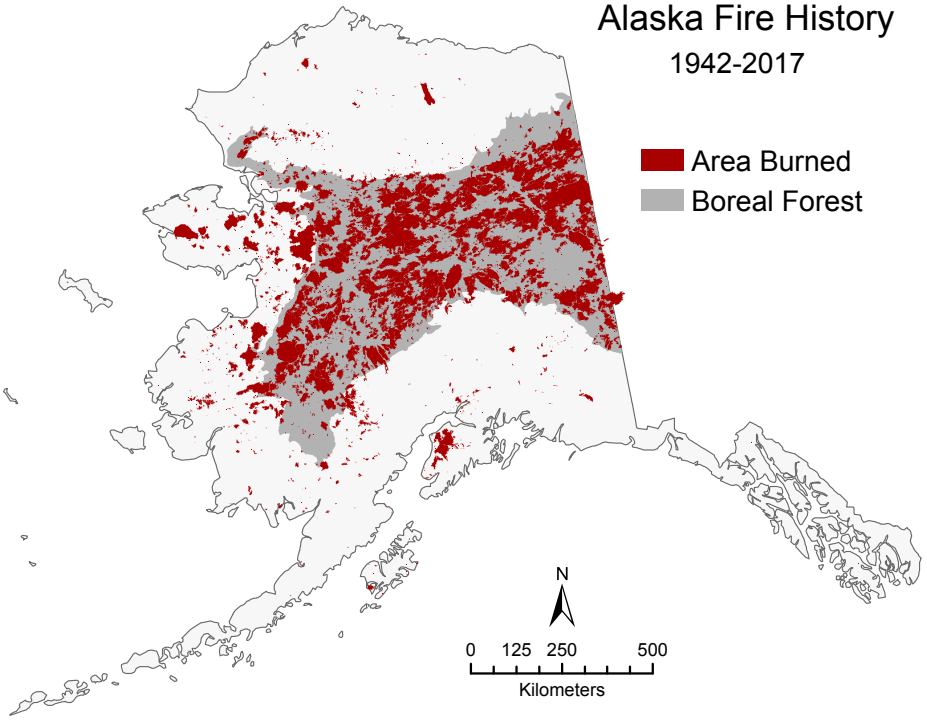
Changes in store for the boreal forests of Alaska

Warmer temperatures have led to longer snow-free seasons, changes in vegetation, and loss of ice and permafrost, all of which can contribute to longer and more active wildfire seasons. It is likely that the Alaska boreal forest will continue to experience dramatic changes over the next century.

Visit akfireinfo.com for timely and accurate wildland fire information for the entire state.
Call 1-800-237-3633 to report a wildland fire in Alaska.

The average area burned per decade in Alaska is projected to double or more by the middle of this century due to rising temperatures.

Over the past 40 years, the snow free season in Alaska has increased by approximately 5 days per decade, mostly because snow began melting earlier in the spring. This gives fuels (vegetation), soils, and snow-fed streams more time to dry and allows wildfires to start earlier and burn longer into the summer and fall, when organic soils are thawed to their maximum depth.



Wildfire changes and boreal forests

How the Alaska boreal forest responds to future climate change impacts how it burns. For example, warmer and drier weather makes forests more flammable. Changes in the length of the seasons — for example, earlier springs or drier falls — increase the length of the wildfire season. Late-season burning allows wildfires to burn deeper.

Black spruce has been the dominant tree species in Alaska's boreal forest for the past 5,500 years. While black spruce stands are well adapted to wildfire, they are also vulnerable to changes in the wildfire regime.

In Alaska, the number of years between wildfires at a particular location (the fire return interval) has dropped by 25% since the early 2000s. Instead of wildfires recurring at an average of every 196 years, they now recur at an average of every 144 years. A shorter fire return interval could prevent spruce trees from reaching maturity and reproducing before the next wildfire occurs, which could lead to different vegetation overtaking areas previously dominated by spruce.

Burn depth can also significantly impact post-wildfire vegetation changes because of the disturbance in soil/surface temperature and moisture. When wildfires burn longer and hotter, the surface layer is burned deeper, which favors establishment of deciduous trees. Shifts from black spruce stands to deciduous hardwood stands have been observed in several areas in Interior Alaska. Current trends also show a slow northward expansion of boreal forest into tundra, and a northward retreat of the boreal forest at its southern limit.

Wildfire changes and tundra ecosystems

Paleoclimate records indicate that wildfires were more frequent in shrub-dominated tundra systems of the past. Shrubs are currently expanding into these areas again. Coupled with warming and drying of the landscape, the increased shrubbiness is projected to increase wildfire activity in tundra ecosystems over the next century.

How wildfires affect carbon emissions

Over the past 200 years, burning of fossil fuels and deforestation have released greenhouse gases, including carbon dioxide and methane, into the atmosphere. These gases prevent heat from escaping into space and contribute to the rising surface temperatures on Earth. Boreal and tundra ecosystems contain roughly 35 percent of the world's soil carbon. Wildfires release this carbon into the atmosphere, further contributing to rising temperatures.

What this means to you

The changes associated with climate warming and increased wildfire activity could have significant impacts on the landscape, hydrology, permafrost, wildlife, and people of Alaska. These may include:

- Increased risk of damage to infrastructure and cultural sites
- More exposure to smoke
- Increase of early-successional and deciduous species. Deciduous vegetation absorbs and transfers less heat into the atmosphere, having a "cooling effect."
- Changes to wildlife habitat and distribution
- Loss of forest and surface organic materials leads to permafrost thaw, changes in vegetation/water dynamics, and carbon cycling
- Release of carbon from deeper-burning wildfires leads to emission of more greenhouse gases

ALASKA FIRE SCIENCE CONSORTIUM

The Alaska Fire Science Consortium works with researchers and fire managers who study interactions between wildfire and climate change, and how they may alter Alaska's ecosystems. As we start to understand these relationships, we can incorporate this information in planning for the future.

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