Deliverable summary D5.3

Methods for estimating effective radius of clear-cut zone as eradication method for forest PnPs

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Dissemination Level	
PU Public	**PU**
CI Classified, as referred to Commission Decision 2001/844/EC	
CO Confidential, only for members of the consortium (including the Commission Services)	

1. Summary

Objectives:

One of the main measures to successfully eradicate invasive forest pathogens and pests (PnPs) is to fell and remove all susceptible plants within an area, called clear cut zone (CCZ). Our objective was to develop models for estimating the effective radius of CCZ as an eradication method for forest PnPs. The definition of CCZ relies on the understanding of the dispersal capabilities of the PnPs species and its behaviour, which may vary according to landscape heterogeneity. With this goal, we developed simulation models based on the dispersal ability of the species and on landscape structure. We used as model species the pine sawyer beetle, *Monochamus galloprovincialis* (Olivier), which is the vector of the invasive pine wood nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer), in Europe.

Rationale:

In a previous study, the team from INRAe developed an individual-based dispersal model to better estimate the dispersal ability of *M. galloprovincialis* in a homogeneous pine landscape. The shape of the dispersal kernel was calibrated on distances recorded in flight mill experiments. Model parameters were then fine-tuned based on mark-release-recapture experiments in a homogenous landscape composed of pine plantations. The dispersal of the nematode vector and the nematode transmission were then used to estimate the relationship between the radius and the effectiveness of the CCZ at eradicating the PWN.

In a second approach, using again mark-release-recapture experiments we analysed the effect of landscape heterogeneity on the vector's dispersal. A mark-release-recapture experiment was carried out in a heterogeneous landscape, combining maritime pine plantations, clear-cuts and isolated patches of broadleaved and mixed forests. The field experiment was done in the southwest of France, 36 traps were disposed in a grid, about 170 m distant from each other, occupying an area of about 100ha in a heterogeneous landscape (Fig. 1). Least-cost path analysis was then used to model dispersal trajectories and assign friction values to each land-use type in the landscape. Friction values of each land use type were estimated based on a model optimization process. For that, we assumed that the number of catches in each trap (recaptures) would depend on the least-cost pathway between the release point and the trap. Multiple scenarios with different friction values for the different land use types were used. Successive iterations allowed identifying the friction value of the different land-uses which best explained the traps catches.

Finally, the combination of friction values assigned to land-use types is integrated in the dispersal model to determine the effectiveness of CCZ in heterogeneous habitats.

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