	MODELLING FOREST MANAGEMENT IN MIXED MEDITERRANEAN FORESTS WITH AUSTRIAN BLACK PINE IN THE SOUTHERN ALPS (USING CAPSIS SOFTWARE)	**Ref.**
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Expert(s)	Country	Volume (md)	Amount (€)	Beneficiary	Funding	Start date	End date	Partner(s)	Reference
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Detailed description of the project	Services provided

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Forest growth models are used by the French National Forest Services (ONF) to support forest managers in their operational decisions. A growth model is defined by a set of equations relating the age, the dendrometric characteristics of a forest stand, and the dimensions of the trees that constitute the stand. These models take into account a broad set of forest types and silvicultural conditions. This makes it possible to identify the most important variables in the evolution of a given forest stand, and to classify them by way of a sensitivity analysis. Growth models also save considerable time and money, compared to experimental field settings that take several years and resources to produce results.

The Austrian black pine has been widely used to reforest mountainous areas in the Mediterranean hinterland. These forest stands are characteristic of strong and representative dynamics that occur in forests elsewhere in the Southern Alps: colonization by "climax" species, disease induced by drought or by bark beetle attack etc. Their renewal is thus a crucial issue.

In the framework of the publishing of the new edition of the Silvicultural Guide for the Forests of the Southern French Alps, The Mediterranean Forests Ecology Unit of the National Institute of Agronomic Research (URFM, INRA-Avignon) has been contracted by the ONF to update Austrian black pine management techniques based on growth models. This study aimed at modeling the actual black pine forests management techniques, based on the growth models developed by the INRA (using CAPSIS in particular), in order to update the techniques being used the ONF.

Services provided

This study summarizes the main characteristics of the evolution of the forests of the mountainous-Mediterranean hinterland of the southern Alps, with the emphasis on the Austrian black pine, which represents more than 70,000 ha of production forest in the region that is covered by the guide: auto-ecology, natural dynamics (beech and fir colonization, disease caused by drought and bark beetle attack), actual management techniques (even aged mixed-forest).

The principal variables used for the simulations are then introduced: thinning intensity, diameter and volume of the average tree removed during thinning, the thinning volume, final harvest volume, total production in volume, stand stability evolution and the slenderness coefficient across time. To simulate the evolution of a given stand, three fertility classes were considered, as well as various initial stands (low density, classic, extensive). Finally, 21 silvicultural techniques were simulated, including those currently used by the ONF. A "systematic thinning for biomass" variant was also assessed.

The results of the study showed the necessity to update the current silvicultural techniques to avoid reductions in the total production volume as a result of overly intensive thinning. Updated silvicultural techniques were proposed for each fertility class (seeding cut at 90 years, reduction of seedling density to 1,600 trees/ha, thinning oriented towards dominant trees with harvest above 60 m^3/ha and less than 35% of the total stand volume before thinning), permitting the maximising of the harvesting diameter in each fertility class. The study concludes on the importance of the silvicultural history of the stand in order to predict its evolution, and on the importance of equipping forest managers with the tools necessary for sound decision-making.