

# HOW CAN THE SURVEILLANCE OF INVASIVE ALIEN PESTS AND PATHOGENS PREVENT TREE PANDEMICS?



HOLISTIC MANAGEMENT OF EMERGING FOREST PESTS AND DISEASES



## Summary

This policy recommendation is based on a paper by Santini and Battisti published in *Frontiers in Physiology* in 2019.

European researchers and EU project HOMED partners study tree pandemics, which are considered a reason for tremendous economic and ecological losses in forest and urban ecosystems. The large-scale infections are often caused by the introduction of an alien pathogen that can find a native insect vector. This process may result in a global epidemic, as already observed with large scale tree diseases, such as Dutch elm disease, cypress canker disease, pine wilt disease, which lead to heavy economic, ecological, and landscape impacts. To prevent tree pandemics and negative impacts on economy and ecosystems, HOMED researchers suggest several urgent actions.

## Keywords

tree pandemics, ecology, emerging diseases, biodiversity, surveillance



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[homed-project.eu](https://homed-project.eu)

# Relevance to legislation

## EU Regulation 1143/2014 on Invasive Alien Species

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Stepping up EU Action to Protect and Restore the World's Forests

### COM/2019/352 final

AAnon. (2016) Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants, amending Regulations (EU) No 228/2013, (EU) No 652/2014 and (EU) No 1143/2014 of the European Parliament and of the Council and repealing Council Directives 69/464/EEC, 74/647/EEC, 93/85/EEC, 98/57/EC, 2000/29/EC, 2006/91/EC and 2007/33/EC OJ L 317, 23.11.2016, p. 4–104

# Relevant acts

- [Commission Implementing Regulation \(EU\) 2019/1262](#) updating the list of invasive alien species of Union concern
- [Commission Delegated Regulation \(EU\) 2018/968](#) with regard to risk assessments in relation to invasive alien species
- [Commission Implementing Regulation \(EU\) 2018/1454](#) specifying the technical format for reporting by the Member States
- [Commission Implementing Regulation \(EU\) 2017/1263](#) updating the list of invasive alien species of Union concern
- [Commission Implementing Regulation \(EU\) 2016/1141](#) adopting a list of invasive alien species of Union concern
- [Commission Implementing Regulation \(EU\) 2016/145](#) adopting the format of the document serving as evidence for the permit issued by the competent authorities of Member States

# Publication date



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# Support to the implementation of the Regulation

Several information documents have been developed in support of the implementation of the Regulation (they should not be considered to represent the views of the European Commission).

## Prevention:

- [Categories of pathways of introduction and spread of IAS](#)
- [Prioritising Pathways of Introduction and Pathway Action Plans](#)

## Early detection and rapid eradication:

- [Surveillance of Invasive Alien Species of Union concern](#)
- [Identification guide for customs on invasive alien species of Union concern](#)

## Management:

- [Management of Invasive Alien Species of Union concern](#)
- [Note on lethal measures to manage IAS of Union concern](#)

# Relevance to actual environmental problems

Biodiversity, Tree pandemics, Emerging diseases

# Description of the problem

Based on the EU Regulation 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants, more specifically clause (4) regarding the threat from introduction of plants and plant products into the EU territory owing to globalisation of trade and climate change, HOMED aims to propose effective and innovative methods to improve the control of invasive alien pest and pathogen species in EU forests.

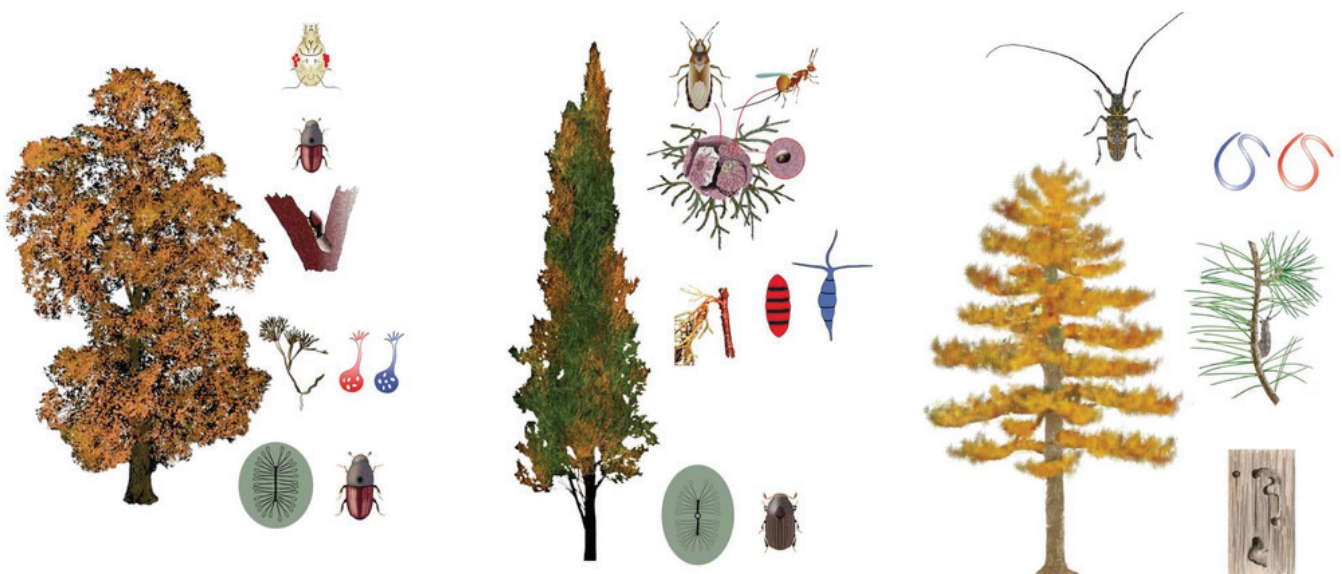
Tremendous economic and ecological losses in forest and urban ecosystems are caused by the introduction of invasive alien pests and pathogens. Documented annual total costs of invasive alien species (IAS) in EU has been estimated at 12.5 billion euro (Kettunen et al., 2009). Known environmental and economic costs of IAS in the US, UK, Australia, South Africa, India are respectively estimated at a total of over US\$ 314 billion (Pimentel et al., 2001; Pimentel et al., 2005).

When humans carry alien pathogenic organisms into new environments, these may find suitable naïve hosts (lacking resistance genes) and environments favoring their pathogenic behavior, like climatic conditions, presence of insect vectors or the lack of natural enemies (Santini et al., 2018). This process may result in epidemics of newly emerging diseases, and eventually, in a pandemic, especially as particular tree diseases, such as Dutch elm disease (associated with

native bark beetles), cypress canker disease (associated with native bark beetles and bugs), pine wilt disease (associated with native longhorn beetles) are well-known for their heavy economic, ecological, and landscape impacts. As a further potential example of a pandemic in action, the case of the fungus *Bretziella* (former *Ceratocystis*) *fagacearum*, agent of the oak decline, is to be considered. This fungus is considered invasive in the USA (Juzwik et al., 2008), where it is vectored mainly by native nitidulid beetles associated with the fungal fructifications (Jagemann et al., 2018). If it were introduced in Europe, it could develop an association with native species of vectors, either bark or nitidulid beetles.

## Results based on the three above mentioned diseases suggest that:

- Pandemics derive from the introduction of an alien pathogen that exploits well-developed interactions between native non-aggressive microorganisms and insect vectors associated with trees, in order to be transported by the latter.
- Deciphering these interactions in native systems predicts the outcome of the introduction of new pathogens and the development of new tree pandemics.



Agents involved in the development of tree pandemics causing dieback of elms (Dutch elm disease - *Ophiostoma novo-ulmi* - *Scolytus* spp.), cypress (cypress canker - *Seiridium cardinale* - *Phloeosinus* spp., *Orsillus maculatus*), and pines (pine wood nematode - *Bursaphelenchus xylophilus* - *Monochamus* spp.). Source: Santini, A. & Battisti, A. (2019).

# Recommendations

To better predict and prevent the pandemic caused by invasive alien pests and diseases in European forests, HOMED researchers suggest to:

- Prohibit the import of live plants for planting, which are known to be the main pathway for the introduction of invasive alien pests or pathogens, unless the production cycle makes them pest-free.
- Establish sentinel plantings with European tree species in the main countries exporting trees to Europe to identify potential alien pests and pathogens.
- Develop detection methods (smart traps or sensors) to be embarked in containers containing woody plants or wooden parts.
- Develop early detection methods to be applied at ports of entry.
- Develop alien invasive species distribution models for planning surveillance programs.
- Develop local and landscape surveillance tools.
- Optimise eradication methods based on host removal and insect suppression to prevent the spread of invasive alien pests and pathogens.
- Encourage research and development on biological control methods for the management of alien pests and pathogens in EU forests.

## Sources

### Main source

Santini, A., & Battisti, A. (2019). Complex Insect-Pathogen Interactions in Tree Pandemics. *Frontiers in Physiology*, 10: 550. doi:10.3389/fphys.2019.00550

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