

How to eradicate an invasive forest pest without clear-cutting

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Introduction

- The pine wood nematode (PWN) *Bursaphelenchus xylophilus* (Steiner and Buhner) Nickle is the causal agent of the pine wilt disease.
- Native to North America (USA and Canada), it has invaded Japan, China, Korea, Portugal, and Spain recently, where it can cause up to 80% - 90% tree mortality, leading to huge economic impacts to the forest sector.
- In Europe, *Monochamus galloprovincialis* (Olivier) is currently the only identified vector of PWN.
- EU regulations require **clear-cutting** a 500-m-radius circle around infested trees (European Commission, 2015). However, this radius is too small to eradicate PWN according to previous studies.
- Alternative: **selective-cutting** on a tree-by-tree basis with intensive surveillance.

Research question

- Which strategy is the most cost-effective: Clear-cutting (CC) or selective-cutting (SC)?

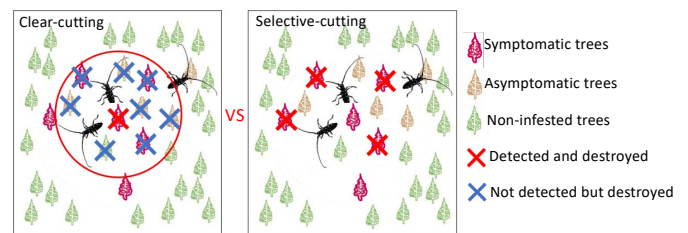


Figure 1. Concepts of two strategies.

Materials and methods

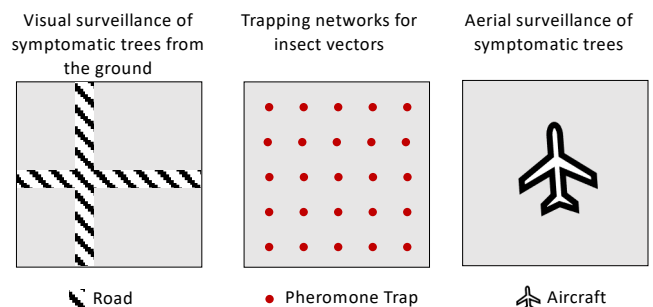
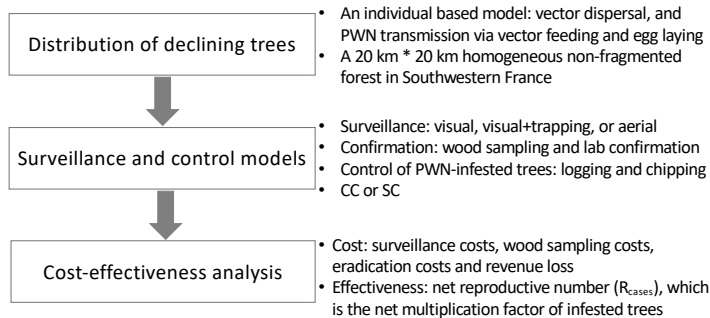


Figure 2. Concepts of three surveillance methods.

Results and conclusion (Sun et al., submitted)

- SC with intensified aerial surveillance allows eradicating PWN (net reproductive number: $R_{cases} < 1$) with **~200-fold** lower costs than CC provided 100% of the infested trees are symptomatic;
- Containment would be more realistic than eradication if PWN is introduced into the areas where **not** all infested trees can be detected and vector beetles are at high population level.
- Aerial surveillance is more efficient than ground surveillance.
- SC is always more cost-effective than CC for the same level of effectiveness, as it saves the costs of cutting healthy trees.
- Overall, these results highlight the need to revise EU policy on PWN management to allow the more cost-effective selective-cutting strategy in non-fragmented pine forest.

References

- European Commission. (2015). Commission Implementing Decision of 26 September 2012 on emergency measures to prevent the spread within the Union of *Bursaphelenchus xylophilus* (Steiner et Buhner) Nickle et al. (The pine wood nematode). Official Journal of the European Union, September 2012, 1–22. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012D0535>
- Sun, H., Robinet, C., Jactel, H., Mourits, M., Branco, M., van der Werf, W., & Douma, J. C. (under revision at *Journal of Applied Ecology*). How to eradicate an invasive forest pest without clear-cutting

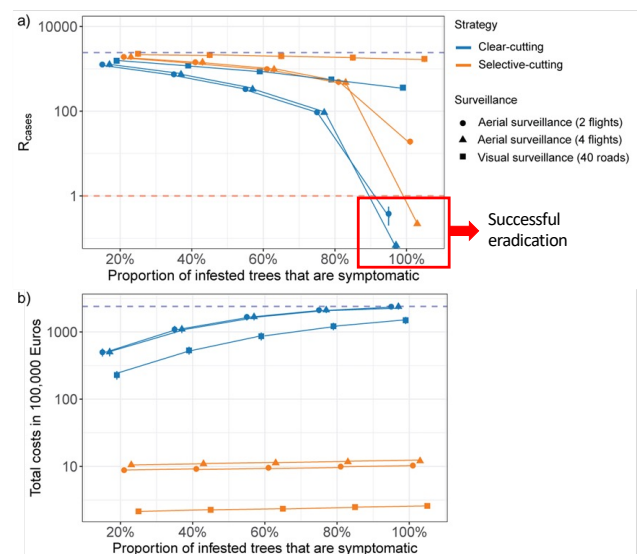


Figure 3. Relationships between the proportion of infested trees that are symptomatic at the time of surveillance and R_{cases} (a) and total costs in 100,000 Euros (b). R_{cases} and costs are presented on a log10 logarithmic axis.