



AMERICAN MUSEUM OF NATURAL HISTORY

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NEW MODELS PREDICT DRASTICALLY GREENER ARCTIC IN COMING DECADES

BOOM IN TREES, SHRUBS EXPECTED TO LEAD TO NET INCREASE IN CLIMATE WARMING

New research predicts that rising temperatures will lead to a massive “greening,” or increase in plant cover, in the Arctic. In a paper published on March 31 in *Nature Climate Change*, scientists reveal new models projecting that wooded areas in the Arctic could increase by as much as 50 percent over the next few decades. The researchers also show that this dramatic greening will accelerate climate warming at a rate greater than previously expected.

“Such widespread redistribution of Arctic vegetation would have impacts that reverberate through the global ecosystem,” said Richard Pearson, lead author on the paper and a research scientist at the American Museum of Natural History’s Center for Biodiversity and Conservation.

Plant growth in Arctic ecosystems has increased over the past few decades, a trend that coincides with increases in temperatures, which are rising at about twice the global rate. The research team – which includes scientists from the Museum, AT&T Labs-Research, Woods Hole Research Center, Colgate University, Cornell University, and the University of York – used climate scenarios for the 2050s to explore how this trend is likely to continue in the future. The scientists developed models that statistically predict the types of plants that could grow under certain temperatures and precipitation. Although it comes with some uncertainty, this type of modeling is a robust way to study the Arctic because the harsh climate limits the range of plants that can grow, making this system simpler to model compared to other regions such as the tropics.

The models reveal the potential for massive redistribution of vegetation across the Arctic under future climate, with about half of all vegetation switching to a different class and a massive increase in tree cover. What might this look like? In Siberia, for instance, trees could grow hundreds of miles north of the present tree line.

“These impacts would extend far beyond the Arctic region,” Pearson said. “For example, some species of birds seasonally migrate from lower latitudes and rely on finding particular polar habitats, such as open space for ground-nesting.”

In addition, the researchers investigated the multiple climate change feedbacks that greening would produce. They found that a phenomenon called the albedo effect, based on the reflectivity of the Earth’s surface, would have the greatest impact on the Arctic’s climate. When the sun hits snow, most of the radiation is reflected back to space. But when it hits an area that’s “dark,” or covered in trees or shrubs, more sunlight is absorbed in the area and temperature increases. This has a positive feedback to climate warming: the more vegetation there is, the more warming will occur.

“By incorporating observed relationships between plants and albedo, we show that vegetation distribution shifts will result in an overall positive feedback to climate that is likely to cause greater warming than has previously been predicted,” said co-author Scott Goetz, of the Woods Hole Research Center.

This work was funded by the National Science Foundation, grants IPY 0732948, IPY 0732954, and Expeditions 0832782. Other authors involved in this study include Steven Phillips (AT&T Labs-Research), Michael Loranty (Woods Hole Research Center and Colgate University), Pieter Beck (Woods Hole Research Center), Theodoros Damoulas (Cornell University), and Sarah Knight (American Museum of Natural History and University of York).

The research paper can be found at: <http://dx.doi.org/10.1038/NCLIMATE1858>

AMERICAN MUSEUM OF NATURAL HISTORY (AMNH.ORG)

The American Museum of Natural History, founded in 1869, is one of the world’s preeminent scientific, educational, and cultural institutions. The Museum encompasses 45

permanent exhibition halls, including the Rose Center for Earth and Space and the Hayden Planetarium, as well as galleries for temporary exhibitions. It is home to the recently restored Theodore Roosevelt Memorial, New York State's official memorial to its 33rd governor and the nation's 26th president, and a tribute to Roosevelt's enduring legacy of conservation. The Museum's five active research divisions and three cross-disciplinary centers support about 200 scientists, whose work draws on a world-class permanent collection of more than 32 million specimens and artifacts, as well as specialized collections for frozen tissue and genomic and astrophysical data, as well as one of the largest natural history libraries in the Western Hemisphere. Through its Richard Gilder Graduate School, it is the only American museum authorized to grant the Ph.D. degree. In 2012, the Museum began offering a pilot Master of Arts in Teaching with a specialization in earth science. Approximately 5 million visitors from around the world came to the Museum last year, and its exhibitions and Space Shows can be seen in venues on five continents. The Museum's website and collection of apps for mobile devices extend its collections, exhibitions, and educational programs to millions more beyond its walls. Visit amnh.org for more information.

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