

Publication**Shrub Expansion of *Alnus viridis* Drives Former Montane Grassland into Nitrogen Saturation****JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)****ID** 3703891**Author(s)** Bühlmann, Tobias; Körner, Christian; Hiltbrunner, Erika**Author(s) at UniBasel** [Bühlmann, Tobias](#) ; [Hiltbrunner, Erika](#) ; [Körner, Christian](#) ;**Year** 2016**Title** Shrub Expansion of *Alnus viridis* Drives Former Montane Grassland into Nitrogen Saturation**Journal** Ecosystems**Volume** 19**Number** 6**Pages / Article-Number** 968-985

The N₂-fixing shrub *Alnus viridis* is currently encroaching on montane grasslands in the Alps as a result of reduced land management and complete abandonment. *Alnus* introduces large amounts of nitrogen (N) into these formerly N-poor grasslands and restricts the succession to montane forests. We studied pools and fluxes of N and the associated C pools in pastures (controls) and adjacent *Alnus* shrublands at two elevations (1650 versus 1950 m a.s.l.) in three valleys in the Swiss central Alps. The total N and C pools stored in 50-year-old *Alnus* shrubland did not exceed those in adjacent pastures with a total of approximately 610 g N m⁻² in phytomass plus soil (down to 30 cm) at both elevations. In *Alnus* stands, reduced soil N pools balanced the gain in phytomass N pools, a likely result of a faster turnover of soil N. The soil solution under *Alnus* was continuously enriched with nitrate, with a total N leaching of 0.79 g N m⁻² season⁻¹ (June–October) under 50-year-old stands at both elevations and the highest flux of 1.76 g N m⁻² season⁻¹ in 25-year-old shrubland at low elevation, clearly indicating an excess of available N in *Alnus* shrubland. In contrast, N leaching across all pastures was close to zero (0.08 g N m⁻²) throughout the season. At the catchment scale, streamlet water showed increased nitrate concentrations with typical flushing peaks in spring and autumn, provided more than one fifth of the catchment area was covered by *Alnus* shrubs. We conclude that the expansion of *Alnus* rapidly converts centuries-old, N-poor grassland into N saturated shrubland, irrespective of elevation, and it reduces the C storage potential of the landscape because the *Alnus* dominance constrains re-establishment of a natural montane forest.

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