

CLIMATE CHANGE AND YOUR NATIONAL FOREST

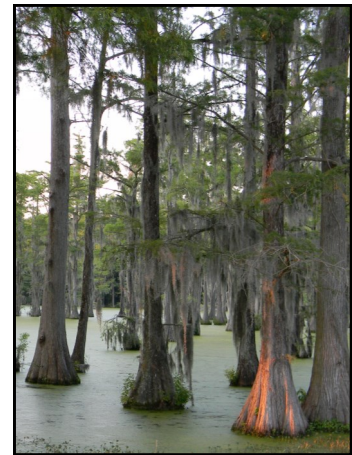
Forestlands across the region are experiencing increased threats from fire, insect and plant invasions, disease, extreme weather, and drought. Scientists project increases in temperature and changes in rainfall patterns that can make these threats occur more often, with more intensity, and/or for longer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



ASSESSING THE POTENTIAL EFFECTS OF CLIMATE CHANGE ON FRANCIS MARION NATIONAL FOREST

Biological Diversity - Plants and animals at risk will respond to environmental changes by adapting, moving, or declining. Species with high genetic variation will be better able to survive in new conditions. Higher temperatures will cause many species to shift ranges, generally moving to track their suitable habit (e.g., northward or up in elevation). However, in some cases, the rate of warming combined with landuse changes will restrict the ability of plants and animals to move into suitable habitat. The species most likely to be negatively impacted by climate change will be highly specialized and habitat restricted, effecting threatened and endangered species more than common species.¹⁻⁶

Forest Health - Invasive and aggressive plant and insect species may increasingly outcompete or negatively affect native species in the future. Winter freezes currently limit many forest pests, and higher temperatures will likely allow these species to increase in number. Destructive insects, such as bark beetles, will be better able to take advantage of forests stressed by more frequent drought. Certain invasive plant species, including cogongrass, are expected to increase dramatically as they are able to tolerate a wide range of harsh conditions, allowing them to rapidly move into new areas.⁷⁻¹²



Coastal Ecosystems - Coastal areas in the Southeast have already experienced an average of one inch of sea level rise per decade over the 20th century, a rate that will continue to increase in the future. Rising seas, in combination with more intense hurricanes, will alter the composition of coastal marshes. As saltwater flooding expands, low-lying coastal wet forests could become marshland where landuse barriers do not exist. Sea level rise can also increase the potential for saltwater intrusion into coastal freshwater tables. Increasing salinity of coastal aquifers may affect groundwater resources within three miles of the coast.¹³⁻¹⁷

Plant Communities - Heat stress may limit the growth of some southern pines and hardwood species. Additional stresses from drought, in combination with wide-scale pest outbreaks, have the potential to cause large areas of forest dieback. Intensified extreme weather events, such as hurricanes, ice storms, and fire, are also expected to lead to changes in plant community composition. An increase in disturbance may promote the establishment of longleaf pine at the expense of loblolly pine. Populations of bald cypress may be particularly vulnerable to future changes, including higher air and water temperatures.¹⁸⁻²³

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Animal Communities - Wildlife species will be affected in different ways, depending on their needs. Amphibians may be most at risk, due to dependencies on moisture and cool temperatures that could be altered in a future climate. Bird species, even those that are presently increasing such as red cockaded woodpeckers, may see a decrease in population size as vegetation types change and heat stress makes migration more difficult. In order to adapt, arrival date and nesting times of some common birds may start earlier in the year. On the other hand, populations of large mammals such as deer and bears may increase with warmer winter temperatures due to a higher winter survival rate.²⁴⁻²⁹

Extreme Weather - The potential for severe storms is expected to increase in the future, including more intense hurricanes making landfall in the southern US, with potential increases in both inland flooding and coastal storm surge events. Under a more variable climate, extended periods of extreme high temperature and drought may lead to drier forest fuels which will burn more easily and at hotter temperatures and contribute to larger and more frequent wildfires. More cloud-to-ground lightning due to warming may also increase wildfire ignitions.³⁰⁻³⁴

Water Resources - Shifts in rainfall patterns will lead to periods of flooding and drought that can significantly impact water resources. Increases in heavy downpours and more intense hurricanes can lead to greater erosion and more sedimentation in waterways. Increased periods of drought may lead to decreasing dissolved oxygen content and poor water quality in some areas. Groundwater-fed wetlands, such as Carolina bays, will be particularly vulnerable to changing climate as temperature and rainfall changes have the potential to lower groundwater table levels, altering the length of time that wetlands hold standing water.³⁵⁻⁴⁰

Recreation - Environmental changes may negatively impact recreational experiences due to changes in the plant and animal communities that make those experiences unique. Fishing in coastal marshes could be affected, as intense storm events and rising sea levels may lead to degraded habitat conditions for game fish. More days above freezing could increase tick and mosquito populations throughout the year, leading to an increase in vector-borne illness. With more days with extreme heat, recreation areas could see decreased use in the summer if temperatures impact visitor comfort.⁴¹⁻⁴⁵

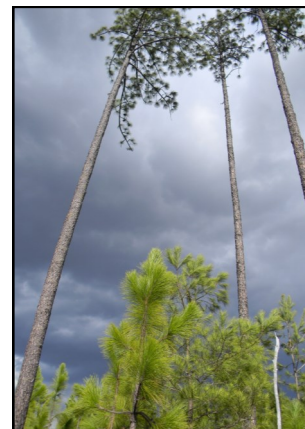
For additional information on climate change impacts on the Francis Marion National Forest go to: www.fs.usda.gov/scnfs and click on "Francis Marion Plan Revision" in the quick links in the upper right hand corner of the website.

MANAGEMENT IMPLICATIONS

Management activities provide national forests with an opportunity to reduce the susceptibility of their resources to multiple threats, including drought, invasive species, disease, and wildfire. Adaptation to climate change as a management goal may provide multiple benefits. By using sound natural resource management practices that keep predicted future conditions in mind, the Forest Service can promote the immediate and long-term health of its forests. Specific approaches vary with site and species of concern, but examples of adaptive strategies include:

- Manage tree densities where needed through sound forest management practices such as thinning and prescribed fire to maximize carbon sequestration while reducing the susceptibility of forest stands to water stress, insect and disease outbreaks, and wildfire.⁴⁶⁻⁴⁹
- Protect existing coastal marshes by promoting healthy vegetation and restoring natural hydrology, and maintain coastal land buffers to allow for the natural inland migration of salt marshes as sea levels rise.⁵⁰
- Maintain piles of natural woody debris and promote wetlands in areas of high amphibian diversity to supplement habitats that retain cool, moist conditions.⁵¹
- Monitor for new invasive species moving into areas where they were not traditionally found, especially following disturbance events such as hurricanes and fire.⁵²
- Focus restoration efforts in longleaf pine forests and promote the planting of longleaf pine over loblolly pine where feasible.^{53, 54}

Adaptation to climate change as a management goal may provide multiple benefits



CLIMATE CHANGE AND YOUR NATIONAL FOREST: CITATIONS

Information in this factsheet is summarized from 54 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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