Climate change impacts on seed quality and distribution of light-needled *Pinus sylvestris* and *Larix* spp. in Northern Eurasia in a warming climate

*Nadezhda Tchebakova[1], Elena I. Parfenova[1], Elena V. Bazhina[1], Nina A. Kuzmina[1], Pavel Y. Groisman[2]

1. Institute of Forests, Siberian Branch, Russian Academy of Sciences, 2. NC State University Research Scholar

Global simulations have demonstrated the potential for profound effects of climate change on the distribution of terrestrial ecosystems and individual species at all hierarchical levels. We modeled progressions of potential forest types, dominant tree species and their seed zones (climatypes) in Siberia during the 21st century. We developed and used large-scale bioclimatic models and statistical seed models to predict forest types and seed crops in a warming climate. All simulations were run for the baseline period 1961-1990 and for the mid- and end of the century. We ran twenty global circulation models from CMIP5 (AR5) and used two climate change scenarios RCP 2.6 (less warming) and RCP 8.5 (greater warming) to provide a range of warming. Ecological-bioclimatic modeling projects substantial vegetation changes: biomes shift northwards; area of conifer forest decreases and grasslands increases. The zone at risk of forest loss in Siberia would extend northwards. To minimize negative consequences and benefit from climate change in Siberian forests potential adaptive measures may be introduced depending on management goals. A genetic approach is to assist trees and forests to adapt to new climates by transferring seed to locations that are suitable to the seed zones of future climates. A bioclimatic model of *Pinus sylvestris* seed quality and productivity that relates seed weight and climates ($R^2 = 0.74$) was used to map the seed weight distributions in new CMIP5 RCP 2.6 and RCP 8.5 climates. Seed weight isolines would shift northwards in a warming climate: as far as 500 km in the moderate scenario and up to 1000 km in the extreme scenario. In the cold climate of Siberia pine and larch seed production may benefit from climate warming and would favor to expanding areas of productive forests.

The study was supported by RFBR grant # 20-05-00540.

Keywords: Climate change , Boreal forest, Seed zones , Seed quality and distribution, Pinus sylvestris and Larix spp. , Northern Eurasia

