

Pastureland restoration is urgent for Sámi reindeer pastoralism to coexist with the forest industry and adapt to climate change in Northern Sweden



Photo: David Harnesk

Key recommendations

- Pastureland restoration must be implemented to reduce dependency on coping mechanisms such as emergency feeding, mechanized transport and intense workloads. These coping mechanisms are increasingly used to deal with the cumulative effects of encroachments from competing land uses, predator pressure, and the impacts of climate change on snow conditions.
- Vigorous thinning of dense, managed forests is a critical pastureland restoration measures that can reverse the negative trend of loss, degradation and fragmentation of ground lichens, which are key forage resources for reindeer during snow periods. Other studies show that implementing such restoration measures can benefit both reindeer pastoralism and forestry.
- Conservation of old-growth and primary forests would further improve the conditions for Sámi reindeer pastoralism as such forests are habitats for pendulous lichens, another key forage resource, and are important for cultural heritage, biodiversity conservation, and carbon storage.
- Pastureland restoration measures that improve the ecological conditions for Sámi reindeer pastoralism must be adapted to local and landscape scale conditions, and Indigenous and local knowledge can help in that process.

For more information, contact the researchers:

David Harnesk, Lund University Centre for Sustainability Studies

Lennart Olsson, Lund University Centre for Sustainability Studies

Didac Pascual, Lund University, Department of Physical Geography and Ecosystem Science

Sápmi and reindeer pastoralism

Sápmi, the lands of the Indigenous Sámi people, spans across Northern Fennoscandia, and includes Northern Sweden. Reindeer pastoralism is an important livelihood and cultural practice among the Sámi. It is based on free-ranging semi-domesticated reindeer that use natural pastures within highly variable, multi-purpose pastoral landscapes. It also delivers multiple ecosystem services such as food production and climate warming mitigation as grazing suppresses the greening of mountain ecosystems, counteracting albedo feedbacks. The land on which reindeer pastoralism is practiced also represents cultural landscapes in which the Sámi people hold customary and Indigenous rights to land, water, and natural resources and carry the collective experience of a colonial history.

The pasture availability problem

The pastoral winter season is a critical time in the annual herding cycle, wherein the accessibility of ground - and pendulous lichens as forage is vital to the survival of the herd. Since the 1950s there has been a massive reduction of such key forage resources in Northern Sweden. The main culprit is intensive forestry which has resulted in denser and younger forests, leading to the loss, degradation, and fragmentation of lichen habitats [1-3]. It is the cumulative effects of encroachments, climate change impacts on snow conditions, and predator pressure, that has worsened the availability of reindeer forage during snow periods (the “pasture availability problem”, for short).

We conducted a study together with members of the Maskaure forest reindeer herding community. The study examined how community members cope with and experience basal ice formation within their landscape under the influence of climatic and environmental change. Our goal was to better understand what constitutes ecological conditions in line with members’ desired experiences of their landscapes to improve on policy recommendations. The study combined a literature review, workshops, semi-structured interviews, and quantitative analysis of climate - and forest data.

Basal ice formation

Our study focused on impacts and causal relations around basal ice formation, under snow, that is thick enough to coat key forage resources at the ground vegetation layer with ice, making them inaccessible. Two types of weather events can create conditions for this to occur, rain-on-snow events and thaw-and-freeze events, both of which mostly occur between October and December [2].

Our findings show that the impact of basal ice formation on the availability of winter forage for reindeer is amplified by the directional effects of climate change and encroachments, especially particular forestry practices and their surrounding infrastructure [2]. We found that ongoing and planned land uses will exacerbate the pasture availability problem, which in turn will be exacerbated by climate change impacts on snow conditions and lichen habitats. Members of the Maskaure forest reindeer herding community clarified how some coping mechanisms threaten natural pasture-based reindeer pastoralism, and that the pasture availability problem therefore represented a threat to Sámi identity, culture, and livelihoods more broadly. Below we present three policy recommendations.

Vigorous thinning as pastureland restoration

Ground lichens gain biomass slowly as they require light, a suitable combination of water and temperature and a balance of nutrients to grow effectively. Forest densification thus helps other plants outcompete ground lichens at the ground vegetation layer [1].

Our policy recommendation is to implement regulation that pushes forestry companies to “open up” dense, managed forests. Timely and vigorous thinning of forests to 800 – 1200 stems per hectare can increase light availability and improve the conditions for ground lichen growth and sustenance [3-4]. Harvest residues must be piled up and removed to not negate potential gains and small machinery is preferred [4]. Studies show that forestry remain profitable even if it implements such adapted forest management practices, adapted to local conditions [4-5].

Old-growth and primary forest conservation

Pendulous lichens have similar growth requirements and poor dispersal abilities, but also depend on specific substrates to survive. Community formation depends on forest age and possibly even forest volume. These conditions are found in forests older than 100 years [1].

Our recommendation is to increase the amount of protected old-growth and primary forests in Northern Sweden, and to let more managed forests age to old-growth status. Members of the Maskaure forest reindeer herding community underlined that foraging on pendulous lichens is the preferred adaptation measure during severe basal ice formation events. Other societally recognized values of such forests include cultural heritage, biodiversity conservation and carbon storage [6-8]. Protection schemes must also allow for continued use of that land by Sámi reindeer pastoralists. There are several examples of such protection schemes to draw on when implementing our policy recommendation.

Integrating Indigenous and local knowledge

Forest management and planning adapted to reindeer pastoralism requires a Sámi pastoral landscape perspective to be incorporated into decision-making [1-2].

Our recommendation is to strengthen the decision-making power of reindeer herding communities in their negotiations with other land users, such as large forest owners and forestry operators. Other studies show that all implemented institutional arrangements have failed at providing reindeer pastoralists with meaningful influence over forest management and planning practices [9]. Given that on-the-ground forest management practices must incorporate factors beyond those we suggest above, such as variation at the stand scale, we believe that a stronger position of those with Indigenous and local knowledge could provide an improved base for decision-making.

New research project takes the next step

The Swedish Research Council FORMAS recently funded the project “*Embracing extreme weather and compound events in landscape planning: the case of reindeer husbandry in Northern Sweden*”. The project will develop storyline-based alternatives for planning at the landscape scale to better navigate the expected increase of impactful extreme weather and compound events. The project can be considered a continuation of the research of the Lund University division of CliCNord and will put more emphasis on articulating different decision-making strategies in landscape planning that could address trade-offs in sustainable development as societies are increasingly confronted with compounding extreme weather due to climate change.

References

- 1 Harnesk, D. (2022). The decreasing availability of reindeer forage in boreal forests during snow cover periods: A Sámi pastoral landscape perspective in Sweden. *Ambio*, 51(12), 2508-2523.
- 2 Harnesk, D., Pascual, D., & Olsson, L. (2023). Compound hazards of climate change, forestry, and other encroachments on winter pasture-lands: a storyline approach in a forest reindeer herding community in Northern Sweden. *Regional Environmental Change*, 23(4), 126.
- 3 Sandström, P., Cory, N., Svensson, J., Hedenås, H., Jougda, L., & Borchert, N. (2016). On the decline of ground lichen forests in the Swedish boreal landscape: Implications for reindeer husbandry and sustainable forest management. *Ambio*, 45, 415-429.
- 4 Eggers, J., Roos, U., Lind, T., & Sandström, P. (2024). Adapted forest management to improve the potential for reindeer husbandry in Northern Sweden. *Ambio*, 53(1), 46-62.
- 5 Pettersson, F., Jacobsson, S. & Nyström, K. (2017). Economic assessment of different pre-commercial thinning and thinning regimes. *Skogforsk. Arbetsrapport 948-2017*.
- 6 Östlund, L., & Norstedt, G. (2021). Preservation of the cultural legacy of the indigenous Sami in northern forest reserves—Present shortcomings and future possibilities. *Forest Ecology and Management*, 502, 119726.
- 7 Jonsson, M., Bengtsson, J., Moen, J., Gamfeldt, L., & Snäll, T. (2020). Stand age and climate influence forest ecosystem service delivery and multifunctionality. *Environmental Research Letters*, 15(9), 0940a8.
- 8 Keith, H., Kun, Z., Hugh, S., Svoboda, M., Mikoláš, M., Adam, D., ... & Mackey, B. (2024). Carbon carrying capacity in primary forests shows potential for mitigation achieving the European Green Deal 2030 target. *Communications Earth & Environment*, 5(1), 256.
- 9 Roos, U., Lidestav, G., Sandström, S., & Sandström, P. (2022). Samråd: an institutional arrangement in the context of forestry and reindeer husbandry in northern Sweden. *International Forestry Review*, 24(3), 441-457.



Photo: Anna-Maria Fjellström

The CliCNord Research Project

The research, which has informed this brief, is part of the project Climate Change Resilience in Small Communities in the Nordic Countries (CliCNord). The project investigates how places far from the larger cities in the Nordic countries can adapt to and withstand future challenges related to climate change. In doing so, the project explores the following questions:

- How do small Nordic communities understand their own situation regarding climate change?
- How do they currently handle adverse events?
- How can they build resilience towards climate-related hazards?

Read more at: <https://www.clicnord.org>

We would like to express our gratitude to all of the members of the Maskaure reindeer herding community and to staff at Silvermuseet / the Institute for Arctic Landscape Research in Arjeplog for the support and hospitality that you provided throughout the research.