

Response of conifers to industrial pollution in Northwest Russia

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T.A.Sazonova, S.V.Kolosova **RESPONSE OF CONIFERS TO INDUSTRIAL POLLUTION IN NORTHWEST RUSSIA** Forest Research Institute, Karelian Research Centre, Russian Academy of Science e-mail address: tatjana.sazonova@krc.karelia.ru fax: 8814768160 telephone: 8814578216 Pushkinskaya, 11, Petrozavodsk, 185910, Russian Federation Forest Research Institute, Karelian Research Centre, Russian Academy of Science Conifers, water status, pollutants, Northwest Russia Satellite images reveal the response of terrestrial ecosystems to industrial pollution only when their degradation becomes visible, whereas in situ surveys in areas with elevated industrial pollution levels permit earlier identification of changes in physiological processes in various plant species, and determination of how lasting these changes would be. The effects of industrial pollution on physiological processes in two tree species dominating in Euro-pean taiga (*Picea obovata* Ledeb. and *Pinus sylvestris* L.) were studied in 1991-1992 and 1996-2000. Sample plots were situated in a feathermoss-dwarf shrub spruce stand and a dwarf shrub-lichen pine stand in the Lap-land reserve, 30 km away from the Monchegorsk copper-nickel smelter "Severonickel" (Kola Peninsula, Mur-mansk region). Annual sulphate sulphur deposition in the area is 1000-2000 kg/km², total heavy metal deposition – 50-500 kg/km² (Vasilieva et al., 2000). The response of spruce and pine trees to industrial pollution was estimated using the value of the water deficit in the needles and shoot xylem, determined through the measured water potential (Ψ_w) in needled shoots. Simultaneously, the health status of the trees was determined visually (crown shape, life span, needle damage and defoliation). The main findings were as follows: 1. Sulphur and heavy metal impact results in disturbances in the water transport system of spruce and pine trees, manifest in a non-linear rise in the water deficit and deterioration of the tree health. 2. On the other hand, industrial pollution was not found to change diurnal Ψ_w dynamics, and the range of its weather-induced variation over the growing season stayed within the Ψ_w variation limits recorded under background conditions, indicating that stomatal control retained much of its function. 3. Agreement between the health status determined visually (including needle yellowing and die-back) and by the water deficit value was more conspicuous in spruce than in pine trees. 4. Pollutant concentrations being the same, the time interval between the onset of physiological changes in the water conducting system and the tree death was shorter in spruce than in pine. One can therefore conclude that spruce is less resistant to pollution than pine. Hence, in remote sensing, changes in the condition of spruce forests visible in satellite images would enable earlier diagnosis of an increase in the industrial pollution level.