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DURHAM, N.H. – In a study led by University of New Hampshire scientist George Hurtt, new global land-use history reconstructions suggest that between 42 and 68 percent of the land surface has been impacted by human land-use activity since the year 1700. These new estimates are substantially larger and more comprehensive than previous estimates. Moreover, because these estimates includes all ice-free land surfaces, the estimated percent of land area impacted would be much higher if nonproductive lands such as deserts were excluded.

“Humans have a big impact on a lot of different aspects of the Earth system,” says Hurtt, assistant professor of natural resources at the UNH Institute for the Study of Earth, Oceans, and Space and the Department of Natural Resources. UNH co-authors of the study include Berrien Moore, Stephen Frolking, and Matthew Fearon. The study was also co-authored by Steve Pacala, Elena Shevliakova, and Sergey Malysev of Princeton University, and Richard Houghton of the Woods Hole Research Center.

Hurtt continues, “One type of impact is through our atmospheric emissions while another is how we’re altering the land surface through land-use activities” – the focus of this study. Land-use activities affect many different things such as the structure of ecosystems, distribution of species, the carbon cycle, water cycle, and even the planet’s energy balance.

“This study is the first spatially resolved 300-year reconstruction of how humans have impacted the land surface globally through land conversions, for example, land clearing for agriculture, agriculture abandonment, etc., and includes the first reconstruction of global wood harvesting activity over that time period,” Hurtt says.

To produce the estimates, the study used data from remote sensing satellites, historical statistics on land use, and other sources of information in a massive computer simulation to estimate some 100 million potential historical land-use events globally.

One important outcome of this study is that it provides the first global estimates of the spatial pattern and age of lands recovering from prior land-use activities. Logging and the clearing of land for agriculture releases carbon to the atmosphere. Similarly, allowing forests to regrow from logging, and recover from the abandonment of agriculture, creates areas that accumulate carbon

in vegetation and soils. This study provides the basis for the first global, spatially resolved, estimates of carbon sources and sinks that result from land-clearing and regrowth activities.

In previous studies, U.S. ecosystems have been shown to be a net sink for carbon. The major factor responsible for the sink is the contemporary regrowth of forests on land that was previously cleared for agriculture. This new study provides the basis for analogous estimates globally, and may ultimately lead to helping to solve the "missing carbon sink" problem – the gap in the global carbon budget between known sources and sinks of carbon to the atmosphere.

Hurtt will give a "platform" presentation on this study at the upcoming Seventh International Carbon Dioxide Conference to be held September 25-30 in Boulder, Colorado. Testament to just how important carbon science has become as climate change garners more scientific interest, 500 carbon scientists, representing a variety of disciplines including atmospheric chemistry, oceanography, and terrestrial ecology, are expected to attend the conference. The first carbon conference, held in Bern, Switzerland in 1981, attracted 40 scientists.