Introduced tree species in European forests

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Eradication as an option for managing invasive tree species in protected areas

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Introduction

The spread of introduced tree species in natural habitats may have a major impact on native and endemic species.

The data on plant invasion in protected areas (PAs) is both limited and fragmented (Pyšek et al. 2013).

How to manage them?

- Prioritise species according to their potential impact
- Identify conservation goals
- Establish strategies

How does the eradication affect natural re-vegetation?

Establish strategies

- Species specific → propagule pressure
- Site specific → not all habitats react in the same way
- How?
  - Mechanical treatments
  - Chemical treatments
  - Combined strategies targeting the different growing stages

Mechanical treatments: sutainability and efficacy

Species & site characteristics:

- ✓ Does it re-sprout?
- ✓ What is its flooding tolerance?
- ✓ How does native vegetation react to disturbance?

?

- Girdling
- Waterlogging
- Mulching
- Root removal

Chemical treatments: potential and risks

Herbicides

- Have been applied in some protected areas
- Increase the effectiveness of girdling (+)
- Affect non-target species (-)
- Slow degradation in cold climates (-)

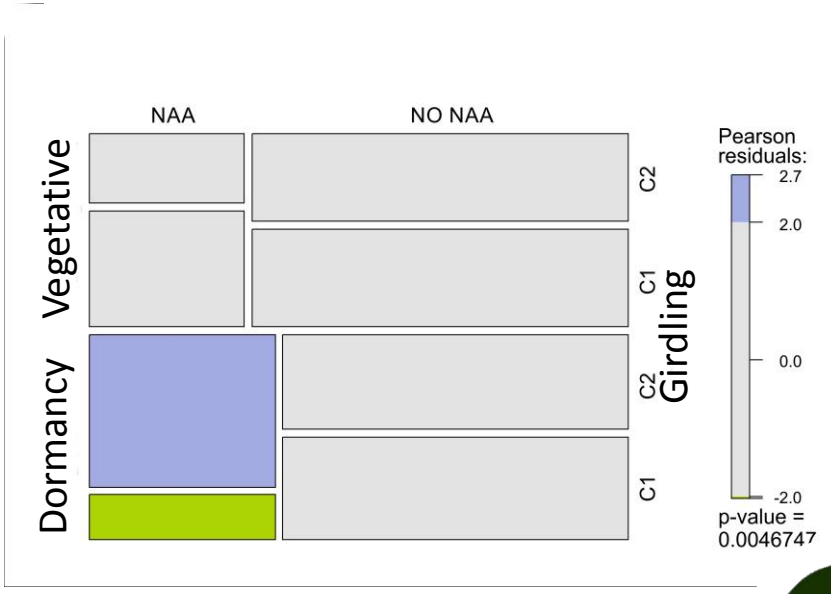
Plant growth regulators

- Natural or synthetic compounds (e.g. hormones) influencing developmental or metabolic processes
- Can they be used to increase the efficacy of girdling?

Chemical treatments: experimental application of NAA

Eradicate *Quercus rubra* with girdling and α-napthalene acetic acid (NAA)

- ✓ Synthtetic auxin long used for apple thinning
  - ✓ Auxin is the inhibitor of shoot formation
  - ✓ No risks for non-target organisms (US EPA, 2007)



Minari et al. 2015

Eradications in protected islands

Island ecosystems are particularly vulnerable to the invasion of introduced species:

- ✓ Severe impacts: intensive strategies
- ✓ Can they provide useful insights on management approaches?

- Anholt, Denmark (Doody 2013)

AIM→ re-establish the lichen-rich communities of the northern grey dunes

Pinus mugo eradication: mosaic burning, grazing, hand removal

- Montecristo, Italy (Zanichelli et al. 2014)

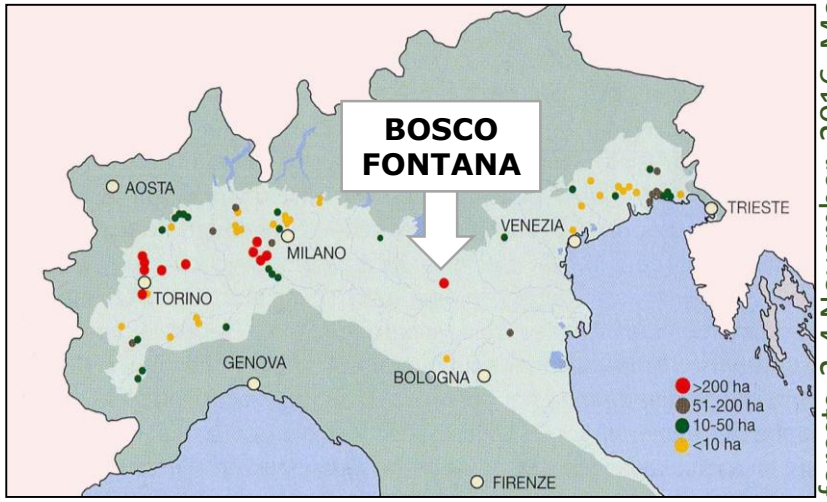
AIM→ preserve the flora (300 vascularspecies in 10 km^2)

Ailanthus altissima eradication: sprayed, painted or injected with glyphosate

Low number of attempts! (Genovesi & Carnevali 2011)

- ✓ restrictions related to presence of endemic species
- ✓ low public awarenes

Eradication and restoration in the Bosco Fontana Nature Reserve

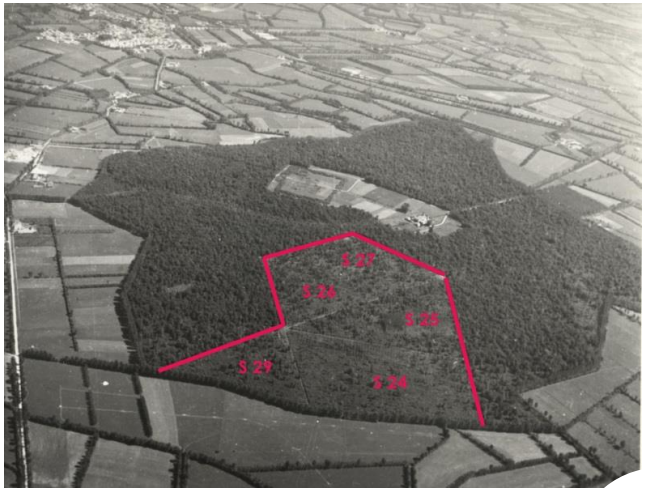


Characteristic forest of the Po river plain:

Quercus robur, Carpinus betulus, Acer campestre, Ulmus minor

- 1921 National Monument
- WWI-II intense harvest
- 1952-1958 reafforestation: *Quercus robur*, *Quercus rubra*, *Populus alba*, *Juglans nigra*, *Pinus nigra*

- 1998 Special Protection Area (Birds Directive)
- 2004 Special Area of Consevation (Habitat Directive)
- Area: 233 ha in total, 198 ha of forest



Increasing deadwood and microhabitat availability with alien species

For species that do not re-sprout and whose seedlings do not find suitable conditions for regeneration, eradication provides an opportunity for the creation of habitat trees.

Research Article - doi: 10.3832/ifor1281-007 ©iFo

The Habitat-Trees experiment: using exotic tree species as new microhabitats for the native fauna **2014 iForest 8: 464-470**

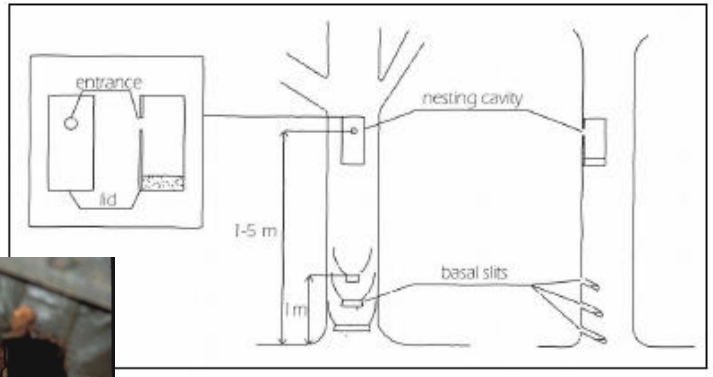
Livia Zapponi [1-2], Emma Minari [1], Luca Longo [3], Ilaria Toni [1], Franco Mason [4], Alessandro Campanaro [1-5]

Costs of the treatments

Type of intervention	Operations	Main equipment used
Standing and fallen snags (with winch)	Directional notch and felling cut	Chainsaw
	Trunk breaking	Tractor and winch
	Snag girdling	Bark-stripper
Standing and fallen snags (using explosive charges)	Holes for the explosive	Drill
	Breaking the trunk	Explosive charges
	Snag girdling	Chainsaw and bark-stripper
Artificially uprooted tree	Uprooting	Tractor and winch
Leaning dead tree	Uprooting	Tractor and winch
	Girdling	Chainsaw and bark-stripper
Standing dead tree	Girdling	Chainsaw and bark-stripper
Habitat tree	Basal slits	Chainsaw
	Nest holes	Drill
	Girdling	Bark-stripper

Eradication and restoration in the Bosco Fontana Nature Reserve

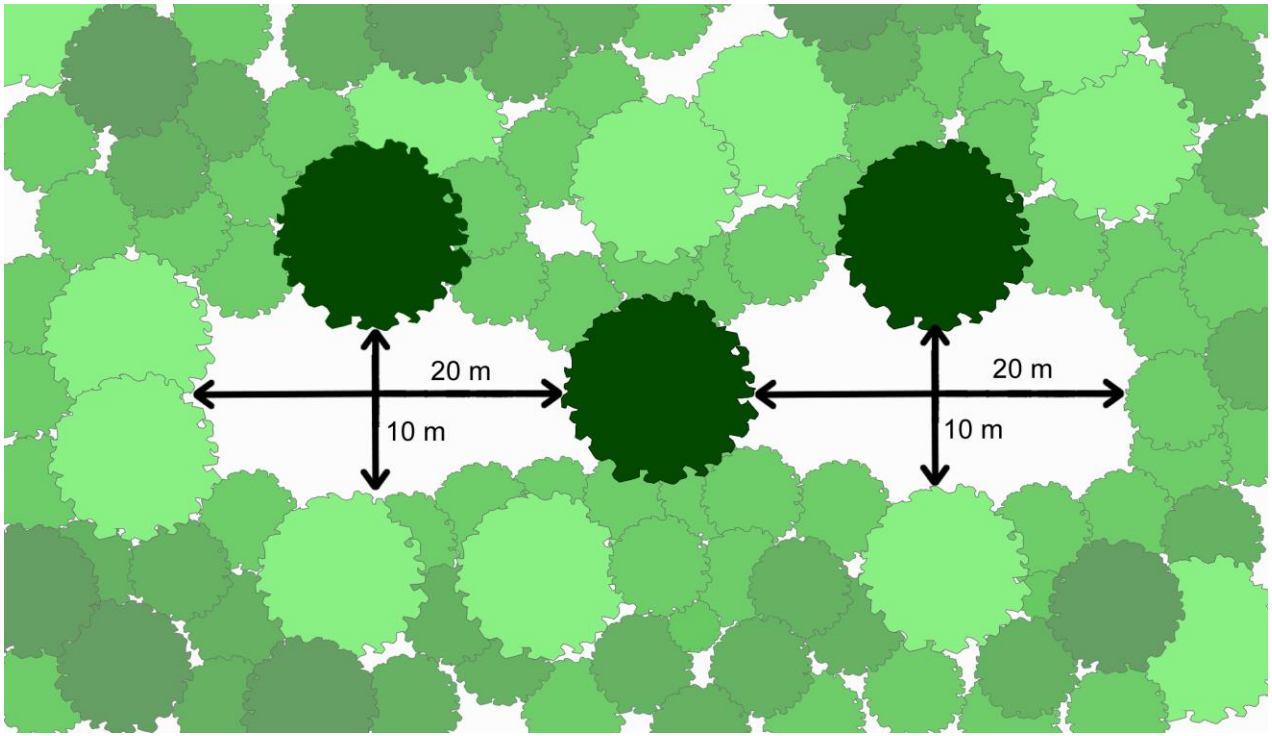
- ✓ The 77% of the trees were still alive after 8 years
- ✓ Better thermal insulation compared with nest-boxes



Eradication and restoration in the Bosco Fontana Nature Reserve

Ecological restoration (Larios & Sunding 2013):

1. Spontaneous succession
2. Technical reclamation
3. Assisted succession



Canopy gap creation (~200 m^3) for pedunculate oak regeneration

Conclusion

- Eradications of invasive tree species require the use of several methods, often used in combination, considering the ecology and growing stage of the species.
- Main current limits:
  - There have only been a few studies that have applied their findings to establish mitigation strategies.
  - There is currently no formal coordination among nature reserves and countries on methods and priorities.
- The challenge for the future is the creation of a common platform:
  - ✓share strategies
  - ✓monitor impacts
  - ✓use long-term results to support best-practices

Thank you for your time

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