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Conversion of Siberian Larch Forests in Response to Climate Change

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The Northern Hemisphere's boreal forests and, in particular, the Siberian boreal forest zone, may have a particularly strong effect on the Earth's climate through changes in the regional surface albedo. Warmer climate has been identified as a potential driver of the conversion of Siberia's larch forests to dark-conifer forests of spruce and fir. This suggests a positive feedback cycle: warmer climate creates a succession from deciduous larch to dark-conifer forest; the resultant albedo change can then promote additional climate warming. The individual based forest growth model, FAREAST, which simulates the composition of the Russian forest, is used to test the impact of warming on forest succession and mitigation of this potential climate/cover feedback. Utilization of FAREAST with climate station and soil data from across Siberia generates baseline biomass (tCha-1) and species composition values from year zero to mature forest for current climate conditions. IPCC climate output data from two of NCAR's Community Climate System Model 3.0 (CCSM) SRES climate change scenarios, which have stabilization at 720ppm of CO2 associated with 2.6°C warming and 550ppm CO2 with 1.2°C warming, are used to evaluate dominant species change in response to climate change. To explore mitigation of albedo changes associated with the predicted shift from larch to dark-conifer forest, the results for the current and two warming scenarios are compared to a set of model runs which introduce European Larch (*Larix decidua*). This deciduous species is adapted to warmer climate conditions and its introduction to Siberia could slow the rate of conversion to dark-conifer forests. Evaluation of climate as the driver for conversion of larch to dark-conifer enhances our ability to identify drivers of land surface change in this complex region and focus future analysis.

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