



Douglas fir in the face of climate change in Burgundy region

Introduction

In Burgundy, Douglas fir occupies 8% of the forested area (68,000 ha) and supplies the French and European sectors. Its growth rate and the quality of its wood make it a very productive species (up to more than 20m³ of wood per hectare per year) and sought after. However, the successive heatwaves of recent years (2003, 2005, 2018, 2019, etc.) combined with a water deficit have caused sometimes significant dieback in the stands. These observations have encouraged foresters to begin thinking about the sustainability of the sector's supply and the modalities by which the Burgundian territory can be favorable to the continuation of Douglas fir silviculture.

Methodology and results

From the establishment of a network of 90 reference forest plots in private forests, representative of the diversity of climates, soils, altitudes, etc.

The partners intended more specifically to:

- Identify the resilience of Douglas stands in a context of climate change using the ARCHI method;
- Establish suitable silvicultural itinerary for Douglas fir in the context of mixed plantings or plantings of replacement species, based on Potential Biodiversity Index (IBP) measurements;
- Help private forest owners in their silvicultural choices using the BioClimSol application;
- Evaluate the carbon stock of a Douglas stand based on its silvicultural itinerary;
- Evaluate sustainability for soils under Douglas fir stands.

Work analyzing the risks to which Douglas plantations are exposed has notably resulted in a modeling of the risk of Douglas fir dieback due to climate change as well as the production of climate vigilance maps. Intended for decision-makers and planners, these provide an overall idea of the future distribution area of Douglas-fir in Burgundy-Franche-Comté if global warming continues with the same intensity. Finally, an analysis of failed plantings and natural regenerations as well as planting experiments - mixed with other species or with new varieties of Douglas fir - were carried out.

Summarized in a synthesis of actions, the results were transferred to Douglas foresters, landowners and forest managers and professionals in the sector through training days, technical sheets and guides including one on the use of the ARCHI method applied to the Douglas.

Lessons learned

From an exhaustive network of reference populations of Douglas fir in Burgundy-Franche-Comté, the project made it possible to collect stationary, dendrometric, ecological and health data which improve knowledge of Douglas fir as well as to launch experiments in order to adapt this important production for the regional wood industry.

The studies encourage foresters to mix Douglas-fir provenances and thus diversify the genetic potential, and to use the California provenance under certain conditions, particularly with its potential capacity to withstand high heat.

Douglas fir monoculture seems to promote nitrification in the soil, and contributes to the increase in nitrate levels in surface waters. It would be recommended to diversify Douglas fir plantations in full and to have a mixed approach at the scale of small watersheds.

Finally, the study made it possible to validate numerous silvicultural concepts indicating that the increase in forest biodiversity and carbon stock in forest soils is favorable to the adaptability of Douglas fir in the face of climate change.



Figure 1. Douglas fir plantation in Burgundy region.

Louis-Adrien Lagneau © CNPF

The information presented in this factsheet was developed by the FOREST4EU partner, drawing on the innovations and knowledge generated by the indicated operational group with their explicit authorization.

Further information

<https://bourgognefranchecomte.cnpf.fr/nos-actions/recherche-et-developpement/douglas-et-changement-climatique-en-bourgogne>



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