



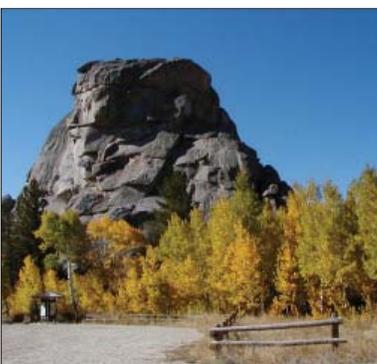
Aspen and Climate Change

Although quaking aspen (*Populus tremuloides*) is the most widespread tree in North America, it needs to receive at least 16 inches of precipitation a year to persist over the long term. Big Hole Battlefield and John Day Fossil Beds National Monument both have some aspen, but the species is more abundant at City of Rocks National Reserve (CIRO) and Craters of the Moon National Monument and Preserve (CRMO) in areas that are often near or below that precipitation threshold. These trees will be especially vulnerable if climate change results in reduced rainfall, earlier snowmelt, or warmer temperatures that increase their evapotranspiration and need for moisture. Although aspen comprise only a small percentage of the land cover in these parks, they contribute disproportionately to biodiversity by creating conditions for a community of understory plants, butterflies, and cavity-nesting birds not found in nearby coniferous forest.

Western Aspen in Decline

The prolonged moist conditions required for the establishment of aspen seedlings are rare in the Rocky Mountains, where the primary means of aspen reproduction is by suckers that grow from the roots of an aspen clone. The aspen decline that has been observed in some parts of the West since the 1930s is commonly attributed to suppression of fires that would stimulate suckering, the encroachment of conifers and sagebrush into aspen stands, browsing by ungulates, fungal infections, and sustained drought.

An aspen clone, which can survive for thousands of years through periodic fires, may produce a stand of trees extending across many acres, each stem of which may live 100 to 150 years. Over time, however, conifers often become established in aspen stands and, if not removed by fire, their shade begins to overtop the aspens, resulting in the death of stems within the clone and deterring regeneration in the understory. Aspen regenerates in some stands even in the absence of fire, and fire does not always result in a long-term increase in sucker density. The highly variable responses of aspen to fire may reflect genetic variability among clones.



Fall foliage at City of Rocks National Reserve.



NPS PHOTOS



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Aspen at Craters of the Moon National Monument and Preserve.

Wildfires are predicted to increase in severity, frequency, and areal extent, which will have large impacts on forest composition. Although increased CO² appears to accelerate the growth of aspen more than that of other tree species, global warming scenarios generally couple relatively large increases in temperature with modest increases in precipitation. The area occupied by aspen is therefore expected to decrease greatly by the end of the century, especially at lower, drier sites and south facing slopes, while moving upward in altitude. Aspen's expansion upslope on southern exposures in Colorado in the last century has been attributed to climate warming, and the relatively warm and dry conditions for many aspen in the Rocky Mountains from 2000 to 2003 may be responsible for a phenomenon first observed in 2004 known as "aspen die-off," referring to the sudden death of mature trees and, in many cases, of the entire clone.

Aspen Monitoring

Formal monitoring of aspen regeneration, stem density, and conifer density began at CRMO in 2007 and CIRO in 2008, too recently to detect any significant trends. However aerial photographs of CIRO taken in 1950, 1977, 1990, and 2004 indicate that although the extent of clones appears to have remained about the same, the number of stems within several clones has declined. The majority of aspen stands monitored in CIRO and CRMO are regenerating and contain a distribution of age classes. Management actions to help aspen survive climate change could include use of prescribed fire and mechanical removal of conifers from aspen stands.

For More Information

Upper Columbia Basin Inventory and Monitoring Network
<http://science.nature.nps.gov/im/units/ucbn/>