Temporal changes in stream water chemistry during forest thinning and logging road construction

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Forest use and management are known to affect stream water chemistry. Research has demonstrated that NO_3^- concentrations tend to increase in streams after clear cutting, but it is still unclear how forest thinning operations affect stream chemistry. We have been monitoring stream water chemistry in an experimental watershed, and continued to collect data while the area was subjected to forest thinning operations and logging road construction in 2013. Our objective was to investigate the short-term effects of thinning operations on stream water chemistry in this experimental watershed.
Forest thinning operations included building logging roads beside streams. Japanese cedar (*cryptomeria japonica*) had been planted in this area. They were thinned using machinery: two planting lines per seven lines were logged. During thinning operations, slash was spread over stream channels. After the thinning was completed, the slash was used to cover the cut slopes of the logging roads.
During the thinning operations, we observed increased soil sediment in stream channels, and the concentrations of K^+, Ca^+, and DOC increased remarkably in streams. In contrast, NO_3^- concentrations decreased to almost undetectable levels. We also observed a thin layer of gel on the stream bed, which was likely a biofilm produced by aquatic microorganisms.
After the thinning operations were completed, K^+, Ca^+, DOC, and NO_3^- concentrations returned to pre-thinning levels. The increased concentrations of K^+, Ca^+, and DOC in stream water were likely to have been leached from the slash or the soil sediment. Additionally, the reduced NO_3^- concentrations were probably caused by an increase in aquatic microorganisms, which used the increased K^+, Ca^+, and DOC as nutrients.

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