RESEARCH WORK UNIT CHARTER

SRS-4156, Center for Forest Disturbance Science

Unit Locations: Athens, GA and Clemson, SC

Project Leader: John A. Stanturf

Area of Research Applicability: Regional, National, and International

Mission: To increase understanding of disturbance processes and their risk of occurrence in order to develop innovative management strategies for reducing vulnerability of ecosystems to degradation.

Problem 1. Understanding disturbances and their effects

Disturbances are normal processes and southern forests are adapted to disturbance from fire, wind, ice, drought, and endemic pests. Human activity, including fire exclusion, fragmentation and urban development, introduction of exotic species, and forest management for goods and services, has introduced novel disturbances or altered the spatial and temporal nature of "natural" disturbances. Understanding disturbance processes and effects and the response of forest ecosystems to single disturbance events as well as multiple interacting disturbances, provides the scientific basis for sustainable forest management.

Problem 1a. Understanding disturbance mechanisms/processes and their impact on forest ecosystems (abiotic: severe weather, wildland fire and fire exclusion, and climate change/variability, biotic: invasive species, and anthropogenic: fragmentation)

Problem 1b. Understanding ecosystem response to disturbance processes.

Problem 1c. Understanding interaction and impacts of multiple disturbances and feedback mechanisms.

Problem 2. Managing disturbances and restoring ecosystems

Sustainable management of southern forest ecosystems is challenged by multiple interacting disturbances, both biotic and abiotic. The greatest threats to forest health are posed by meteorological events that are by nature dynamic and affected by climate variability and subject to climate change. Managers need strategies and tools for reducing vulnerability of forest ecosystems to severe disturbance events, for sustainable management, and for restoring degraded ecosystems.

Problem 2a. Developing strategies for reducing vulnerability of southern forests to severe disturbance events and climate change/variability.

Problem 2b. Developing methods for restoring ecosystems degraded by natural disasters and anthropogenic activity.

Problem 2c. Developing tools for managing wildland fire and reduce impacts on air resources.

Problem 3. Modeling and synthesis of disturbance processes

Integrating and synthesizing knowledge of multiple disturbances and providing managers with tools for sustainably managing forests in the face of disturbance, altered climate, and changing human demographics and preferences requires high-performance computing systems. Developing predictive capability requires skilful application of advanced numerical modeling and visualization techniques. Effectively focusing these resources on dynamic southern forest ecosystems, especially fire-affected forests, requires multidisciplinary teams and collaborations with many partners.

Problem 3a. Developing and maintaining a High Performance Computing Center for the Eastern United States to provide visualization of large three-dimensional, time-dependent data sets and access to complex physical, meteorological, ecological, and spatial models.

Problem 3b. Developing and applying numerical modeling and advanced statistical methods to predict disturbance processes and their effects.

Problem 3c. Integrating and synthesizing knowledge of multiple disturbances and/or effects on multiple ecosystem components.

Relationships to Threats Science Area Priority Topics:

This problem relates to all of the 5 Priority Topics, which are themselves disturbance agents. (5.1 – Impacts of severe weather events on forest ecosystems; 5.2 – Urbanization, fragmentation, and parcelization of forest lands and the associated impacts; 5.3 – Invasive species (all taxa) and outbreaks of native species beyond their normal geographical ranges or historical ranges of behavior; 5.4 – Effects of global climate change and climate variability on eastern forests, including severe drought; 5.5 – Wildland fire and its impacts.)

Key External Contacts:

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