

Climate Change in the Great Smoky Mountains National Park

“Drought, forest fires, loss of sensitive organisms like salamanders and brook trout, more severe floods (possibly leading to the relocation of mountain communities) worsening air pollution and more mobile and far-ranging forest pests and pathogens-those are some of the impacts suggested by the past decade of extreme weather” (*Impacts for the Southeast*, EPA)

About the Park

- The GSM National Park is located on the border of Tennessee and North Carolina. It has over 9 million visitors per year, making it the most visited park in the country.
- In 1983, the GSM National Park became a World Heritage Site, as it is one of the most biodiverse parks with over 100,000 species, and it contains half of the remaining old growth forest in the eastern United States.
- The park provides habitat for animals generally found farther north such as the Carolina northern flying squirrel, the Canada warbler and the bog turtle.
- Unfortunately, it is also one of the five most polluted parks in the country. In addition to problems with air pollution and smog, the threat of climate change has become another important issue for this national park.

General Impacts of Climate Change

- Studies show that the temperature in Tennessee has increased by almost 1° F, and precipitation by 10%.



Source: <http://www.resdiag.com/ContactRDL.htm>

Pollution and Climate Change

- GSM has the worst air quality of any national park, with sulfur dioxide, nitrous oxides, ozone and particulate matter mainly responsible for the unnaturally hazy skies.
- Increased temperatures from global warming would worsen smog.
- Higher water temperatures could lower oxygen levels, concentrating pollutants and degrading water quality.

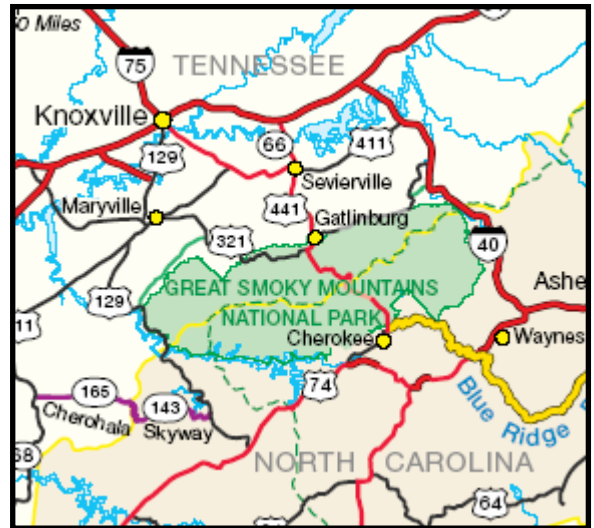
Factsheet by Ana Murteira in conjunction with the Environmental Studies Department at Macalester College

Species and Climate Change

- According to a study conducted by Yale University on mammalian species diversity, the GSM National Park would lose 16.7% of its mammalian diversity under a doubling of atmospheric carbon.
- There will be a range expansion with a doubling of CO₂, where southern species expand northward, but most northern species remain in the same habitat.
- In the GSM, there will be radical shifts in vegetation type that may cause species such as the southern red-back vole and the northern flying squirrel to disappear.
- The habitat of the trout, a coldwater fish species, will diminish due to reduced streamflows. With hotter temperatures, the habitat of warmwater fish may also decline.

Forests and Climate Change

- The extent of forested areas could change little or decline by 5-15%. Red spruce and Fraser fir will disappear under warmer and drier conditions.
- The Appalachian spruce-fir species are already threatened by air pollution and disease. With a drier climate, the forest would convert to grasslands and pasture. A warmer and wetter climate would produce more oaks and pines.
- If conifer and eastern hardwood forests disappear from the park, important recreation areas and species habitats will be lost.



Source: <http://www.nps.gov/grsm/pphtml/maps.html>

Prediction for the Great Smokies

- A warmer climate will increase the rate of evaporation and precipitation. The frequency of hot days will increase.
- By 2100, there is an expected 2-3° F increase in temperature
- In eastern Tennessee, precipitation is expected to increase by 0-10% in winter, 20% in spring and fall and 30% in summer.
- Exotic species invasions, excess nutrient loading and toxic loading, and sedimentation of freshwater systems of the state are expected to increase with climate change.

Additional Information

- EPA: Climate Change and Tennessee
- EPA: Global Warming: Impacts for the Southeast
- NPCA: State of the Parks