Bradford

Climate change and forest productivity in the northern Lake States

Evidence that human activity is influencing the earth's climate is becoming increasingly apparent and these changing climatic conditions, along with altered atmospheric carbon dioxide concentration, are expected to have a substantial impact on future forest ecosystems. Over the next 100-200 years, the primary impact of climate change on forests will be to alter the productivity of existing forests. Forest productivity, the net primary productivity of forest systems, serves as a useful measure of ecosystem function under altered climates.

Predicting future productivity is of particular interest in the northern Lake States where timber products are a significant component of the economy. In addition, forests in this area occupy a "tension zone" where eastern hardwood forests meet both the boreal forest and grasslands. Consequently, many tree species in this region are growing at or near their current range limits, and relatively modest shifts in climatic conditions may have substantial impact on forest productivity. However, understanding how forest productivity will respond to climate change requires appropriately representing the interactions between altered temperature, precipitation and CO2.

We are initiating a research project to characterize how climate change will impact forest productivity in the northern Lake States region. Our general approach combines remote sensing and ecological simulation modeling to quantify both current and future forest productivity. Specific steps in this process include

1) Applying the PnET ecological model to simulate forest productivity for the major forest types in the region and validating these results with field observations.

2) Utilizing remote sensing, and other data where available, to provide regional information about forest type distribution, nitrogen availability, etc.

3) Integrate this information into the validated modeling framework and simulate both current and future productivity.

Our current efforts are focusing on objectives 1 and 2. We have partitioned forests in this region into four types: aspen-birch, upland conifer, northern hardwoods and lowland conifers and are in the process of applying PnET to each forest type. Initial results indicate that the model accurately represents production variability between forest types, across climatic gradients, and through time.

Authors:
John Bradford* – USDA Forest Service, Northern Research Station, Grand Rapids, MN
Peter Reich and Kirk Wythers – University of Minnesota, Department of Forest Resource, St. Paul, MN

*Presenter.

Contact Information:
John Bradford
USDA Forest Service
Northern Research Station
Grand Rapids, MN 55744
Phone: (218) 326-7105
Email: jbbradford@fs.fed.us