



## Setting up innovative silviculture trials

### Planting on waterlogged soil

#### Introduction

Waterlogging is a major constraint for many forest species, and can affect stand productivity and even the survival of seedlings. Its impact varies according to criteria such as its intensity and depth of appearance. The effects of climate change could exacerbate this problem by increasing winter rainfall and summer drought.

A full soil analysis is essential to determine which tree species are best suited to the site. Soil preparation may also be a solution in the case of reforestation, in order to reduce the waterlogging problem. One of the aims of the RAISON project is to identify the most favourable planting method(s) for developing a production forest stand on waterlogged soil.

#### Methodology and results

A property located in the commune of Saint-Gatien-des-bois was selected by CETEF members to set up a system on a 4.6 ha plot, occupied by a Sitka spruce forest planted in 1972 and characterised by fairly acid soil with surface hydromorphy (at shallow depths). Numerous diebacks have led the owner to harvest the spruces in full in 2019, with a view to replacing them with a species more suited to the site. A test comparing 4 planting methods on waterlogged soil was carried out on 1 ha of this plot. The planting scheme involved a row spacing of 3.5 m and a spacing of 3 m between each plant. The initial density was 1143 plants/ha. Each plot has 14 rows with 20 plants/row. Thus, 280 Sessile Oak seedlings will be planted on each of the 4 plots of 25 acres according to the following methods: "1" manual planting without subsoiling, "2" planting on domed ridges, "3" planting on domed posts and "4" planting on domed posts and biological drain (tamping with Willow). The plot for modality 4 had a tamping between each oak plant and 266 willows were therefore planted. There were no replications. In order to avoid edge effects, the lines planted at the edge of the plot were not measured, forming isolation strips.

The ends of the plot were marked with 1m20 stakes and the outside trees closest to the plot were marked with a line. Measured trees will be marked by painting a horizontal line at 1.30m and will be numbered once they have reached a sufficient diameter. All the species will be planted at the same time (winter 2021-2022). The plots of land where the system will be installed have been clear-cut, followed by a full-scale shredding operation in the summer of 2020 and renovation of the existing ditches. The waterlogged nature of the soil means that subsoiling is out of the question.

The factors studied are changes in growth, shape and the general behaviour of the species. A comparative analysis of the costs of each method will be carried out. At installation, the height of all the trees is measured. Over the following three years, the following variables are measured: the condition of the trees (alive, dead, etc.), their height and the presence of phytosanitary problems. Then, the above variables are measured on a minimum sample of 30 trees, chosen randomly or systematically, as well as the circumference (if the tree reaches 1m30 in height and as soon as  $\frac{3}{4}$  of the trees exceed 10 cm in circumference). Before the 1st thinning, all the trees are measured for the above variables. The height is measured on a sample of 20 trees evenly distributed in 5 diameter classes of the same amplitude.

Finally, the silvicultural interventions (protection against game, clearing and thinning) must be the same for all modalities in order to avoid bias when comparing them. Monitoring for at least 30 years is planned.

## Lessons learned

This experiment is the only one of its kind in Normandy, and in future it could serve as a reference protocol for increasing the number of experimental planting sites on waterlogged soils. The data measured will be used to assess the impact of planting methods on stand growth. Integrating these data into a database containing all the systems of this type at national level could enable these comparisons to be refined. Experimenting with the effect of different planting methods on the survival and productivity of tree species is a long-term project for the forest and requires long-term sources of funding to enable these stands to be monitored.





Figure 1. Oak plant in its protective cover.  
Sylvain Gaudin © 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://hautsdefrance-normandie.cnpf.fr/projet-raison>



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