More logging, deforestation may better serve climate in some areas

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Replacing forests with snow-covered meadows may provide greater climatic and economic benefits than if trees are left standing in some regions, according to a Dartmouth College study that for the first time puts a dollar value on snow's ability to reflect the sun's energy.

The findings suggest more frequent logging or deforestation may better serve our planet and pocketbooks in high latitude areas where snowfall is common and timber productivity is low. Such a scenario could involve including snow cover/albedo in existing greenhouse gas exchanges like the Kyoto protocol or a cap-and-trade program or ecosystem services market in which landowners are paid to maintain snow cover and produce timber rather than conserve forests and store carbon. Previous studies have put a price on many ecosystem services – or services that nature provides to humans that have both economic and biological value, such as drinking water and crop pollination—but the Dartmouth study is the first to do so for albedo, or the surface reflection of incoming solar energy.

The findings contrast with the dominant paradigm that including forest climate mitigation services such as carbon storage on compliance markets will lead to the conservation of forests. Instead, the findings show that in some areas, it is better to have snow act as a natural mirror if you want to use forests for climate-related purposes.

The findings will be presented Dec. 12th at the American Geophysical Union's annual fall meeting in San Francisco in the Global

Environmental Change High Profile Topics session. A PDF of the study is available on request.

Climate change mitigation projects, such as the Kyoto Protocol, encourage reforestation because growing forests take up carbon dioxide, but previous studies have suggested the cooling aspect of surface albedo could counterbalance the benefits of forest growth.

The Dartmouth researchers placed an economic value on timber through wood prices as well as on albedo and carbon by using a sophisticated model of the climate and economy called an integrated-assessment model. They then examined the potential impact of these values on hardwood and softwood forest rotations in the White Mountain National Forest in New Hampshire. A rotation period begins when new trees are planted and ends when most of the trees are harvested.

Their results suggest that including the value of albedo can shorten optimal forest rotation periods significantly compared to scenarios where only timber and carbon are considered. For instance, in spruce and fir stands, very short rotation periods of 25 years become economically optimal when albedo is considered. The researchers attributed this to the low timber productivity and substantial snowfall in the White Mountain National Forest. Thus, they expect that in high latitude sites, where snowfall is common and forest productivity is low, valuing albedo may mean the optimal forest size is near zero.

The researchers note that increased timber harvesting may harm biodiversity and other ecosystem services, so they recommend forest managers take those factors into account as they try to maximize the flow of timber, carbon storage and albedo in mid- and high-latitude temperate and boreal forests.

Provided by Dartmouth College