Life Cycle of *F. circinatum*

General information

Description	Study of life cycle of *F. circinatum*	
Geographical area	Europe	
Group of tree species	Pine species	
Date	July 2018	
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Tool type	Case studies	Literature review
Tool format	Text	
Language	English	
Risk management plans to which the tools can be added	Risk management plan of Pitch Canker Disease	
Risk management plans link	https://plurifor.efi.int/wp-content/uploads/WP2/plans/Fusarium-risk-plan_ES.pdf	
This tool is…	☒ an improved tool	
Original tool of which this one is an improvement	Literarure review of the lyfe cycle of the pathogen (Gordon et al. 2001; Wingfield et al. 2008; Bezos et al. 2015)	

Topic

Risk	Pine pitch canker		
Risk component	☒ hazard	☐ impact	☐ vulnerability
Risk area	Risk planning		
Risk phase	Surveillance/monitoring/early warning		
Risk phase (alternative terms)	Prevention		
Sendai priorities	☒ Priority 1: Understanding disaster risk ☒ Priority 2: Strengthening disaster risk governance to manage disaster risk ☐ Priority 3: Investing in disaster risk reduction for resilience ☐ Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction		
Contribution to Sendai targets	☒ Reduce global disaster mortality ☐ Reduce the number of affected people ☐ Reduce the direct disaster economic loss ☐ Reduce disaster damage to critical infrastructure ☐ Increase the number of national and local disaster risk reduction strategies ☐ Enhance international cooperation to developing countries ☐ Increase availability of and access to multi-hazard early warning systems and disaster risk information and assessment		

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Description and analysis

Summary
Study the life cycle of the pathogen to solve one of the current main problems; which are the pathways of spread of the disease. For this purpouse, the endophytic state of the fungus, healthy plants harvouring PPC and other plants in the understory as reservoir of FC are important topics that should be studied in depth.

Place in national/regional policy
Currently, there is some legislation about the trade of vegetal material and the movement of wood in demarcated areas. However a better knowledge of the life cycle would provide more information about this topic.

Goals and achievements
The aim of this tool is to provide valuable information about the disease cycle of the pathogen and their main ways of dispersion, including its endophytic stage in asymptomatic grass and other understory plants.

Stakeholders involved
A workshop was held in Aveiro to present the new diagnosis tool to researchers, forests owners and representatives from Spain and Portugal. Furthermore, Cantabria government is involved as well as nursery owners and managers.

Implementation stage
The study of the pathways of dispersion of the pathogen has been completed and is countinoulsy updated with new information found in literature.

State of technical knowledge
It is previously known that dispersal of *F. circinatum* spores occurs through wind, insect vectors, water splash, soil, movement of infected plant materials and during human activities. The understory vegetation can serve also as reservoir of inoculum of the fungus.

Regulatory and/or socio-economic contexts
The tool can help forest owners and authorities to make decisions about trade of vegetal material or management of infected stands.

Impacts of the tool

A better understanding of the disease life cycle and the ways of dispersion of the fungus, would provide valuable information to avoid the expansion of the disease and could improve the measures of controlling the disease.

Implementation requirements and durability

Description of the implementation steps
Literature review has been done to complete the life cycle of the fungus. In particular, special attention has been paid to the the pathways of spread of the disease, the endophytic stage of the fungus and the presence of the fungus in the understory vegetation. Further implementation stages would include the use of this information to make decisions about plant trade and forest operations.

Governance
UVa is responsible for literature review of the tool. Cantabria government will contribute with technical support and assistance.

Regulatory framework
The tool will help to make decisions on vegetal trade and reforestation process.

Human resources requirements
Implementation of the knowledge provided by the tool will require communication between experts, authorities and forest and nurseries owners.

Financial requirements Since the result of the literature review is to provide information to make proper decisions, no finalcial requirements are expected.
Technical requirements Forest and nursieries owners and authorities should be aware of the best practices to avoid the dispersion of the disease.
Priorities identified for successful implementation of the tool (political, technical, human, financial…) The priorities for the implementation of the tool are (i) to perform a proper literature review to identify all the pathways of dispersion of the disease; (ii) to develop a life cycle of the fungus including all the relevant stages and risks of dispersion; (iii) to spread the knowledge among the stakeholders and authorities.
Challenges or risk factors (legal, financial, safety…) expected during the implementation and solutions proposed One the life cycle and the pathways of dispersion are identified, the main risk is that authorities and forest or nurseries owners don´t follow the "good practice" manual to avoid disease spread.
Additional and non-formal experiences to help the implementation of good practice To help the implementation of the tool in the knowledge of the life cycle of the pathogen, authorities and nursery owners should be trainned and informed to be more familiar with it.

SWOT analysis

Strengths	**Weaknesses**
Trough literature review, the knowledge-gaps of pathways of spread of the disease will be completed. The information can serve as basis for forest owners and to prevent spread of the fungus. This tool specifies the transmission of the pathogen from diseased trees to healthy ones, due to the role of *Tomicus piniperda*.	More data are needed to provide a comprenhensive view of the endophytic stage of the fungus and its presence in the understory vegetation. Moreover, the life cycle of other insects as plausible vectors of the disease may be included.
Opportunities	**Threats**
New information may be included in the Good Practice manual to prevent the dispersion of the disease.	Globalization and vegetal trade may increase the spread of the pathogen. Difficultites to persuade the stakeholders to change their habits.

Lessons learnt

Evaluation process, if exists (internal or external) An evaluation of the literature review of pathways of spread of the disease will be made to complete the life cycle of the fungus and the mains pathways of spread.
Assessment of results (quantitative and qualitative) and comparison with main goals Life cycle of the fungus has been completed and endophytic stage studied. The presence of the F. circinatum in understory plants has been recently proposed as a reservoir of the pathogen.
Negative aspects identified There are gaps ok knowledge regarding the pathogen biology and pathways of transmission.

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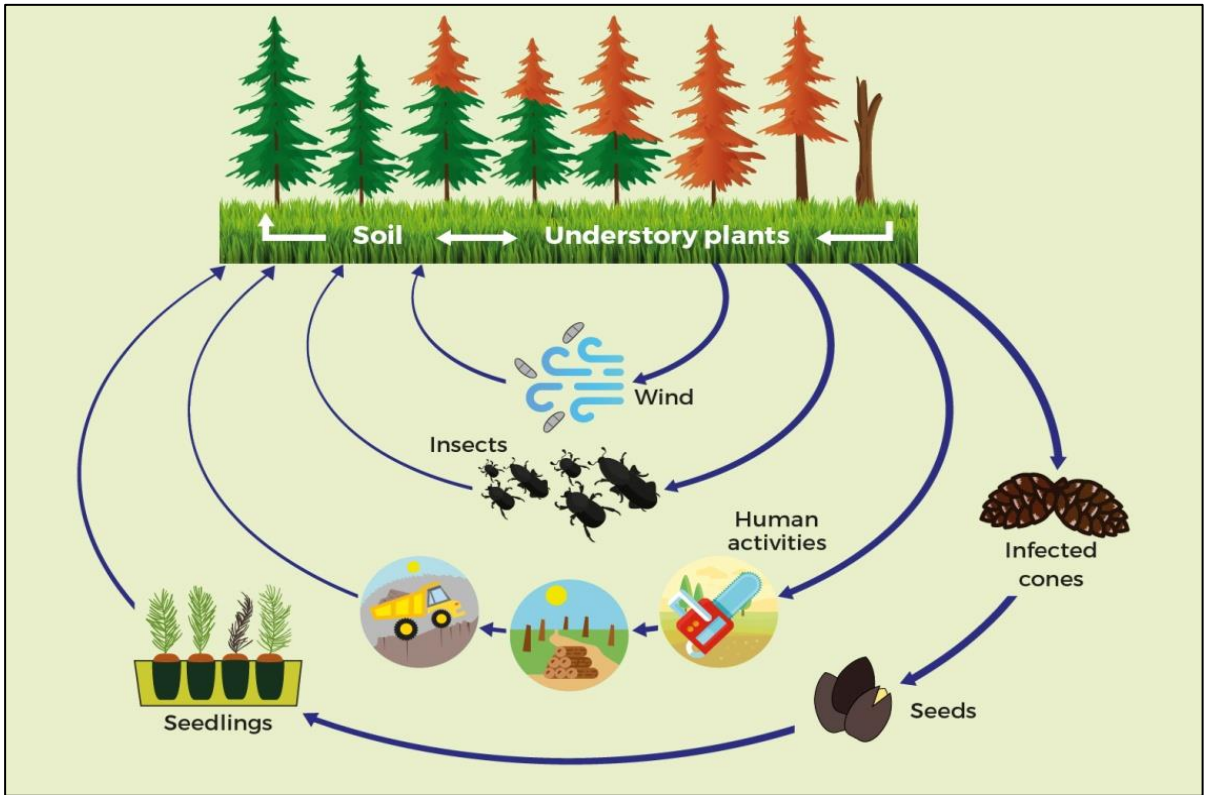
Unexpected consequences (short- / mid- / long-term) and corrective measures implemented
N.A



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