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Forest cover disturbances and river run-off changes in Nizhnee Priangarye

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The regional water balance changes including disturbance of the natural runoff dynamics of Siberian rivers are often a result of large-scale soil and forest disturbances in river catchments areas. The primary disturbance causes are fire and clear cuts.

Nizhnee Priangarye forest cover has been changed considerably over past several decades due to logging and fire. Most of the accessible regional forest was cut as early as in 1960s. Therefore this region is nowadays a mosaic of forest regeneration sites including both post-human and post-fire regeneration patterns.

Hydrological models built for five rivers (Taseyeva, Karabula, Chadobets, Irkineyeva, and Mura) of Nizhnee Priangarye showed that their annual runoff is significantly correlated with time-factor and a number of hydro climatic factors. The river run-offs were found to decrease with time within a period of about twenty years beginning from early 1960's. This might be due to increasing fresh clear-cut areas, where wind grows very active and moisture evaporation increases in wintertime. The annual runoff decrease was estimated to be 0.5-1.3mm.

After this 20-year period, a the river runoffs were observed to increase, starting from1975 for Taseyeva river, 1986 for Chadobets, and 1984 for Irkineyeva and Mura rivers. These years appeared to agree fairly well with the time when young forest regeneration began to expand in areas cut in 1950-60s. We would attribute the observed runoff increase to decreasing moisture evaporation in winter and increasing snow accumulating capability of post-logging secondary stands.

River runoff thus reflects all land cover changes that can be of opposite signs and, as a result, compensate each other. A spatial analysis of river runoff changes and dynamics of human-caused and natural disturbances in catchments accounting for climatic trends and weather conditions allows to better understand the mechanisms driving the processes of interest and their effects and make well-grounded conclusions concerning runoff formation genesis.