

Effects of clear cutting on soil properties in a mature *Cryptomeria japonica* forest

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Clear cutting can alter the nitrogen cycling of forest ecosystems as it can lead to reduced nitrogen uptake by plants, increased soil nitrification rate and increased nitrogen runoff by stream water. However, the effects of clear cutting can vary depending on the climatic conditions, soil conditions and successional stage of the forest ecosystem. In Japan, information about the effects on mature forest ecosystems is limited. In the present study, we evaluated the effects of clear cutting on a mature 250-year-old Japanese cedar (*Cryptomeria japonica*) forest in Kochi prefecture. Approximately 1.4 ha of the area was damaged by a forest fire in March 2005. Within the burned area, three 30m x 30m study plots were established as uncut areas (remaining plots). Three clear cut plots were set outside the remaining plots but within the burned area. Japanese cedar trees in areas other than remaining plots were cut in November 2005. In addition, three plots were established in an unburned area adjacent to the burned area as control plots. Before clear cutting in November 2005, soil samples were collected from the surface and organic layers in the remaining, cut and control plots. One year after clear cutting in November 2006, soil samples were collected from the remaining and clear cut plots.

Effects of fire on soil properties were evaluated by comparing the three study plots in 2005. The mass of organic layer in the burned area (remaining and clear cut plots) was 40% of that in the control plots. Production of soil nitrate in the burned area was 70% of that in the control plots. Other soil properties were not different between the study plots. These results suggest that the effect of the fire on soil properties was not strong although the organic layer was significantly reduced by the fire.

Effects of clear cutting were evaluated by comparing soil samples in the remaining and clear cut plots in 2005 and 2006 using two-way ANOVA. There was a significant interaction between year and cut treatment for soil nitrate, calcium and marginally significant for potassium and fine root biomass. These nutrient concentrations in the clear cut plots increased after clear cutting, especially soil nitrate concentration, which increased by 7-fold. In contrast, the production of nutrients during the incubation was not affected by the clear cutting. These results suggest that soil nutrients in the clear cut plots were increased by the decrease of nutrient uptake by plants and the effect of clear cutting on soil microbial activity was of minor importance.