

Original article

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## Climate Change and its Impact on the Vital State of Forest-Steppe Populations of the Common Pine of the Russian Plain

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**Annotation.** The problems of climate change and its effects on the pine forests of the forest-steppe region of the Russian plain are considered. The analysis of average annual temperatures showed that at the beginning of the XXI century the region entered a phase of rapid climatic changes. Over the last 15 years the rate of warming accelerated 1.7 times, the number of droughts doubled, the number of optimal years decreased from 8 to 5 / 10 years. The results of 35-year monitoring of seed multiplication systems of Scots pine (Voronezh region, Stupino test object, 30 trees) are summarized. Initially, forest-steppe populations represented stable equilibrium systems and the main elements of seed reproduction – self-fertility, proportion of plump seeds, number of seeds per cone were in dynamic equilibrium with the habitat. Climate warming, an 8-year heat wave, and droughts caused pine forests to transition to a lower life state in 2015, a weakly non-equilibrium system. It was found that it took them three optimal years to return to equilibrium. At present, the northern and central populations are in stable equilibrium, the life state of the southern forest-steppe is lower – unstable equilibrium. Further climate warming increases the probability of pine forests destabilizing again, and a decrease in the number of optimal years precludes a return to the initial state.

**Key words:** Scots pine, forest-steppe, climate warming, monitoring, vital state, seed productivity.

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