

# **ADAPTING TRADITIONAL FOREST MANAGEMENT PRACTICES TO ADDRESS CHANGING ENVIRONMENTAL STRESSES**

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## **EXTENDED ABSTRACT**

Climate patterns are changing across the Southeastern United States, influencing the frequency and intensity of natural disturbance events such as hurricanes, wildfires, and drought. Many of the devastating impacts from these disturbance events are being exacerbated by climate change, leading to widespread damage and losses, especially within the various forest ecosystems of the region. Examples of large-scale forest disturbance events are being experienced across many of the Southeastern States. In late 2018, Hurricane Michael destroyed approximately \$2 billion in timber across Florida and Georgia (Bates and McClure 2018, Florida Forest Service 2018). Studies have also predicted increasing drought frequency and subsequent wildfire occurrence across the Southeast, leading to declining forest productivity and increased fire-suppression costs (McNulty and others 2013, Mitchell and others 2014). Forests are increasingly susceptible to more severe and frequent disturbances, and managers are challenged to maintain stand health. Therefore, adaptive forest management is needed to increase forest resiliency to changing environmental conditions. Information must be readily available to help forest managers better understand these stressors and how to adapt their forest management approaches.

In 2010 the Forest Service, U.S. Department of Agriculture, created the Template for Assessing Climate Change Impacts and Management Options (TACCIMO). This web-based tool was developed to connect peer-reviewed climate change science with strategic-level forest planning and management. Users can input management objectives to gain access to summarized findings from scientific climate change publications that directly influence forest management. In addition to this search function, TACCIMO users may also filter climate change literature and publication selections by geographic location. While useful as a strategic information tool, TACCIMO is limited to forecasting expected outcomes. The Forest Operations Resource Tool (FORT) was created to connect those outcomes with operational (specific and stand-level) guidance to supplement TACCIMO.

FORT is a mobile application management tool that allows forest land managers to select adaptation practices to reduce or mitigate stand-level disturbances and threats. This tool provides management recommendations at differing levels of specificity from historical and widely used literature sources such as the Forestry Handbook, Service Forester's

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Handbook, and various State forest management guides. FORT brings traditional practices from historical literature into an accessible, digital format. A field forester may access this information in the field when creating, implementing, or revising their management plans. FORT provides recommendations that encompass the entire timeline of a silvicultural regime, including site preparation and planting, intermediate treatments, and stand-initiation treatments. The management practices available from the tool are appropriate for the different forest types and species of the Southeastern United States. FORT provides a geospatial reference for these management practices by grouping applicable silvicultural prescriptions by ecoregion. Ecoregions are distinct assemblages of species, natural communities, and environmental conditions. The ecoregion scale ranges from the broadest (level 1) to the most specific (level 4) designations within the United States. (Commission for Environmental Cooperation 1997, Omernik 1987, Omernik and Griffith 2014). The geospatial reference aspect of FORT will allow a user to select management tactics appropriate for each ecoregion.

The integration of appropriate forest management practices from the source material into the database is FORT's primary function. This information is then divided into specific categories that help organize the management recommendations. These categories include general and sub-management goals, action and sub-actions, associated threats, species and forest type, ecoregion and location, and a standardized specificity rating. The management and sub-management goal categories correspond to the measurable outcomes accomplished by the management action. Goals in these categories may be sustaining ecological functioning within the forest stand or maximizing economic return through managing multiple timber products. The action and sub-action categories are descriptors of specific management recommendations. The associated threats category refers to specific disturbances (i.e., flooding, erosion, windthrow, etc.) the management action aims to mitigate. Species and forest type and ecoregion and location are categories designed to catalog geospatial and species-specific information. The specificity rating given to each management action ranges from level 1 to level 4. The specificity rating corresponds with the specificity of the management practice recommendation. For example, a recommendation of general thinning to improve tree vigor during a drought period would be in level 1, whereas a specific recommendation of basal area left following a cut for a specific forest type or species would be labeled as level 4. All categories can be accessed through the tool's search function, allowing users to generate a management plan specific to their forest stands.

As FORT is developed, more historical literature sources will be incorporated, giving users digital access to a variety of traditional management practices that foresters have implemented for generations. Access to this information is imperative for foresters facing increased natural disturbance frequencies and intensities. However, some management practices may be outdated. New implementation of traditional management tactics must be coupled with current climate science and projections to help forest managers adapt to a changing climate.

## REFERENCES

- Bates, C.; McClure, M. 2018. Timber Impact Assessment: Hurricane Michael, October 10-11, 2018. Dry Branch, GA: Georgia Forestry Commission. 12 p. <https://gatrees.org/wp-content/uploads/2020/01/Hurricane-MichaelTimber-Impact-Assessment-Georgia-October-10-11-2018-2.pdf>. [Date accessed: April 6, 2022].
- Commission for Environmental Cooperation. 1997. Ecological regions of North America: toward a common perspective. Revised 2006. Montreal, Quebec, Canada: Commission for Environmental Cooperation. 71 p. + map. 1: 12,500,000; colored.
- Florida Forest Service. 2018. Initial value estimate of altered, damaged, or destroyed timber in Florida. Hurricane Michael initial timber damage estimation report. [https://www.fdacs.gov/content/download/82204/file/hurricanemichaelinitialtimberdamageestimate\\_lite.pdf](https://www.fdacs.gov/content/download/82204/file/hurricanemichaelinitialtimberdamageestimate_lite.pdf). [Date accessed: July 13, 2021].
- McNulty, S.; Caldwell, P.; Doyle, T.W. [and others]. 2013. Forests and climate change in the Southeast USA. In: Ingram, K.; Dow, K.; Carter, L.; Anderson, J., eds. Climate of the Southeast United States: variability, change, impacts, and vulnerability. Washington, DC: Island Press: 165–189.
- Mitchell, R.J.; Liu, Y.; O'Brien, J.J. [and others]. 2014. Future climate and fire interactions in the southeastern region of the United States. *Forest Ecology and Management*. 327: 316–326. <http://dx.doi.org/10.1016/j.foreco.2013.12.003>.
- Omernik, J.M. 1987. Ecoregions of the conterminous United States. *Annals of the Association of American Geographers*. 77(1): 118-125. 1: 7,500,000.
- Omernik, J.M.; Griffith, G.E. 2014. Ecoregions of the conterminous United States: evolution of a hierarchical spatial framework. *Environmental Management*. 54(6): 1249–1266.