

Alnus glutinosa

Description of model and ensemble projections

The current distribution of *Alnus glutinosa* is modelled to cover most of the lowlands of the Swiss Plateau, the Northern and Interior Alps, as well as of the Ticino. The species naturally inhabits low altitude, moist forests throughout Europe and Western Asia. Some of the coldest observations in the Northwestern Pre-Alps and the Central Jura are not captured by the model ensemble, and likely represent conditions for which the models do not find sufficient evidence for *A. glutinosa* being present.

Under expected climate change using the A1B scenario, most combinations of statistical and regional climate models predict a complete colonization of all lower altitudes in Switzerland by *A. glutinosa*, meaning that these regions represent soon climate conditions, under which no presence of *Picea* is currently being observed. The species doesn't seem to colonize much higher altitudes in the near future, and remains in the relatively flat areas of lower altitudes.

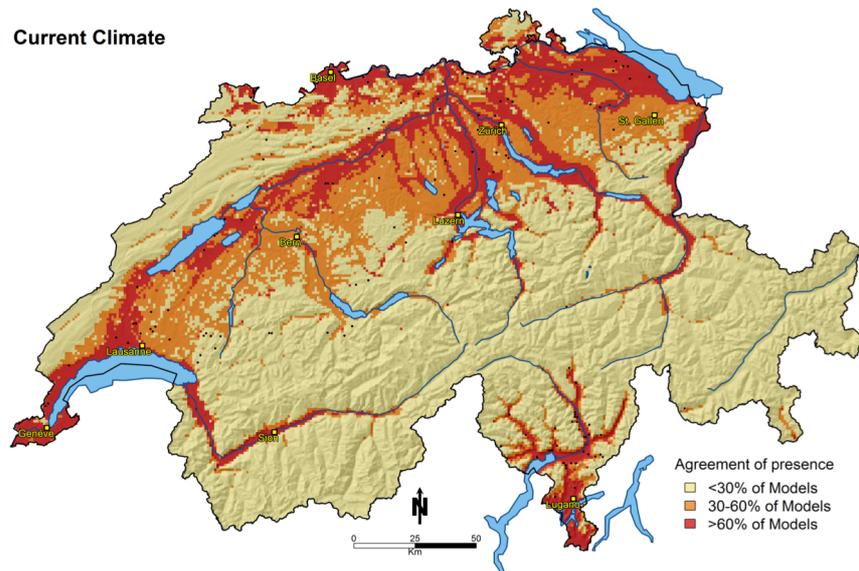


Figure 1. Current distribution (black dots) from the Swiss National Forest inventory (LFI 1) and simulated habitat suitability under current climate as calibrated from LFI forest inventory data of Switzerland.

Synthesis and Conclusions

The model fits the distribution of *Alnus glutinosa* generally well, and can be considered a credible model to project the future habitat suitability of *A. glutinosa*. The ensemble models project a 100% overlap between the current and the future range in Switzerland and still a considerable overlap (71%) in Europe. In addition, the species projected to gain considerable range size in Switzerland (+174%) but will likely lose ~20% of its current European range size. However, the species is not particularly threatened, and will still find sufficient suitable habitat, both in Switzerland and in Europe. As a less preferred timber, it will not get assisted migration. Yet, the species likely doesn't depend on this help, as it has sufficient overlap in many regions of Europe.

In addition, the species easily colonizes initial soils, as it has a symbiosis with the bacterium *Frankia alni*. This is a nitrogen-fixing bacterium, that allows *A. glutinosa* to grow on initial soils and it helps to improve soil fertility through this process. It depends on moist soils, though, and cannot grow on moderately or considerably dry slopes. It therefore is often found along lakes and rivers, since it tolerates better than many other species high water tables and is a dominant species in alluvial forests. Yet, it also grows in other moist forests, though mostly not as dominant species. It grows best if the pH of the soil is ranging between 5.5 and 7.2, meaning that it prefers soils that are not too acidic, but rather high in pH. It usually appears early in successions, due to its capacity to grow on initial soils and due to its low shade tolerance.

The species is susceptible to *Phytophthora alni*, a recently evolved disease that has affected parts of Europe already. The timber is primarily used for fiber production in some regions (paper), and could also be used for energy wood production. It can help stabilize river banks, and can assist in flood control. It is also sometimes mixed into stands of other trees such as Walnut (*Juglans regia*), Douglas fir (*Pseudotsuga menziesii*) or poplar (*Populus tremula*) to increase soil fertility through nitrogen fixing.

Range change statistics

	CH	Europe
Current range size [km²]	6'686	172'507
Future (2080) range size	18'345	142'534
Range Change 2080/2000 [%]	274%	82.6%
Overlap 2000/2080 [km²]	6'686	121'992
Overlap/current range [%]	100%	70.7%

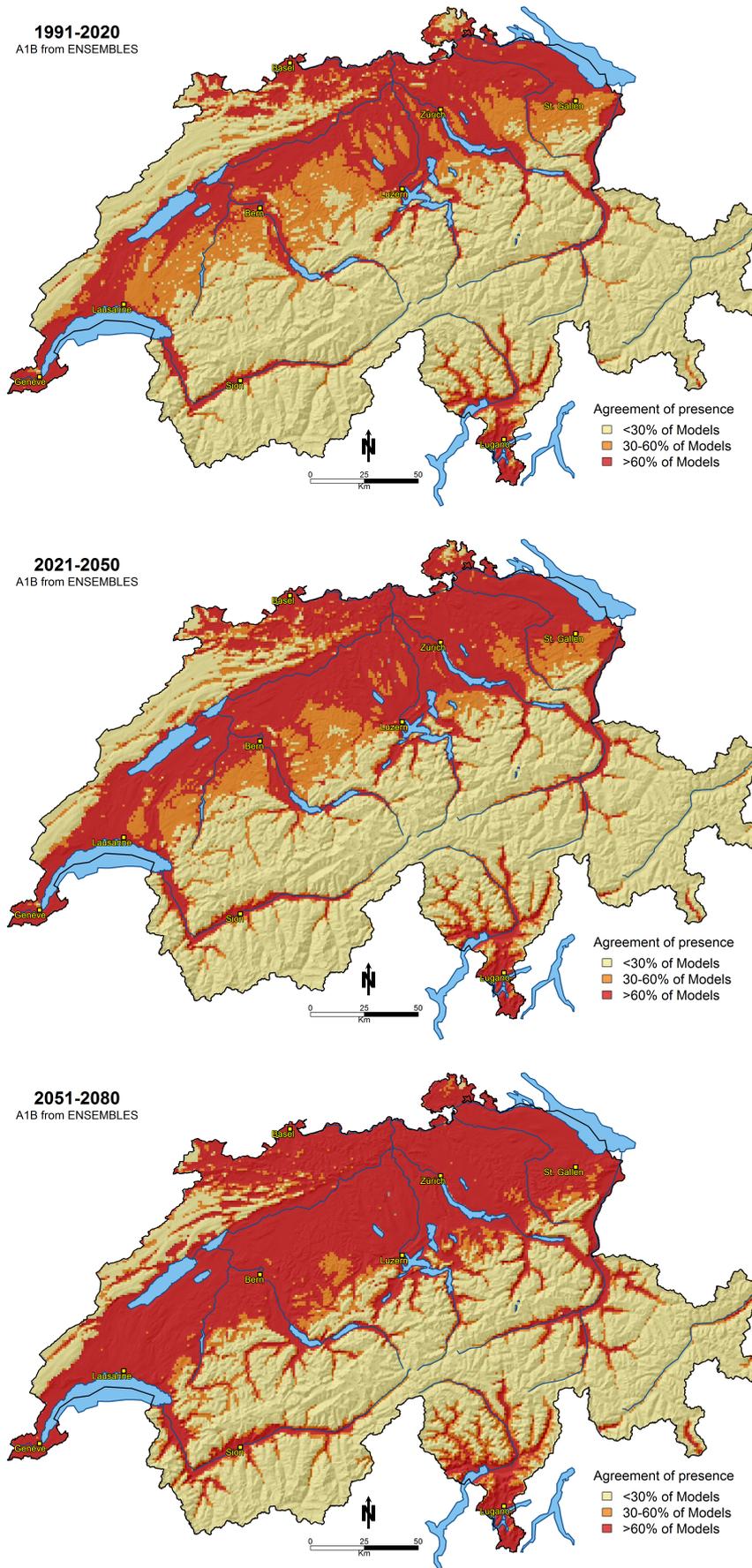


Figure 2: Ensemble of projected future ranges of suitable habitat as modeled from six RCMs and six statistical models. Light yellow colors indicate that all climate & statistical model combinations project absence of the species, while dark red colors indicate presence. Orange colors indicate uncertainty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