How might climate change affect the distribution, structure and productivity of major Siberian forest types?

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Previous regional studies in Siberia have demonstrated climate warming and associated changes in distribution of vegetation and forest types, starting at the end of the 20th century. In this study we used two regional bioclimatic envelope models to simulate potential changes in forest types distribution and developed new regression models to stimulate changes in stand height in tablelands and southern mountains of central Siberia under warming 21st century climate. Stand height models were based on forest inventory data (2850 plots). The forest type and stand height maps were superimposed to identify how heights would change in different forest types in future climates. Climate projections from the general circulation model Hadley HadCM3 for emission scenarios B1 and A2 for 2080s were paired with the regional bioclimatic models. Under the harsh A2 scenario, simulated changes included: a 80-90% decrease in forest-tundra and tundra, a 30% decrease in forest area, a 5-fold increase in forest-steppe, and a 10-fold increase in steppe, forest-steppe and steppe would cover 55% of central Siberia. Under sufficiently moist conditions, the southern and middle taiga were simulated to benefit from 21st century climate warming. Habitats suitable for highly-productive forests (≥30-40 m stand height) were simulated to increase at the expense of less productive forests (10-20 m). In response to the more extreme A2 climate the area of these highly-productive forests would increase 10-25%. Stand height increases of 10 m were simulated over 35-50% of the current forest area in central Siberia. In the extremely warm A2 climate scenario, the tall trees (25-30 m) would occur over 8-12% of area in all forest types except forest-tundra by the end of the century. In forest-steppe, trees of 30-40 m may cover some 15% of the area under sufficient moisture.

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