# Long-term warming increases nitrogen availability but has reduced carbon mineralization in an alpine environment

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Climate warming is expected to impact on soil and plant processes in Alpine ecosystems. Increased ambient and soil temperatures are likely to increase plant growth and organic matter mineralization. However, over time these effects are likely to change, due to changes in the C:N of soil organic matter, soil mineral-N availability, and in plant assemblages which in turn alter the type and quality of leaf litter. In addition, increased temperatures will affect the frequency of dry-wet cycles and drying depth. This study examined the effect of litter addition and dry-wet cycle on nutrient cycling of soils from long-term warming trials.

Incubation experiments used soils from plots of 10-year warming studies on the Bogong High Plains in south-east Australia. It was found that soils with a warming history had decreased microbial biomass and activity in addition to decreased N-mineralisation. However, there was increased C-mineralisation in warmed soils after they were amended with litters differing in the C:N ratio. Interestingly, warming history increased soil available N and decreased soil respiration in response to dry-rewetting cycles. These effects were associated with the lower initial microbial biomass (MBC), reduced MBC and increased C use efficiency after dry-rewet cycles in comparison to non-warmed soils.

In summary, while increased temperatures would have predicted to increase C and N mineralization, it is likely that over time, due to increased frequency of dry-rewet cycles, that soil-C is conserved due to a reduction in microbial activity.