

→ The portable version released in October includes a new function that forecasts tree growth and the related changes in ecosystem service benefits over time.

Other cities have used the Forest Service's software to analyze their urban forests. Chicago used its report to bolster its Urban Forest Action Plan. The nonprofit group Friends of Pittsburgh Urban Forest (now known as Tree Pittsburgh) commissioned a report to help define management

needs and planting priorities. The Wisconsin Department of Natural Resources found that trees in the Green Bay metro area provide a 300 percent return on investment, more than offsetting the money spent to plant and take care of them.

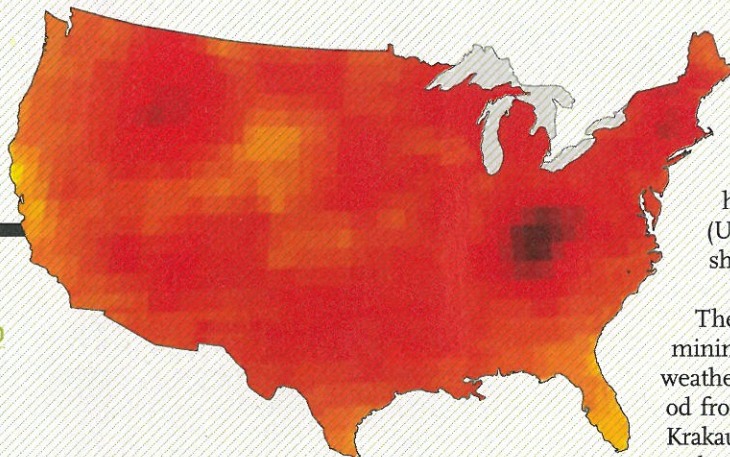
Seattle's approach offers some lessons in how to effectively use the technology. In 2007, the city adopted an urban forest management plan as a kind of road map, with a goal of increasing tree canopy cover to 30 percent, up

from 23 percent, by 2037. Lisa Ciecko, the study's main author, says that the data has already been used in an update to the city's management plan and is helping the city to prioritize and plan its tree-related spending.

Read Seattle's report, *Seattle's Forest Ecosystem Values: Analysis of the Structure, Function, and Economic Benefits*, at [www.seattle.gov/trees/ecoservices.htm](http://www.seattle.gov/trees/ecoservices.htm). Check out the i-Tree software suite, and Nowak's analysis, at [www.itree.org](http://www.itree.org).

## CLIMATE: WARMER LOWS

**A RESEARCHER SAYS  
USDA HARDINESS ZONE  
METHODOLOGY IS FLAWED  
WHEN TEMPERATURES  
ARE RISING.**



(2012) of the journal *Advances in Meteorology*. Those findings, he says, suggest that “over one-third of the country has already shifted half zones compared to the current (USDA) release and over one-fifth has shifted full zones.”

The USDA based its map on annual minimum temperatures at about 8,000 weather stations, averaged over the period from 1976 to 2005. But in his paper, Krakauer used minimum temperature for each year as the variable, without averaging.

Plant people waited more than a decade for the U.S. Department of Agriculture's most recent Plant Hardiness Zone Map, which was released in January 2012 (see “Winter in Retreat,” *LAM*, April 2012). But Nir Y. Krakauer, an assistant professor of engineering at the City College of New York, says it's already out of date.

Krakauer, who previously worked as a fellow in the National Oceanic and Atmospheric Administration's Climate and Global Change postdoctoral program, has proposed a methodology that he says would provide a more accurate assessment for planting.

He wrote about his findings in “Estimating Climate Trends: Application to United States Plant Hardiness Zones,” an article in Volume 2012

In his analysis, Krakauer found that winter temperatures are rising faster than summer ones, and that minimum temperatures are rising faster than average temperatures. So, he says, “the average is cooler than what we actually expect to see now. Taking the average wouldn't be a problem if there wasn't a warming trend.” He also found that while the whole continental United States is warming, some areas, such as the southern Appalachian region, are warming faster than others.

Krakauer used information from 421 stations selected for their long history of data collection and meticulous record keeping. He says using fewer stations didn't skew his results, since the warming trend was consistent from place to place.



**ABOVE**  
Minimum temperatures from February 2011 to February 2012 (in Celsius) rose significantly relative to the 1976-2005 mean used by the USDA.

COURTESY NIR Y. KRAKAUER