Sentinel plantings as a pipeline for early detection for establishing a breeding program

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Introduction

- Increasing international trade
- Increasing unintentional introduction of organism to new, non-native regions i.e. through live plant trade
- Increasing threat to forests and agriculture worldwide
- Are phytosanitary controls sufficient?
- How to know the unknown?
- Often not known what to look for

Introduction

- Not enough personnel/ resources for continuous controls upon entry and monitoring of sites, national differences
- Detection often only after substantial spread and establishment
- If you can‘t prevent introductions of non-native organisms how can you prepare for it?

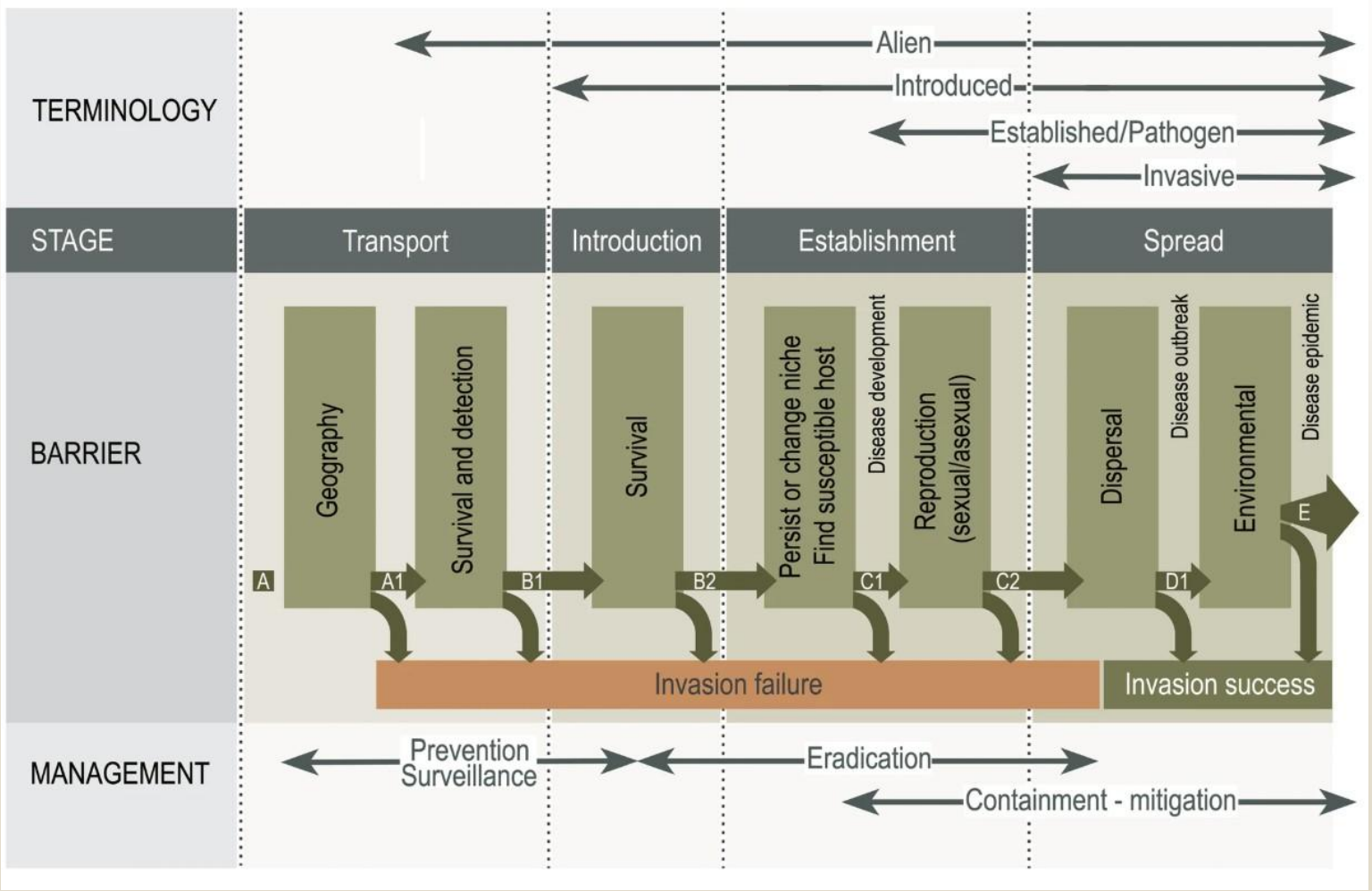
Different approaches for fast detection/ surveillance

- In forestry it‘s more difficult than in agriculture due to perennial plants
- First approaches using urban gardens and botanical gardens as established collections of non-native plants
- Move to specifically selected plants in plantations established for surveillance

- Spore trapping to catch spores of potentially invasive pathogens
- Citizen science

Why is it important to prevent new introductions?

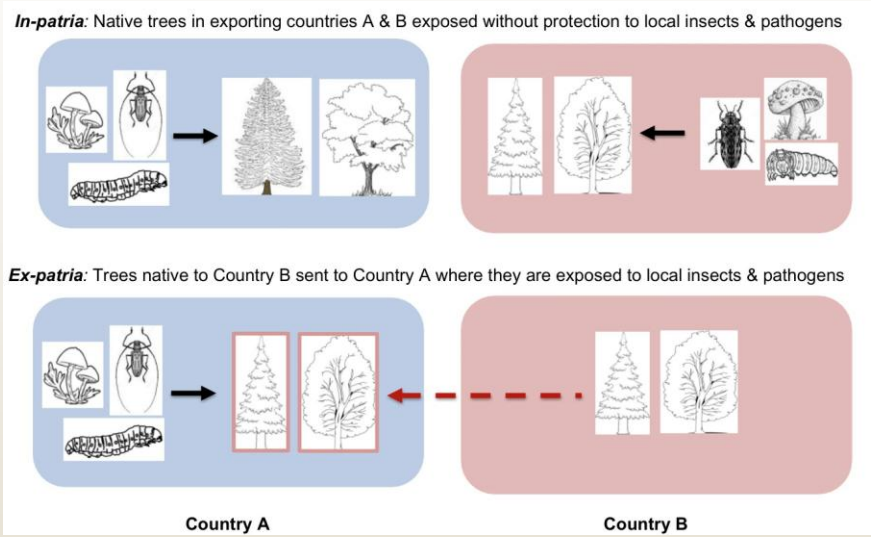
- Cost intensive after introduction to manage
- Hard to contain
- Major damage to entire populations



Paap, T., Wingfield, M.J., Burgess, T.I. *et al.* Invasion Frameworks: a Forest Pathogen Perspective. *Curr Forestry Rep* **8**, 74–89 (2022). https://doi.org/10.1007/s40725-021-00157-4

What are Sentinel plantings?

- Designated plantings for detection of new host-pathogen associations
- Used as pre-screening to get a bigger picture
- Designated plantations with high amount of replicas at a young age
- Provide standardised approach and establish specific methods for control and / or early detection for potential threats to make screening easier
  - like resistance breeding before potential introduction, rapid detection methods like LAMP or test-strips



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Establishment of Sentinels

- Collaborations over four continents
  - China, Italy, South Africa, Sweden, USA
  - Each country planted plants from the other continents
  - Some overlap of tree species for comparison
  - In Italy also native plants as *in-patria*

Sentinel Plantings in Florence

- Establishment of seven North American and six South African species in experimental site in 2019 in two different projects (HOMED and Sentinel)
- Intensive monitoring during spring and autumn from 2020-2023
- **Aims**
  - Identify organisms that are new associations or have never been found in this regions as well as new species
  - Verify Sentinel approach as basis for a breeding program

Sentinel Plantings in Florence

- Symptoms observed primarily on leaves presumably caused by pathogens (and to a lesser extent insects)
- Culture-based isolation to detect causal agent followed by DNA-based identification
- Multi-gene phylogenies to determine species

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