

Castanea sativa

Description of model and ensemble projections

The current distribution of *Castanea sativa* is modelled to cover the low altitudes of the Ticino and some warm regions North of the Alps (lower Valais, Reuss Valley and regions surrounding Lake Zurich and Walensee, Geneva). The species has been naturalized after being introduced by Romans and the traditional chestnut plantation forests nowadays form part of the natural heritage of the Ticino. The model reflects the observed distribution of the species very well, specifically south of the Alps. Obviously, some areas North of the Alps have similar climates. Observations from the Valais indicate that the species grows well, once planted.

Under expected climate change using the A1B scenario, most combinations of statistical and regional climate models suggest a rapid spread of *Castanea* on the Plateau, starting from the regions that already have suitable climates today. It means that these regions soon will have climate conditions, under which *Castanea* is currently being observed to grow well. The Ticino is projected to remain suitable also at low altitudes.

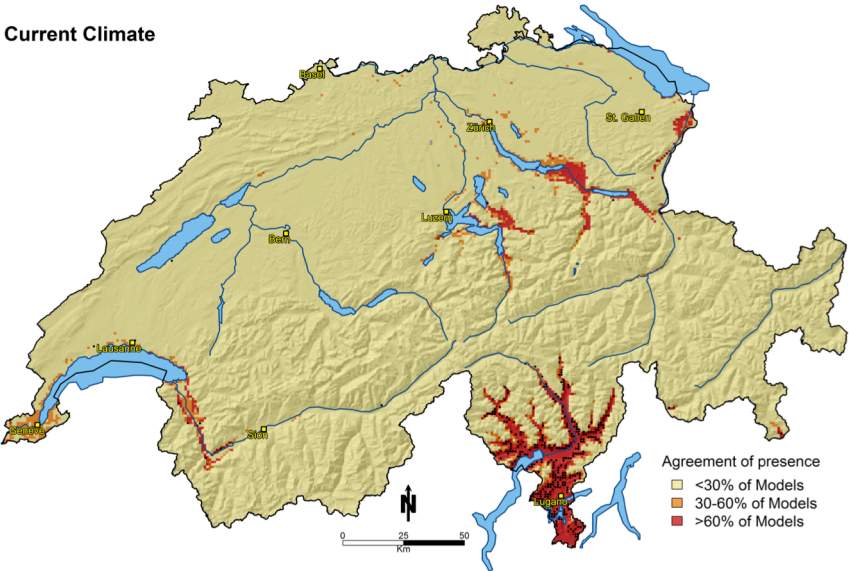


Figure 1. Current distribution (black dots) from the Swiss National Forest inventory (LFI 1) and simulated habitat suitability under current climate as calibrated from LFI forest inventory data of Switzerland.

Synthesis and Conclusions

The model fits the distribution of *Castanea sativa* well, and can be considered a credible model to project the future habitat suitability of the species. The ensemble models project a 100% overlap between the current and the future range in Switzerland. No model was available for Europe, since the ICP Forest Level I data set does not have sufficient distribution points for the species. The simulated spread is high, and primarily expands into regions, where the species is already planted successfully as an ornamental tree.

However, *Castanea* is not likely to expand the range that rapidly onto the Plateau on its own. It also is hampered by pests, and may thus not thrive well under warmer climates. As a late successional, slowly migrating species *Castanea* has difficulties to migrate the large distances required to track climate change and to migrate across the Alps (Meier *et al.* 2012). It therefore likely does not play a major role in Swiss Plateau forests in the future.

In the Ticino, the species is projected to still find suitable habitats at lowest elevations. It will depend on the tolerance and resistance to pests whether the species can still grow sufficiently well under these conditions in the future. Otherwise, oak species will re-colonize these regions, which *Castanea* occupies today.

Range change statistics		
	CH	Europe
Current range size [km²]	1'470	–
Future (2080) range size	15'585	–
Range Change 2080/2000 [%]	>999%	–
Overlap 2000/2080 [km²]	1'468	–
Overlap/current range [%]	99.8%	–

References

Meier ES, Lischke H, Schmatz DR, Zimmermann NE (2012) Climate, competition and connectivity affect future migration and ranges of European trees. *Global Ecology and Biogeography* 21, 164-178.

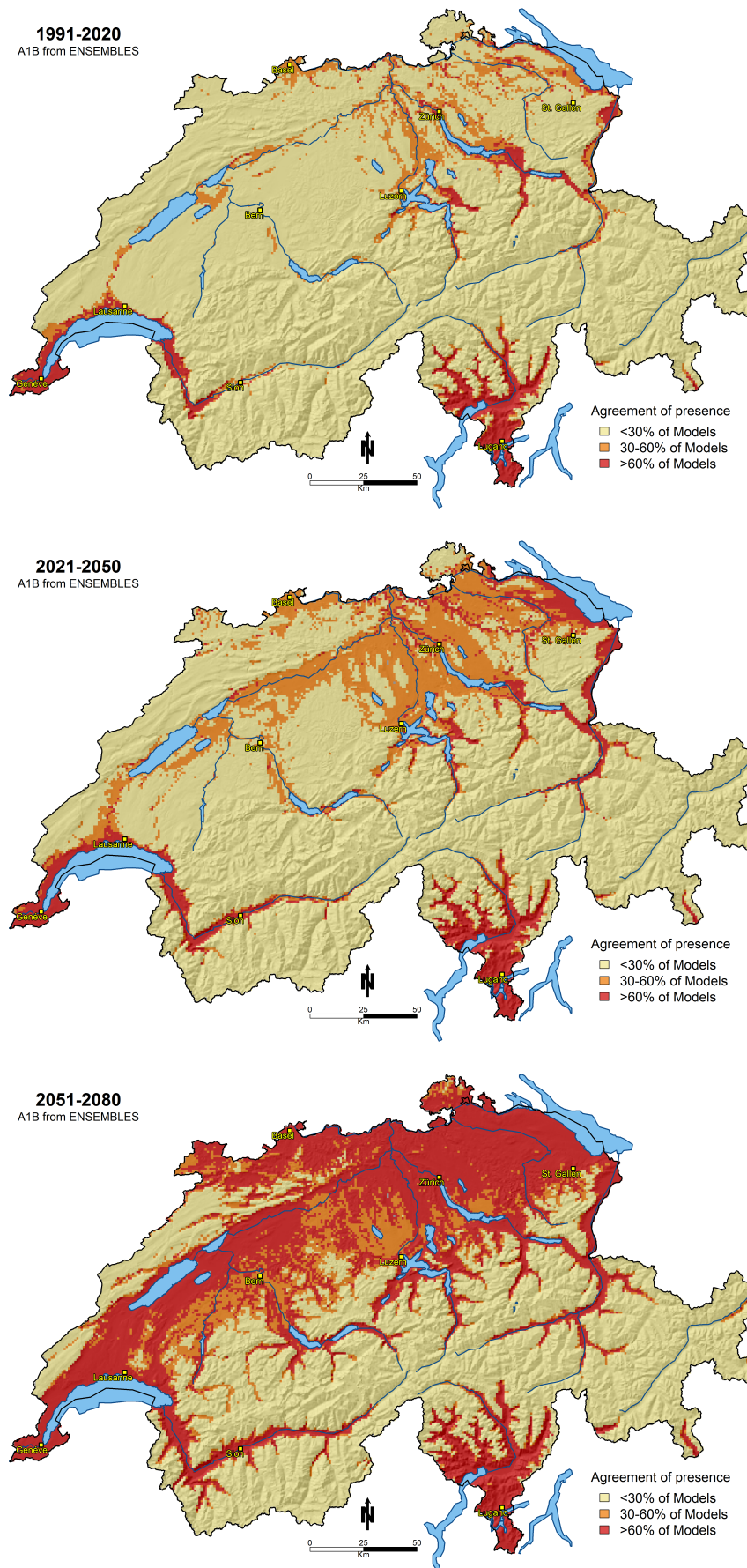


Figure 2: Ensemble of projected future ranges of suitable habitat as modeled from six RCMs and six statistical models. Light yellow colors indicate that all climate & statistical model combinations project absence of the species, while dark red colors indicate presence. Orange colors indicate uncertainty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