

Nitrate and DOC losses after clear-cutting and understory strip-cutting in a cool-temperate forested watershed

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Nitrate (NO₃⁻) and dissolved organic carbon (DOC) concentration in stream water after clear-cutting of trees and subsequent strip-cutting of understory vegetation, dwarf bamboo (*Sasa* spp.) were investigated to understand the effect of these disturbances on biogeochemical processes in cool-temperate forested watershed in northern Japan. Trees of 8 ha watershed except riparian zone were clear-cut in January-March of 2003. *Sasa* was strip-cut in October of 2003 and larch seedlings were planted on the cut line immediately after the *Sasa* cutting. Stream water was sampled every two or three weeks from 2002 to 2008. Tree-cutting did not cause a significant increase of nitrate concentration in stream water during the growing season after the cutting. Subsequent *Sasa*-cutting caused significant increase of stream nitrate concentration to ca. 15 micro mol L⁻¹. These results suggested that nitrogen uptake by *Sasa* was very important in preventing nitrogen leaching after tree-cutting, and decline of this nitrogen uptake after *Sasa*-cutting lead to marked nitrate leaching to the stream. Five years following trees and *Sasa* cutting, nitrate concentration fluctuated in the range of < 0.1 to 22 micro mol L⁻¹ depending on year. Nitrate concentration did not get back to pre-cutting level during five years after the tree-cutting. DOC concentration in stream water was not changed after both cuttings of tree and *Sasa* and had clear seasonal pattern that peaked in late summer (August - September). Stream DOC concentration increased in growing period with low runoff from late May to August and then decreased after runoff increased in fall, indicating that dilution by the runoff reduce stream DOC concentration after late summer. However, DOC concentration remained low during winter when runoff was stably low, suggesting that high temperature also promote DOC production in soil during the dry period of early summer. These results suggests that riparian area is the main source of DOC rather than cut area on the slope, and thus DOC loss from ecosystem was not influenced by the cutting of trees and *Sasa* in this watershed. These results indicate the response to cutting is different between Nitrate and DOC by the different source area of these solutes in the watershed with cool climate and the gentle basin topography.

Keywords: nitrate, DOC, stream water, clear-cutting, *Sasa* strip-cutting, understory vegetation