

Effects of Forestry Practices on Acidification - Dynamic Modelling of 12 Forest Plots

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Soil- and soil water chemistry at 12 ICP level II sites have been modelled with the acidification model MAGIC 7, with the aim of investigating the effect of different harvesting intensity on acidification of soil and soil water. In the modelling, detailed time series of forest nutrient uptake have been used for each site. The sites are forested with Norway spruce and Scots pine, planted between 1915 and 1955. Three sites are located in the north of Sweden and nine in the south.

Three scenarios

Three scenarios regarding forestry practices have been modelled:

- 1) base scenario: one to four thinnings, clear cutting (stem harvesting), and replanting (today's forestry),
- 2) whole tree harvesting: as the base scenario, but with whole tree harvesting (slash removal),
- 3) no harvesting: thinnings up to year 2000, but linearly decreasing uptake instead of clear cutting.

In all three scenarios deposition trends calculated by CCE/IIASA were used for the modelled period 1860 - 2100 (figure 1). The yearly time series of net forest uptake from 1860 and into the future were constructed based on the history of vegetation and forestry practices at each site. A rotation time is 79 to 141 years (average 98 years) depending on site productivity.

Figure 2. Base saturation (BS) in the soil (left) and acid neutralising capacity (ANC) in the soil water (right) for all the sites, years 1860, 2000 and average for the years 2050-2100 for the three scenarios. The line is between the minimum value and the maximum, the box between the 25 percentile and the 75 percentile.

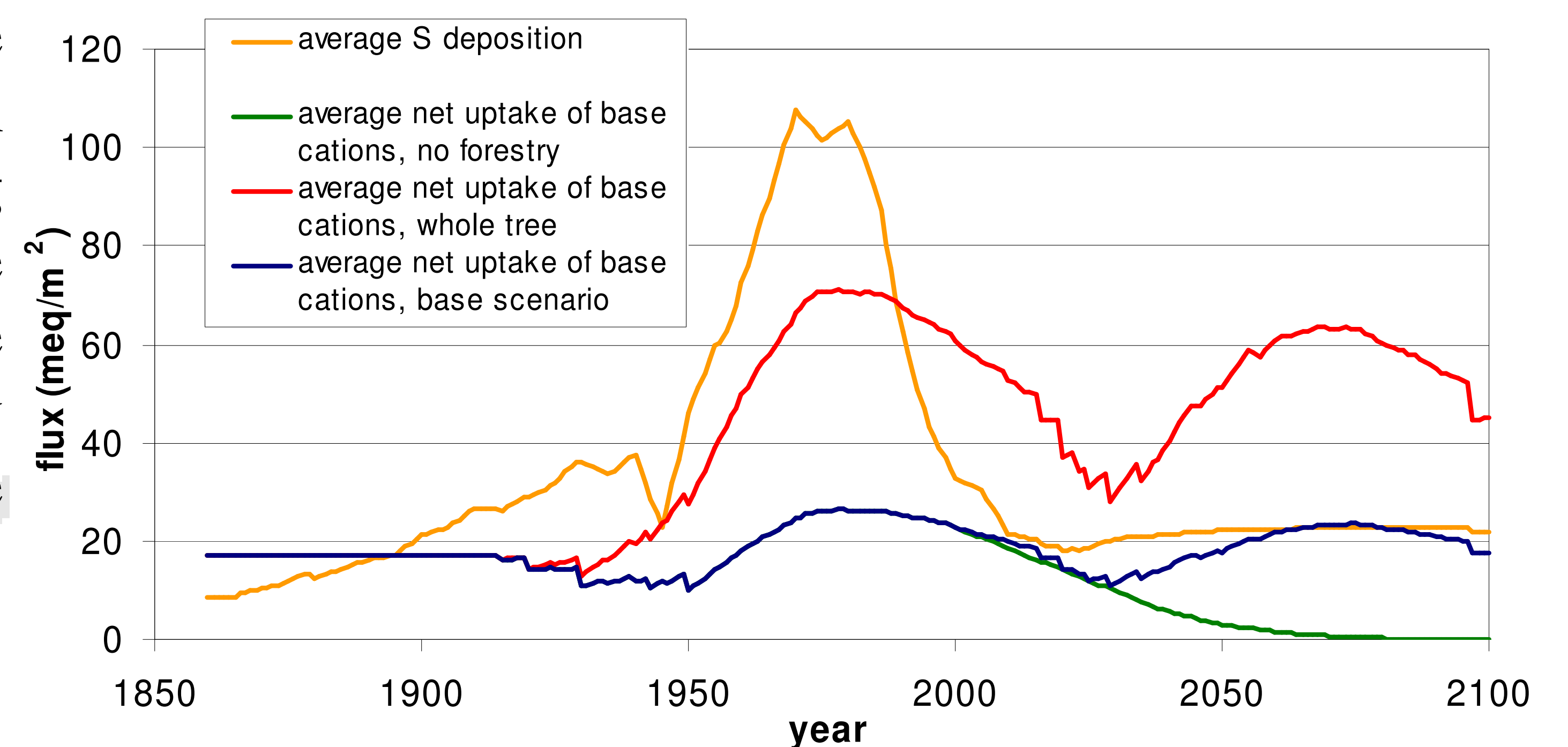
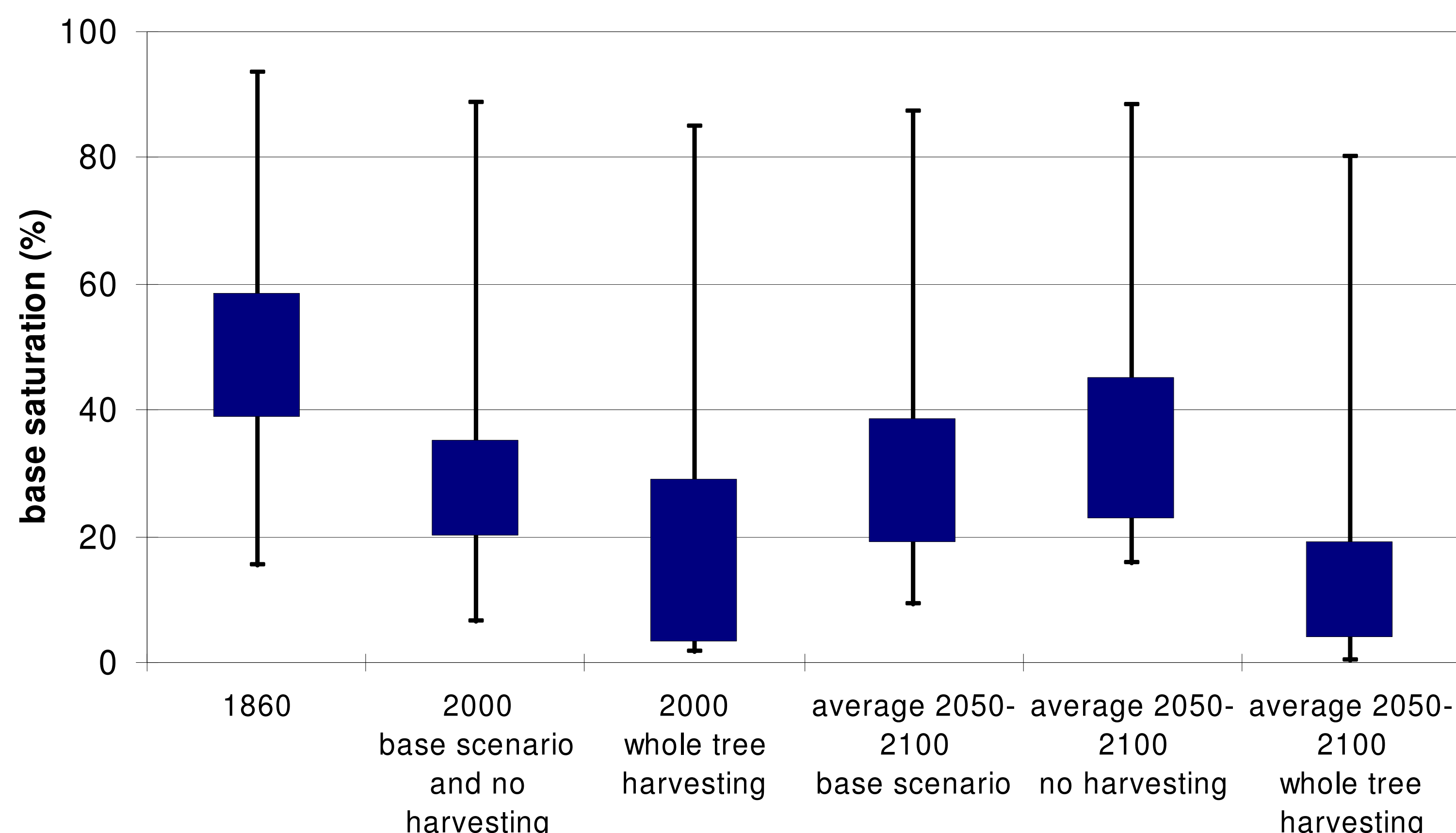


Figure 1. Time series of S deposition and net uptake of base cations in vegetation. Average of all sites, three scenarios.

Results

Both the ANC in the soil water and the base saturation of the soil have decreased between 1860 and 2000, for all sites and all scenarios (figure 2, the base scenario and the no harvesting scenario are identical up to year 2000). After year 2000, ANC rises or stays constant for all scenarios and sites (with one exception, the whole tree scenario in S22a). The base saturation, on the other hand, continues to decrease for most sites in the whole tree scenario and for some sites in the base scenario. In the no harvesting scenario, the base saturation increases for four sites and for the other eight sites it stays almost the same ($\pm 2.6\%$ -units).

Conclusions

None of the 12 sites modelled can support whole tree harvesting without losing base saturation or without compensatory fertilisation. The sites do not recover from acidification under today's forestry practices either (the base scenario). With no harvesting at all, all sites' base saturation and ANC recover, but some very slowly.

