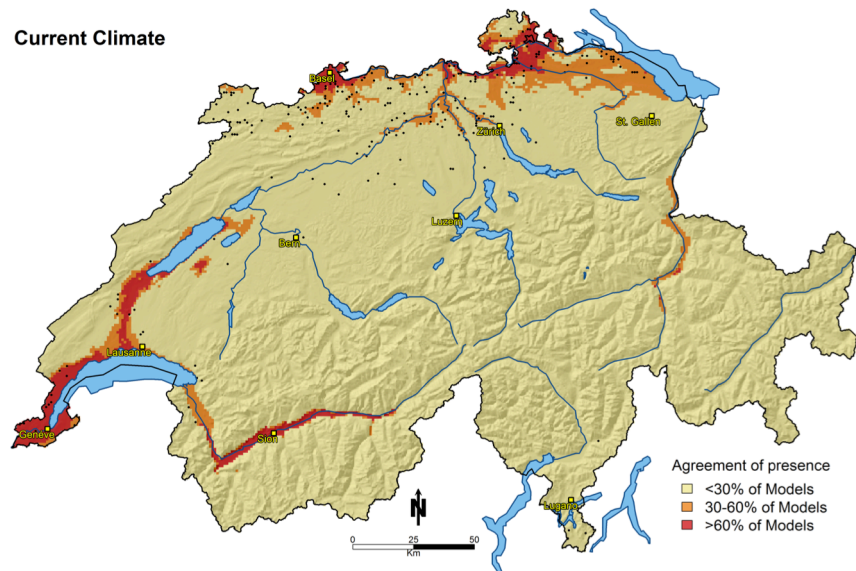


## *Carpinus betulus*

### Description of model and ensemble projections

The current distribution of *Carpinus betulus* is modelled to cover most of the warm regions of Switzerland (Valais, Chur basin, Canton of Geneva, low altitude regions in Basel and in the Canton of Schaffhausen). Not well modeled is the Ticino, and some scattered regions in the Jura and Swiss Plateau of Northern Switzerland. The species naturally inhabits primarily the colline and montane belt, and is often favored by forest management where forests are cut frequently (coppice management). The fact that some parts of the Plateau region are not modeled to be suitable reflects the fact that the model does not find sufficient evidence for *Carpinus* being present in these situations consistently.



**Figure 1.** Current distribution (black dots) from the Swiss National Forest inventory (LFI 1) and simulated habitat suitability under current climate as calibrated from forest inventory data across the Alps (MANFRED project).

Under expected climate change using the A1B scenario, most combinations of statistical and regional climate models predict a rapid spread of *Carpinus* onto the Plateau and the interior valleys (Valais, Engadin, Chur basin), meaning that these regions represent soon climate conditions, under which presence of *Carpinus* is currently being observed. The species can be considered a “winner” of climate change.

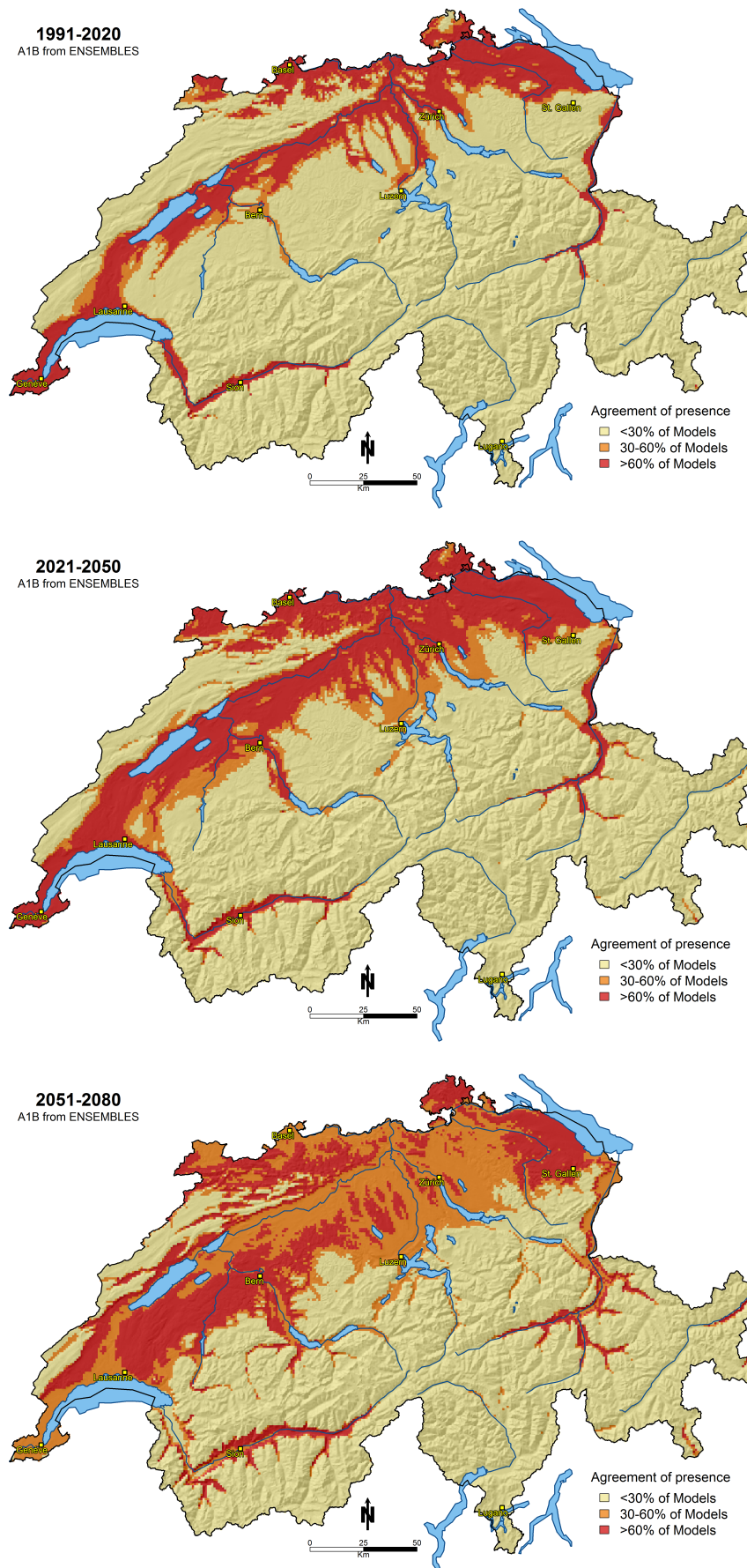
### Synthesis and Conclusions

The model fits the distribution of *Carpinus betulus* comparably well, and can be considered a credible model to project the future habitat suitability of *Carpinus*. The only exception is the lack of projecting suitable habitats in the Ticino, both under current and future climates. The ensemble models project a 17% overlap between the current and the future range in Switzerland and a somewhat higher overlap (35%) in Europe. This is not a very high overlap, but the species is likely moderately mobile and may thus cope quite well under climate change, since it grows relatively fast, produces flowers and fruits at relatively young age, and regenerates well after cutting or damage.

In Europe, the species is projected to lose much of its range (>50%), while it is projected to expand its range by a factor of 5 in Switzerland. Again, this is likely not a severe problem due to its moderately high mobility. The lack of projecting suitable habitats in the Ticino must have its origin in the broad range of habitats the species can be found, and the inconsistent presence in specific climates due to variable management over the whole Alps. The species would naturally cover a much smaller range without human management interventions. This also cautions a bit the massive spread on the Plateau. This spread might be reasonable, if either the climate becomes really dry, or if coppice management practice is frequently applied. Otherwise, the projected suitability shift might be considered too optimistic under future conditions.

#### Range change statistics

	CH	Europe
<b>Current range size [km<sup>2</sup>]</b>	1'433	112'413
<b>Future (2080) range size</b>	7'712	50'565
<b>Range Change 2080/2000 [%]</b>	538.2%	44.9%
<b>Overlap 2000/2080 [km<sup>2</sup>]</b>	244	39'412
<b>Overlap/current range [%]</b>	17.0%	35.1%



**Figure 2:** Ensemble of projected future ranges of suitable habitat as modeled from six RCMs and six statistical models. Light yellow colors indicate that all climate & statistical model combinations project absence of the species, while dark red colors indicate presence. Orange colors indicate uncertainty regarding habitat suitability.