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Electronic Supplementary Material
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Title: **On the Decline of Ground Lichen Forests in the Swedish Boreal Landscape – Implications for Reindeer Husbandry and Sustainable Forest Management**

Appendix S1

Central to this study is the status and trend of ground lichen abundant forests. Two changes have occurred within the study period (1953-date) which requires assumptions to be made before the data for lichen abundant areas can be deemed comparable.

First, the definition of lichen abundant has been redefined during the sample period. From 1983 to date lichen abundant was defined as "more than 50% of the ground layer vegetation cover is lichen" (diffuse coverage), however prior to 1983 lichen rich was defined as a "cover that was predominately lichen". Ground layer cover was classified into three blocks: two different moss types and one lichen type. Therefore if all three types are present "predominately" could potentially mean greater than 33.3% rather than the specified 50% from 1983-date. Using ground layer vegetation cover data from permanent sample plots within the Reindeer Husbandry Area (RHA) for the period 1983-2013 we found that for 98% of sample plots where lichen cover was "predominant", the lichen cover was >50%. In total 475 plots were classified as "predominately lichen". Of these 475 plots, 464 had lichen coverage >50% and only 11 plots had lichen cover <50% (specific results for the 11 sample plots with <50% lichen: min=38%, mean=43%, max=49%). Based upon this, the assumption has been made that the definition of lichen abundant is consistent throughout the time series used in the study.

The second assumption regards sample plot size. In 1973 the sample plot size used for vegetation layer definition was changed from a 6.64m to a 10m radius. It could be hypothesized that an object has a higher probability of being classified as lichen abundant on a smaller than on a larger sample plot. This could therefore potentially lead to a relative over-estimation of the lichen abundant area during the period 1953-1972 when compared to 1973-2014. Ideally, to test for bias, both sample plot sizes should be tested simultaneously. However, with historical data this is not possible. Instead we carried out a sensitivity analysis using data from 2009-2013 where we compared the classification of plots as lichen abundant based on a 10m radius sample plot (n=13 008) with twin 0.28m radius plots (n=1226) for the RHA in order to assess the potential impact of the change in sample plot size (Table S1).

Table S1 Comparison of lichen abundant estimates using 10m radius sample plots and twin 0.28m radius sample plots

Sample plot type	Number of evaluated plots within RHA	Number of plots classified as lichen abundant	Area estimate[1] of lichen rich productive forest land within RHA
10m radius	13008	382	406182 ha
2 x 0.28m radius	1226	36	417705 ha

1. Lichen rich forest land with RHA. 2009-2013, productive forest land outside of protected areas as of 2013.

The areal estimates were 2.84% higher when lichen coverage was based on the smaller sample plot. Although the differences in plot sizes in this sensitivity test are not the same as the change in plot size that occurred in 1973 they still indicate that the classification of a plot as lichen abundant is relatively robust to the effects of sample plot size.