ASSESSING THE POTENTIAL EFFECTS OF CLIMATE CHANGE ON DANIEL BOONE NATIONAL FOREST

Forestlands across the region are experiencing increased threats from fire, insect and plant invasions, disease, extreme weather, and drought. Scientists project increases in temperature and changes in rainfall patterns that can make these threats occur more often, with more intensity, and/or for longer durations. Although many of the effects of future changes are negative, natural resource management strategies can help mitigate these impacts. Responses informed by the best current science enable natural resource professionals within the Forest Service to better protect the land, resources, and the region's forestlands into the future.

Forest Health - Invasive and aggressive plant and insect species may increasingly outcompete or negatively affect native species in the future. Winter freezes historically limit the range of forest pests but higher temperature will likely allow increases in their number and spread. Drought and other factors will increase the susceptibility of forests to destructive insects such as the hemlock woolly adelgid and the two-lined chestnut borer.

Response: Manage tree densities through practices such as thinning and prescribed fire to maximize carbon sequestration and reduce the vulnerability of forest stands to water stress, insect and disease outbreaks, and wildfire.
Response: Continually monitor for new invasive species moving into areas where they were not traditionally found, especially following extreme weather events.

Fall Forest Colors Daniel Boone

Bark Camp Creek

Plant Communities - Heat stress may limit the growth of some southern pines and hardwood species. Stress from drought and wide-scale pest outbreaks have the potential to cause large areas of forest dieback. Intensified extreme weather events, such as tornadoes, ice storms, and fire, are also expected to cause changes in plant community composition. Some species of rare or endemic plants may be disproportionately impacted. Species more resistant to these disturbances, will be more resilient to a changing climate.

Response: Focus restoration efforts in wind resistant forests, such as shortleaf pines as well as native hardwoods.
Response: Manage for a range of ages and species in forests to lessen potential loss from drought or infestation.
Response: Restore native warm season grasses in areas that have been planted in non-native monocultures such as fescue.

Yellow Lady's Slipper

Animal Communities - Wildlife species will be affected in different ways. Amphibians may be most at risk as suitable habitat decreases due to warmer, dryer conditions. Greater ambient temperatures may be harmful certain bat species like the endangered Indiana bat and the Virginia big-eared bat. Alternatively, deer populations may increase due to higher survival rates during warmer winters.

Response: Maintain piles of natural woody debris in areas of high amphibian diversity to supplement habitats that retain cool, moist conditions.

Response: Create habitat corridors, assist in species movement, and identify high-value conservation lands adjacent to National Forests.

Extreme Weather - The potential for severe storm events is expected to increase in the future, including more intense rain events followed by longer dry periods. Extended periods of dry season and drought may lead to drier forest fuels which will burn more easily and contribute to larger and more frequent wildfires. More cloud-to-ground lightning due to warming may also increase wildfire ignitions.

Response: Identify areas that provide particularly valuable ecosystem services, like timber harvest or carbon sequestration, and are also vulnerable to extreme weather, droughts, tornadoes or hurricanes. Then plan conservation strategies (e.g. thinning, prescribed burns, species selection) accordingly to mitigate for extreme weather impacts.

Indiana Bat

Cumberland River

Wetland Daniel Boone

Water Resources - Shifts in rainfall patterns will lead to periods of flooding and drought that can significantly affect depth and volume of water in lakes, streams, wetlands and underground water systems. Heavy downpours may lead to erosion and sedimentation in waterways as well as flooding and damage to forest roads and recreation sites. Periods of drought between rain events may affect species of fish, mussels and amphibians that are sensitive to fluctuations in water temperature and depth. Geographically isolated wetlands are critical wildlife habitat and can be impacted by changes in surrounding landcover.

Response: Reduce the amount of water taken in by surrounding trees and plants, using management strategies such as thinning and prescribed burns, in order relieve stress on isolated wetlands and streams.
Response: Relieve groundwater and large reservoir use when there is ample surface water during wet periods or times of high water flow to recharge aquifers, provide temporary irrigation, decrease stored sediment loss.
Response: Restore and reinforce vegetation in headwater and seep and spring areas to help alleviate runoff of sediment during heavy rain, reduce climate-induced warming of water, and decrease water sensitivity to changes in air temperature.

Recreation - Environmental changes may negatively impact recreational experiences due to changes in the plant and animal communities that make those experiences unique. More days above freezing could increase tick and mosquito populations throughout the year, leading to an increase in vector-borne illness. With more days of extreme heat, recreation areas could see decreased use in the summer if temperatures impact visitor comfort.

Response: Communicate early warnings for extreme weather to protect vulnerable groups from health impacts, such as heat illnesses, and monitor for early outbreaks of disease.

Climate Change and Your National Forest: Citations

Information in this factsheet is summarized from 56 peer-reviewed science papers found in the USDA Forest Service's TACCIMO tool. TACCIMO (the Template for Assessing Climate Change Impacts and Management Options) is a web-based application integrating climate change science with management and planning options through search and reporting tools that connect land managers with peer-reviewed information they can trust. For more information and the latest science about managing healthy forests for the future visit the TACCIMO tool online: **www.forestthreats.org/taccimotool**

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