

Are Forests Making a Comeback?

NEW FINDINGS SUGGEST OPTIMISM ON GLOBAL OUTLOOK

A paper published recently in the Proceedings of the National Academy of Sciences offers new evidence that the world's forests, particularly in developed nations, are gaining ground and may even be returning to a healthy, restored condition. These findings—which seem counterintuitive in the wake of clear cutting, commercial exploitation, and environmental damage in global forests over the last half-century—have generated hope that forest declines can be reversed.

Three of the authors of this paper, Roger A. Sedjo, a senior fellow at RFF; Pekka E. Kauppi, professor of environmental science and policy at the University of Helsinki; and Jesse H. Ausubel, director, Program for the Human Environment, of The Rockefeller University and an RFF University Fellow, sat down with Resources to discuss their research and its possible implications. Their conversation follows.

Roger Sedjo: Our study discovered that since 1990, tree stock has increased in 22 of the world's 50 most densely forested countries, and most of those are developed nations. That is good news, of course, but overall the world is still losing forests—about 39,000 square miles per year. What our findings show is that there are policy measures that can reverse this trend, such as tree-planting programs and better forest management.

Pekka Kauppi: We found in a sense two worlds—69 countries with increasing forests between 1990 and 2005, and 92 still with decreasing. If we discount Brazil and Indonesia, which have experienced large forest depletion, then globally the forests of the world increased by about two percent since 1990.

Forests are always in a state of change—they are living ecosystems, after all. One of the innovative features of our study is a new kind of measurement, called “forest identity,” to track changes over time. We aggregated data from the United Nations Food and Agriculture Organization (FAO) for more than 200 countries. Rather than just count trees or take photos from above, we calculated each country's “growing stock,” those trees mature enough to be counted as timber. We did this by measuring the volume of timber, biomass, and captured carbon. The carbon capture of forests is increasingly important because it affects the carbon dioxide concentrations in the air.

Jesse Ausubel: Forests resemble the blind men's elephant. Some people look at a forest and see wood to convert into paper products or furniture. Others consider the spatial area, the habitat, the square kilometers needed to harbor deer or tigers. Some look at the forest and see tons of carbon removed from the atmosphere. Using the forest identity, we provide one equation that integrates consistently all these major views of the forest. It offers a common vocabulary for diverse stakeholders for forests.

Sedjo: In forest surveys of the past, we were pretty limited to a one-dimensional data set. The data available today are multi-faceted. The forest area might be constant, but the condition of the forest might be deteriorating or improving. The forest identity approach allows us to assess the condition of the forest, not just its size.

Kauppi: We know that as nations grow and develop, their forests shrink. And then, at some point in history, forests suddenly start to expand, a point called forest transition. In this study, we mapped these changes across the United States, Europe, and Asia and found that the shift from shrinking to expanding forests occurs through the continents. And we have an optimistic view that other areas will eventually experience this forest transition as well, perhaps in a few decades. However, we can't forget that overall deforestation is continuing, and at the current rate of forest decline worldwide, we will lose all our forests in 300 years.

Ausubel: Each of us recognized, perhaps 10 to 15 years ago, that forest transition was taking place in the United States, Scandinavia, and a few other regions. The availability of the new FAO data set enabled us to look at the period 1990 to 2005. And I was surprised that 22 of the 50 countries with the most forests now have increasing volume. When we look at all 214 countries, we find that 69 of 214 countries, including those with smaller forest areas, have increasing forests.

The number of countries and the extent of the transition did surprise us. All the European nations, except perhaps Estonia, have increasing forests. We were surprised that places like India, China, Turkey, Ukraine, Tunisia, Vietnam, and Malaysia added area or volume between 1990 and 2005. If you had asked me as a young environmental scientist back in the late 1970s whether India or China would have increasing forests by 2005, I would have said no. I would not have expected the transition to occur as early as it has. On the negative side, Indonesia is a tragic outlier in rate of loss of both area and density, and Nigeria and the Philippines also are rapidly losing area. Brazil's rates are not that high, but the absolute loss is huge, tying Indonesia for the worst, because Brazil's base is so large. The forest identity helps us recognize where action is needed to hasten the forest transition and shows diverse successful paths.

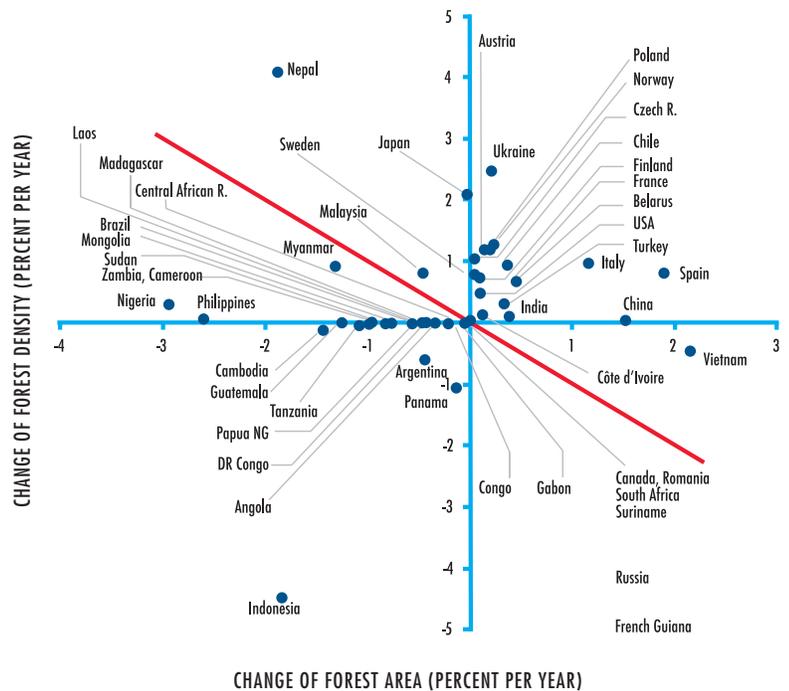
Sedjo: People ask us why reforestation occurs. The study confirmed a relationship between per capita income in countries and forest expansion. Environmental economists know that initial increases in per capita income are associated with the deteriorating environmental quality—and then there's a point at which it levels off as income increases. As income rises and countries become wealthier, we see environmental quality improving. We found something very similar with forestry. None of our 50 most forested countries with a per capita income of \$4,600 or more had experienced deterioration in their forests. They were all either constant or positive, one of our most interesting discoveries.

Now, at below \$4,600 per capita, we got a whole array of performances. China and India, big countries with large forests, showed a positive improvement in their forests. But Brazil and Indonesia, also big countries with large forests and lower per capita incomes, showed a loss. So at below \$4,600, other factors were clearly working.

Kauppi: Another major concern about forests is the impact they have on climate change. Forests absorb carbon from the air, and carbon sequestration is one result of the capture of greenhouse gases by trees. If you have more biomass in forests, you have less carbon to warm the air. Certainly we believe that reforestation will help curb the accumulation of carbon dioxide in the earth's atmosphere.

Figure 1.
A Global Chart of How Forests Have Changed in Area and Density, from 1990-2005

This chart displays how forests are changing in the 50 countries with the most growing stock in 2005. The higher a country appears on the chart, the faster its forest area expanded. The farther to the right one appears, the faster its forest density grew. And, the farther to the right of the red diagonal line, the faster its volume of growing stock increased. Examples include China, India, Italy, Spain, and Vietnam, which have diverse climates and degrees of wealth.



Ausubel: But an offsetting consideration may be at work here, the albedo effect. Forests in general are dark, and dark surfaces absorb heat; light surfaces, like deserts, reflect more and, from the point of view of physics, are cooler. Some analysts look at the difference in reflectivity and estimate the offset in heat retention could be substantial in relation to the amount of carbon that the forests hold. It's an old idea that is getting renewed attention. Improved history of the albedo effect could change our calculations of the planet's climate history.

Sedjo: I think there's something to that. If albedo is important, then it should be built into some of the general circulation models that predict temperatures and climate conditions around the world. And it sounds as though there are some new scientific findings that would raise questions about both the future and the past.

Ausubel: Yes, it could mean the big numerical simulations of climate aren't accounting as accurately and as fully as they should for what's happened historically. Ironically, deforestation may have contributed less to global warming than usually stated.

Sedjo: Another issue that came up was the difference between deforestation in the temperate and northern boreal zones, as opposed to the tropics, which have warmer air that holds more moisture. And evaporation from forests in warm areas forms clouds that tend to cool the earth.

Ausubel: The history of land cover, at least for the last 200 years, needs to be reconstructed in detail. There should be, maybe decade by decade, snapshots of Earth's land cover from 1800 to the present, with the reconstructed albedos and the possibility of including the related moisture feedbacks.

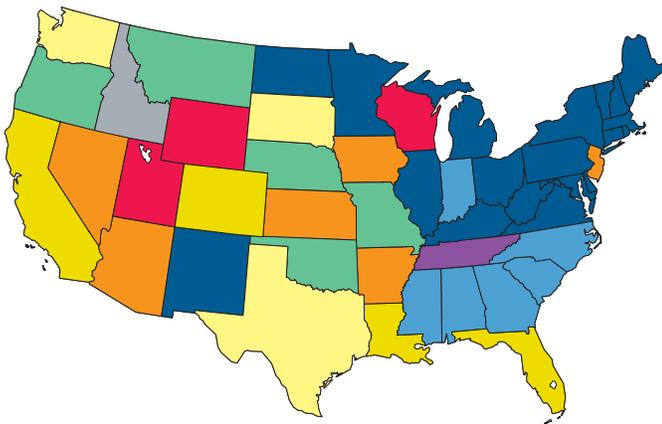
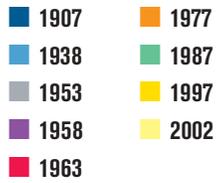


Figure 2.
The Historical Transition from Deforestation to Reforestation Across the United States

When forests that have been cleared are allowed to regrow, the turning point is called a forest transition. The dark to light colors indicate the spread of the transition across the country and each color corresponds to the date when the smallest amount of forest area was reported. Before 1800, European settlers had cleared a comparatively modest area, but during the following decades, they cleared more than in the previous 250 years of settlement. Although the rate of change after 1920 has been more modest, regional transitions have occurred across the country.

Sedjo: So what do our findings suggest about what can be done to reverse deforestation? Should we be concentrating on saving natural forests or nurturing plantation forests?

Kauppi: We should do both. Governments can play a big role, as well as private companies and even individuals. Systematic tree planting and better forest management can help us achieve sustainable forests, but the biggest factor is prosperity. When nations have higher incomes, their people pay more attention to preserving nature. They protect trees from fire and insects and other threats. No one wants to lose forests if society has the means and capability to follow more sustainable behavior.

It's also necessary to distinguish between young and mature forests. We know that carefully cultivated young tree plantations can provide most if not all of the commercial timber we need, and leave the older forests relatively undisturbed and protected from logging.

Ausubel: Some risks rise with the return of forests, to be sure. For example, Spain and Portugal had little forest for the last 500 years, so they had few forest fires. Since much of their forest has regrown, in recent years they have had huge fires. And people living near expanding forests notice a large increase in wildlife—deer, bears, even cougars or mountain lions. As New England's forests have regrown, residents have suffered a spread of Lyme disease from deer ticks.

Sedjo: The study shows that the condition of forests is dynamic, and that in many countries the forests are expanding, healthy, doing well, and there are lots of benefits that flow from this. And forests in countries that are having problems are not beyond correction. The fact that we have a chance for massive reforestation of the earth in the 21st century is wonderful, and we should seize it. ■