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Nutrient concentration on skid trails under brushmats: is a redistribution of nutrients possible?

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In mechanized timber harvesting building brush mats from logging residues on skid trails is common practice. Protective effects of brush mats against soil compaction are documented by several studies. On the other hand, a large quantity of nutrients is concentrated on the skid trail. Fully mechanized harvesting has been criticized frequently for this reallocation of nutrients. Is there really a risk of nutrient imbalances or of nutrient leaching below skid trails? Could the nutrients be redistributed through nutrient uptake by roots of adjacent trees? Effects of fully mechanized thinning on soil, water and nutrient balance were examined in a seventy years old spruce stand on a nutrient-poor site in Bavaria. Sections of the trails where covered with brush mats while other sections remained uncovered. For five replications, soil physical properties, soil chemistry, matter and water balances and the density of fine roots were measured in the middle of the trail, under the tire tracks, at the transition of trail and stand and inside the stand over a period of two years. Logging operation caused soil compaction. The macropore volume decreased and both hydraulic conductivity and air permeability were reduced. The nutrients were largely kept in the forest ecosystem. Results of the soil moisture monitoring indicate that within the sections covered by a brush mat, tree roots extracted water from the soil between the tracks. Without cover the trees scarcely extracted water from this area. Hence, building a brush mat can facilitate water availability and thus enable redistribution of nutrients.