Terrestrial Ecosystem Science

Science Focus Area

What Is the Terrestrial Ecosystem Science SFA?

The TES SFA studies the impact of climate change on vulnerable carbon stores and ecosystem's organisms and function. Researchers aim to understand and predict the fundamental responses and feedbacks of terrestrial systems to climatic and atmospheric change, focusing on temperate ecosystems of eastern North America. To do so, they test ecosystem response to fluctuations in temperature, precipitation, warming carbon dioxide levels, and nutrient availability.

Research Questions

- How vulnerable to climate change are carbon stores of terrestrial ecosystems in eastern North America, and what are the implications for carbon–climate feedbacks?
- How will warming impact boreal peatland ecosystem productivity, carbon storage, and greenhouse gas fluxes?
- How does water availability and water cycle extremes interact with climate change to regulate net ecosystem exchange and energy balance within temperate and boreal forests?

Why Study Terrestrial Ecosystems?

Climate change is expected to alter the balance of carbon release and uptake across terrestrial ecosystems. As temperature and precipitation regimes change, climate-carbon feedbacks will overwhelm physiological-carbon feedbacks. Such impacts will make large terrestrial carbon stores vulnerable to loss in the form of greenhouse gas releases to the atmosphere, further exacerbating climate change.

U.S. Department of ENERGY | Office of Science
Biological and Environmental Research Program

The Environmental System Science (ESS) program within the U.S. Department of Energy's (DOE) Biological and Environmental Research (BER) program supports research to provide a robust and scale-aware predictive understanding of terrestrial ecosystems, watersheds, and coastal systems.

40 RESEARCHERS

MORE THAN **380** PUBLICATIONS SINCE 2010

100+ PUBLICLY AVAILABLE DATA SETS

Research Design

TES research integrates experimental and observational studies to advance land surface models, provide parameter estimates, and improve data analytics to yield reliable model projections on ecosystem function for a range of climate projections. The SFA is organized around five research themes: peatland carbon cycle responses to warming and elevated carbon dioxide, water carbon and energy processes under compounding climatic stressors, nutrient-carbon feedbacks, microbial and soil carbon–cycling processes, and regional integration and extrapolation. The primary component of the TES SFA is the Spruce and Peatland Responses Under Changing Environments experiment.

Research Location

TES has two main research sites for their studies, one in the black spruce peatland ecosystem of northern Minnesota, and the other in the Missouri Ozarks, which is strategically placed within the geographically and ecologically distinct prairie-forest biome/precipitation transition in the central United States.

More Information

TES
tes-sfa.ornl.gov

ESS Program
ess.science.energy.gov

All images courtesy TES

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