

## **Regional Climate Variations and Change for Terrestrial Ecosystems Workshop Review**

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North Carolina State University, University of North Carolina at Chapel Hill, and the U.S. Environmental Protection Agency in partnership with the U.S. Department of the Interior Southeast Climate Science Center (SECSC) hosted the *Regional Climate Variations and Change for Terrestrial Ecosystems Workshop*. The workshop was held at NC State University in Raleigh on May 16-17, 2013. The workshop assembled approximately 40 climate and ecosystem scientists to discuss challenges and uncertainties of understanding the interactions of climate and ecosystems across the Carolinas. This multi-disciplinary effort sought to bridge the knowledge gap between climate and ecosystems scientists. Another objective of this workshop was to identify climate-related variables which can be used to evaluate projections of climate change for the ecology community in the Carolinas. This workshop was the first in the Carolinas to engage both disciplines to discuss the needs of the ecology community with regard to regional projections of climate change. This facilitated a discussion of the needs of ecologists from the regional projections of climate change and the abilities and limitations of these projections with guidance for appropriate use of projection information.

High-level scientific presentations were given from both disciplines to create a foundation for discussion. Climate presentations focused on data needs for ecosystem scientists

and included talks on global climate modeling, dynamical and statistical downscaling, and synthesizing currently available climate change projections. The open discussion on climate model datasets provided expert guidance on using climate change projections for ecosystems applications. The ecologists' presentations focused on ecosystems needs and challenges, including different ecosystems modeling techniques, uncertainties associated with ecosystem modeling, and examples of climate adaptation practices for ecosystem decisions with respect to climate change. The final discussion addressed the general needs of ecologists with regard to climate information, followed by the climate sensitivities that are drivers for ecological applications in the Southeast. During the discussion, ecologists identified that extreme weather events and potential changes to the spatial and temporal distribution of those events are important for ecosystems. The extremes mentioned most often by the group included temperature extremes, rainfall extremes, and storm frequency. Ecologists also identified that the downscaling does not provide the resolution needed for many applications, and interpolation is typically used to supplement downscaled data. For instance, topoclimatic models are applied to increase the resolution of downscaled climate change datasets. However, climate scientists stress that these techniques are not appropriate for extremes or spatially discontinuous variables such as precipitation.

While the discussion allowed the engagement and understanding to grow between climate scientists and ecologists, eliciting the specific needs of the ecology community proved more difficult because variables can be species and/or application specific, and the relationship between species and climate variability is often uncertain. In addition to the frequency of extreme events, some applications require specialized outputs including evapotranspiration and vapor pressure deficit. The climate influences on species and habitats in the Carolinas were not

discussed, although a high-level discussion of overall ecosystems identified some climate variables of broad importance to the ecology community. The workshop yielded several recommendations:

- More solicitations on collaborative research between ecosystems scientists and climate modelers on discrete decision-based projects are encouraged.
- More documentation and guidance from the climate science community regarding:
  - Appropriate use of downscaled climate change datasets, including strengths and weaknesses
  - Error and uncertainty propagation in climate modeling
- Integrating climate data with land use change information.
- Further engagement is encouraged between the ecologists, hydrologists, biologists, managers, and climate scientists through similar workshops held at least annually.

It was acknowledged that some applications cannot use a small project, decision-based approach; rather they require immediate action to integrate climate change information. In those instances, decision makers rely on the best available data for decisions, which further emphasizes need to document the strengths and weaknesses of climate data and provide expert guidance. As recommended, follow-on workshops will provide updates on the states of the scientific fields alongside discussions of priority needs. An in-depth summary of this workshop will become available through SECSC and the U.S. Geological Survey in early 2014, as part of an open technical report currently in review. That report will include the summary and guidance for the appropriate use based on comparisons of six publicly available regional climate datasets.