Deliverable summary D5.4

Report on cost-effectiveness of new methods of eradication of forest pests

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Project coordinator:	**Hervé Jactel (INRAE)**
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Dissemination Level	
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CI Classified, as referred to Commission Decision 2001/844/EC	
CO Confidential, only for members of the consortium (including the Commission Services)	

1. Summary

The HOMED project aims to develop scientific knowledge for the management of emerging native and non-native invasive species of pests and pathogens menacing European forests. Regarding invasive species, the project aims to develop knowledge and management solutions for its monitoring and control, as well as for its prevention, early detection, and eradication. This work is included in Work Package 5, which focuses on the development of scientific knowledge and management solutions to improve eradication strategies. Here we focus on the eradication strategies of the pine wood nematode (*Bursaphelenchus xylophilus*, called "PWN" hereafter), one of the most threatening pests of conifer forests in Europe. To mitigate the impact and decrease the spread of PWN, the European Union (EU) has specified a series of regulations that makes it mandatory for the European Member States, in the case of detection, to immediately delimit a clear-cut zone of at least 500 m-radius around each infected tree. However, previous studies showed that a clear-cut zone may not be efficient to stop the spread, and may even accelerate the spread of the vector beetles, and therefore, should be revised. The aim of this study is to compare the cost-effectiveness of a clear-cut strategy, with tree-by-tree selective cutting, combined with intensive surveillance. To compare the two strategies, we used an individual-based model that describes the dispersal of the vector, the longhorn beetle Monochamus galloprovincialis, and transmission of PWN (Robinet et al. 2019, 2020). This model was combined with sub-models for assessing the cost-effectiveness of alternative strategies. This work also contributes to Work Package 2 (Task 2.4: Development of a generic framework for economic assessment of risk mitigation).

Our modelling shows that independent of the surveillance method, the number of total cut trees is substantially larger for the clear-cutting strategy than the tree-by-tree selective cutting. Concomitantly, clear-cutting results in much higher costs and a huge number of healthy trees that are cut. Yet, the clear-cutting strategy also allowed a higher sensitive effectiveness, expressed in the proportion of infected trees that were cut, compared with the tree-by-tree selective cutting. The difference on the sensitive effectiveness between the two strategies is greatly evident when surveillance is done by road visual sampling surveys. Combining visual surveillance with trapping networks did not have a detectable increase on the sensitive effectiveness for both strategies, whereas it increased slightly the costs. However, when aerial surveillance is used, which allows a high detectability of symptomatic trees, the difference in the sensitive effectiveness between the two eradication strategies becomes minor. In contrast, the total costs for clear-cutting strategy were always higher than tree-by-tree selective cutting independent of the surveillance method. When combined with aerial surveillance, management costs for tree-by-tree selective cutting were 20-fold lower than the clear-cutting strategy.

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