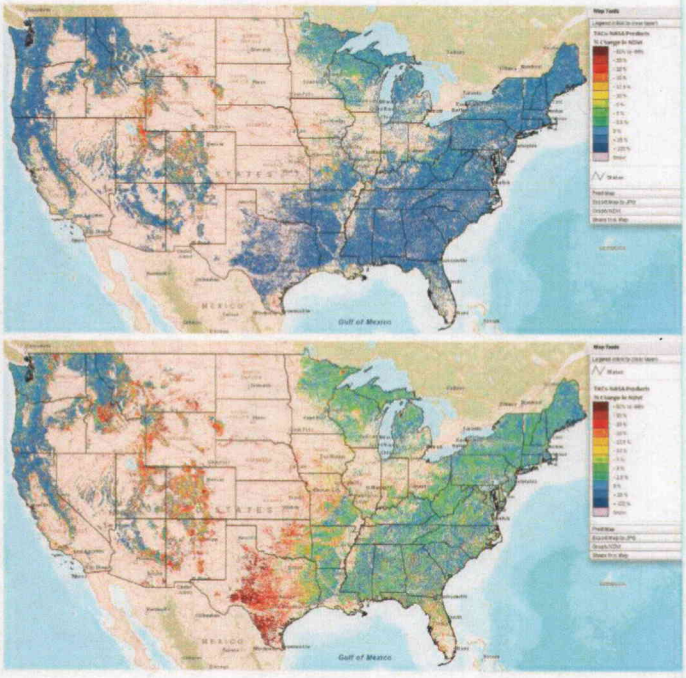
FOREST MANAGEMENT FROM SPACE

THE U.S. FOREST SERVICE AND NASA RELEASE A SATELLITE-BASED TOOL.



ABOVE
These images from mid-September compare forest cover looking back one year, top, and all years, bottom.

COURTESY EASTERN FOREST ENVIRONMENTAL THREAT ASSESSMENT CENTER

In July, the U.S. Forest Service publicly released ForWarn, a new visual tool that lets anyone with a computer track changes to forests over time, not least changes wrought by fires, storms, or drought. ForWarn was developed by the forest service with the National Aeronautics and Space Administration and others.

ForWarn is a satellite-based system. Since its prototype launched in January 2010, NASA satellites have provided snapshots of the entire contiguous United States every eight days, year-round. Clouds and smoke can obstruct views, but the frequency of the snapshots filters out these effects over time.

Bill Hargrove, a forest service research ecologist and a lead developer of the system, explains that ForWarn uses the Normalized Difference Vegetation Index, "which is the ratio of the difference between infrared and red divided by the sum of infrared and red." He says it works by comparing the current satellite view of greenness with a historical view of vegetation in a given location at a given time of year. During the winter, it provides similarly comparative views of snowpack accumulation and melt.

From their computers, managers at the forest service's threat assessment centers—and anyone else, via the Forest Change Assessment Viewer at *www.forwarn.forestthreats.org/fcav*—can use ForWarn to identify places that should be more closely investigated for potential damage or disturbance. Users can look back one year, three years, or all of the years for which data is available. "Currently, the ForWarn products go back to January 2010," says Hargrove, "but we have started working backward in time. Theoretically, this could go all the way back to 2000," when the first tracking sensor was launched.

The technology is a boon for forest service managers, who previously relied only on colleagues' flying around, logging disturbances on small GIS systems, and trying to pinpoint a cause. "It's highly skilled work, but it's expensive and risky," Hargrove says. In 2011, the agency estimated that these "sketch mappers" covered 70 percent of its forests once. ForWarn, he says, gives a much bigger picture at a much lower resolution, helping to focus resources in the air and on the ground where they're most needed.

The technology is generating even more useful information than its creators expected. "It's not measuring disturbance per se," Hargrove says. "It's measuring departure from normal, and that includes forest impacts from changes in weather or climate—extremes of temperature or wetness." This has been especially valuable in helping to track the impact of the extreme temperatures and drought of the past couple of years and finding out how quickly the affected ecosystems recover. ●