BIOLOGICAL INVASIONS IN FOREST – REGIONAL ASPECTS

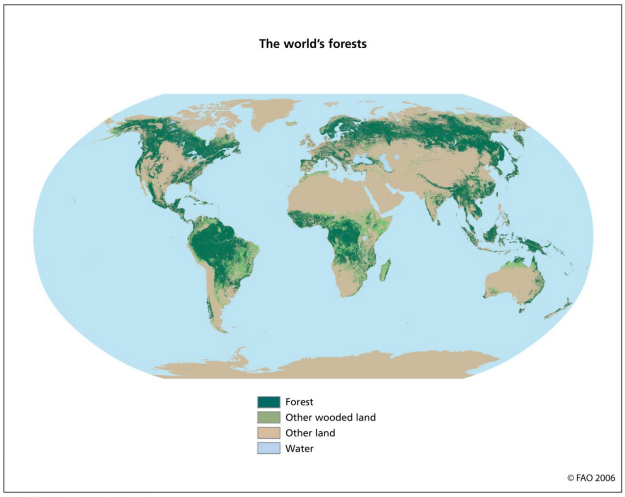
Food and Agriculture Organization of the United Nations

Ferenc Lakatos, director, Institut of Silviculture and Forest Protection, University of West-Hungary

Outline

- Major forest health problems – European overview
- Effect of non native (invasive) species
  - Basic background information
  - Typical examples (C & E-EUR)
- Steps dealing with invasive species
- Possible tools & methods
- Resources
- Summary

World's forests



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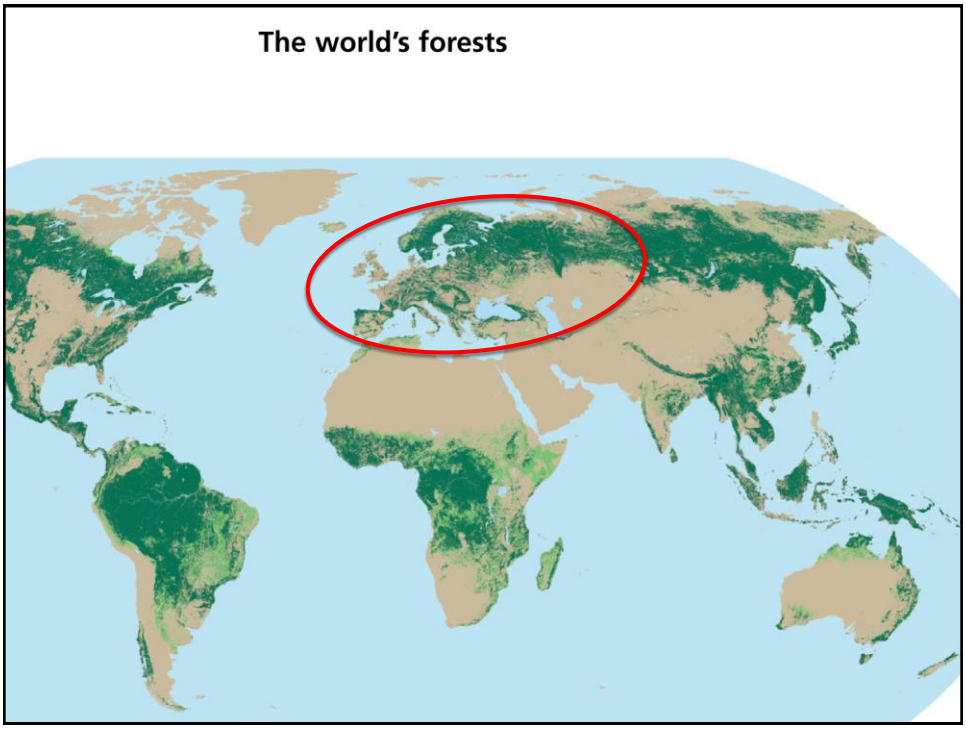
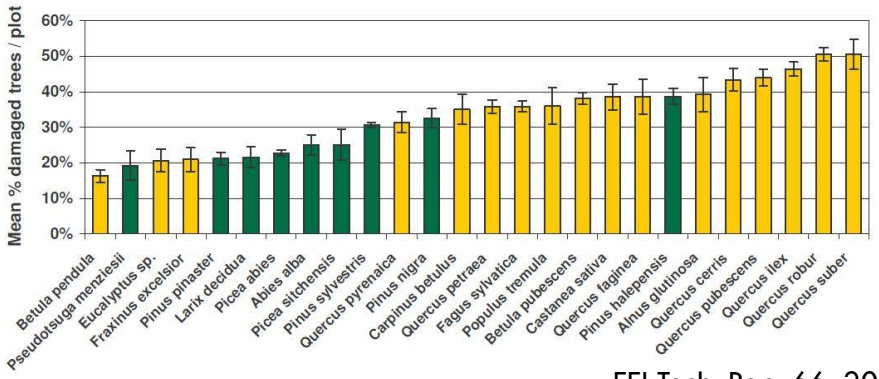


Damages in European Forests – tree species



EFI Tech. Rep. 66, 2011

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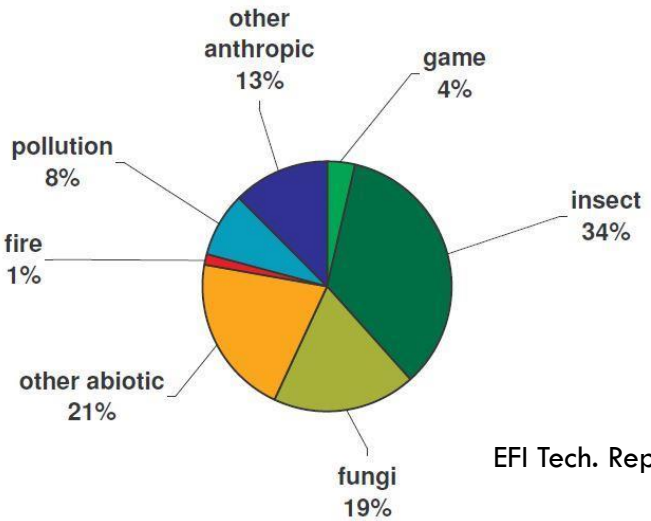
Damage types in European Forests



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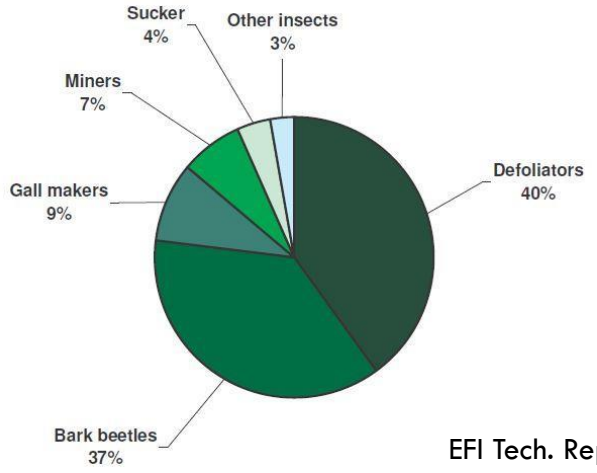
Damages caused by insects



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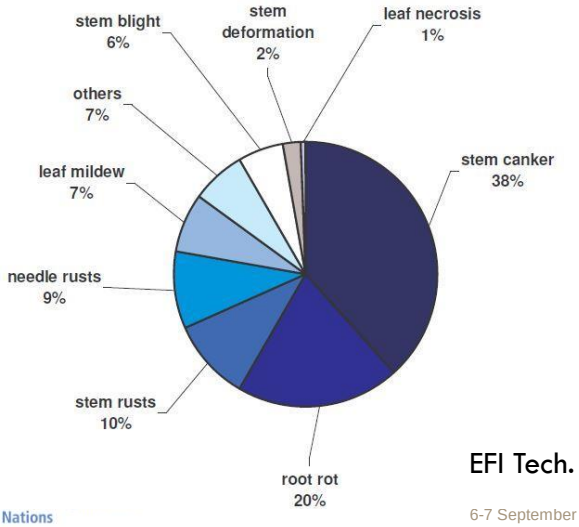
Damages caused by fungi



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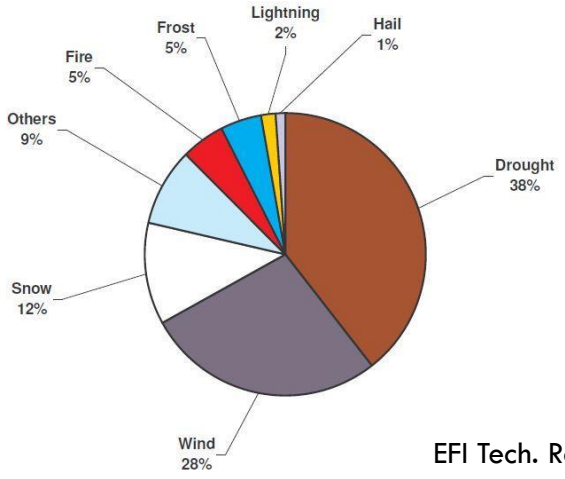
Damages caused abiotic factors



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Effects of non-native (invasive) species

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Motto

"On a global basis ... the two great destroyers of biodiversity are, first habitat destruction and, second, invasion by exotic species"

- E.O. Wilson

Terminology

- **ALIEN SPECIES:** is a species, subspecies, or lower taxon occurring outside of its natural range (past or present) with a dispersal potential (*i.e.* outside the range it occupies naturally or could not occupy without direct or indirect *introduction* or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce.

Terminology

- AN **INVASIVE SPECIES** is: a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Terminology

- Convention on Biological Diversity: **Invasive alien species** (IAS) are species whose introduction and/or spread outside their natural past or present distribution threatens biological diversity.

The origin of – invasive – species

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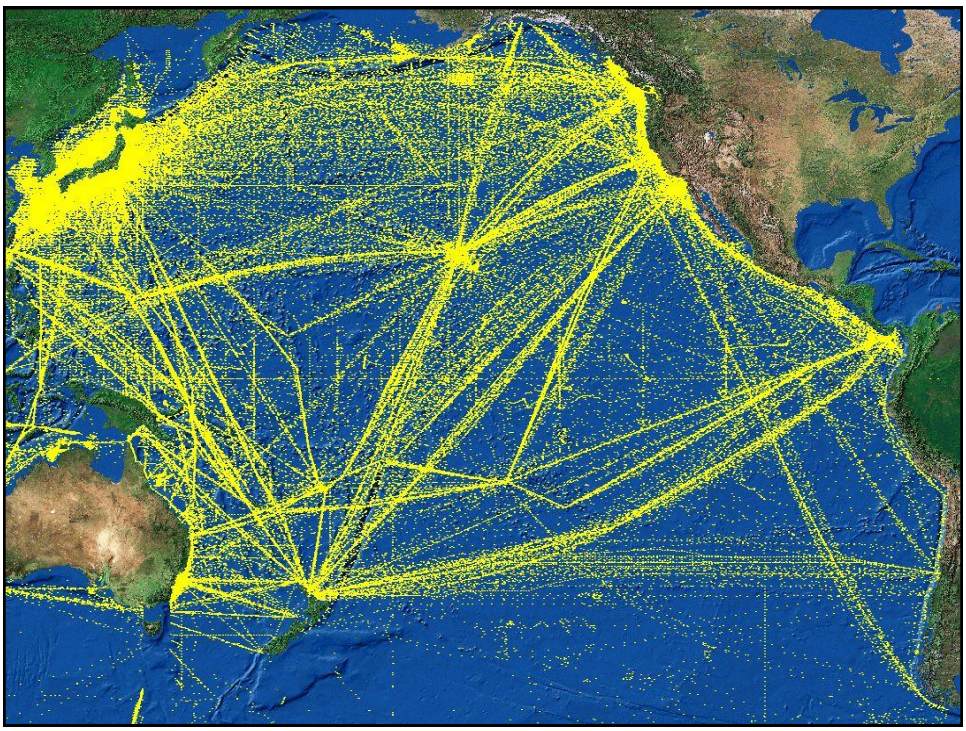
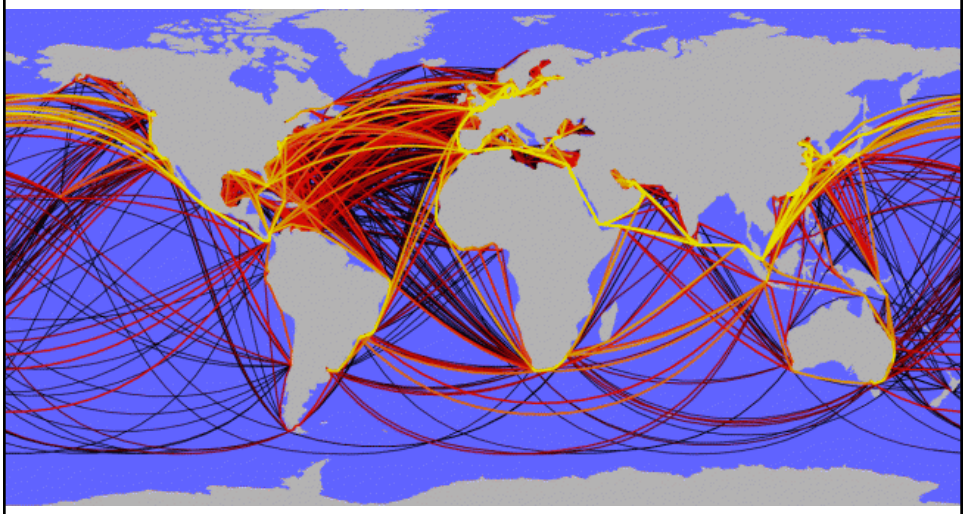
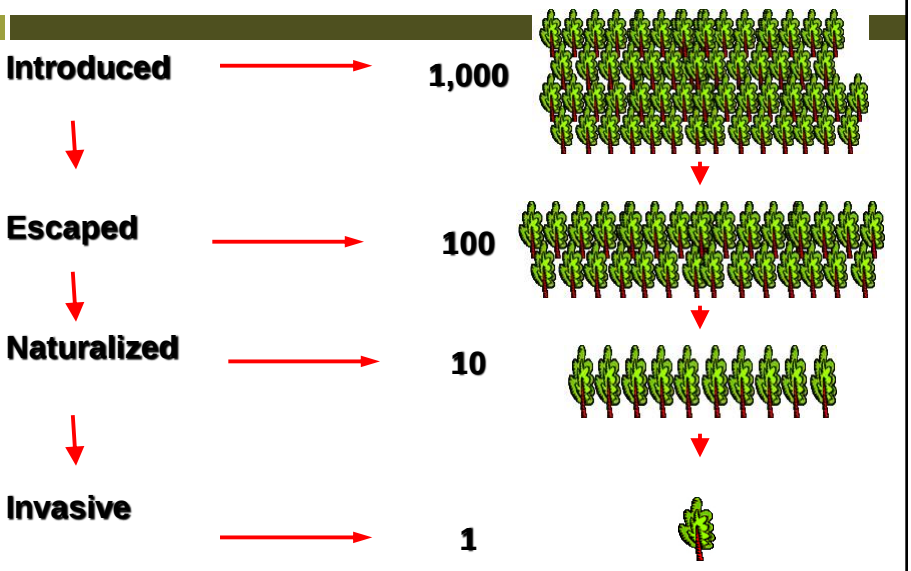




Kaluza et al. 2009

Tens Rule



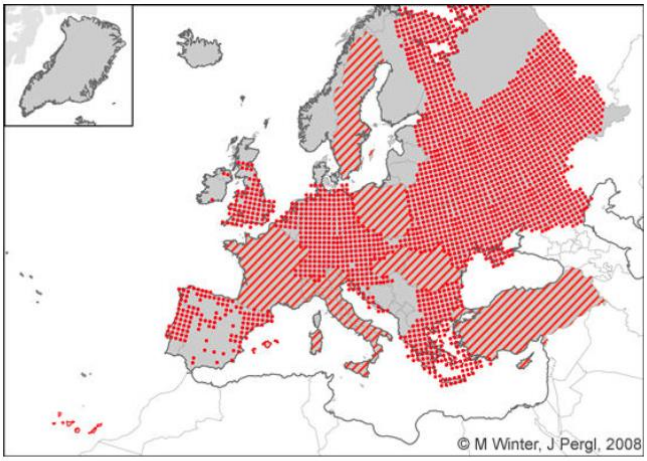
Examples

- Plants (more details by Ingolf KÜHN)
- Fungi (more details by Lucio MONTECCHIO)
- Invertebrates (more details by Alain ROQUES)
- Vertebrates (more details by Wojciech SOLARZ)

Robinia pseudoacacia

- Native range:
  - N-America (Appalachian)
- Known introduced range:
  - Europe, Asia, Africa, Australia
- Introduced to Europe:
  - 1601
- Effect:
  - Once introduced, expands rapidly
- Control:
  - Very difficult (with herbicids: dicamba, fosamine, glyphosate, imazapyr, picloram, triclopyr)

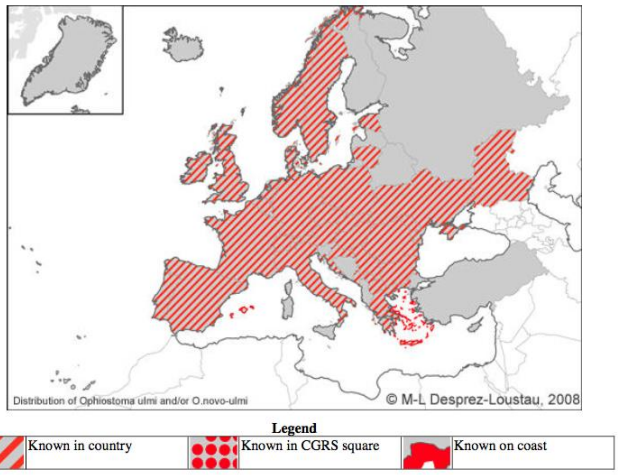
Robinia pseudoacacia



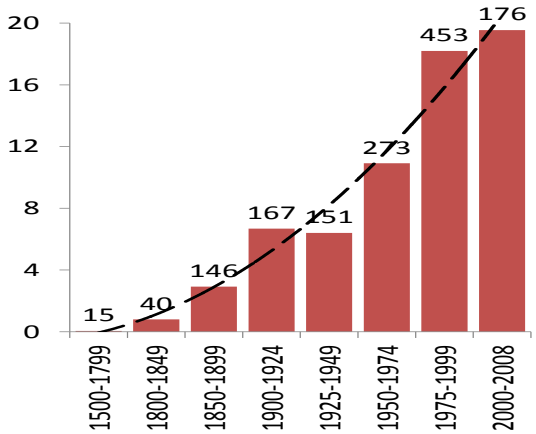
Ophiostoma ulmi & novo-ulmi

- Native range:
  - Asia (?)
- Known introduced range:
  - Europe, N-America
- Introduced to Europe:
  - ≈1800 and 1940
- Effect:
  - Complete elimination of elm (Ulmus) trees
- Control:
  - Very difficult, vector (Scolytus spp.) can be controlled in some ways, but never completely successful

Ophiostoma ulmi & novo-ulmi



Invasive insects in Europe (Roques et al. 2008)



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If you want to became famous…

- Potato beetle (*Leptinotarsa decemlineata*)
- Europe:
  - 1876 (1901), UK
- Hungary:
  - Hédervár, 1947

If you want to became famous…

- Corn beetle (*Diabrotica virgifera*)
- Europe:
  - Belgrade (SR), 1992
- Hungary:
  - Mórahalom, 1995

Cydalima perspectalis

Natural distribution of *Cydalima perspectalis*

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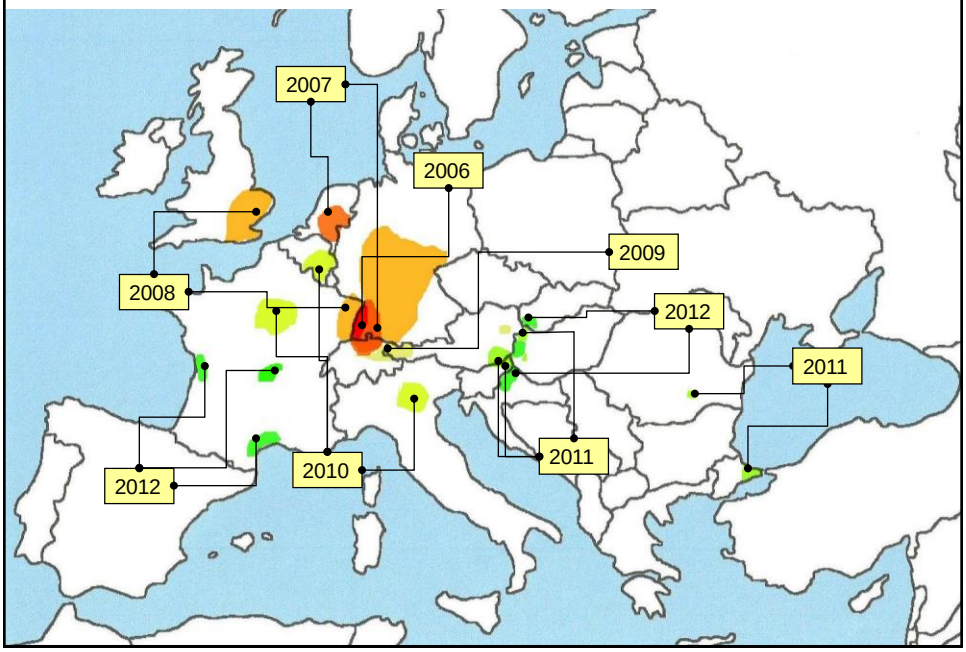
Known distribution of *Cydalima* in Europe (2012)



Cydalima perspectalis

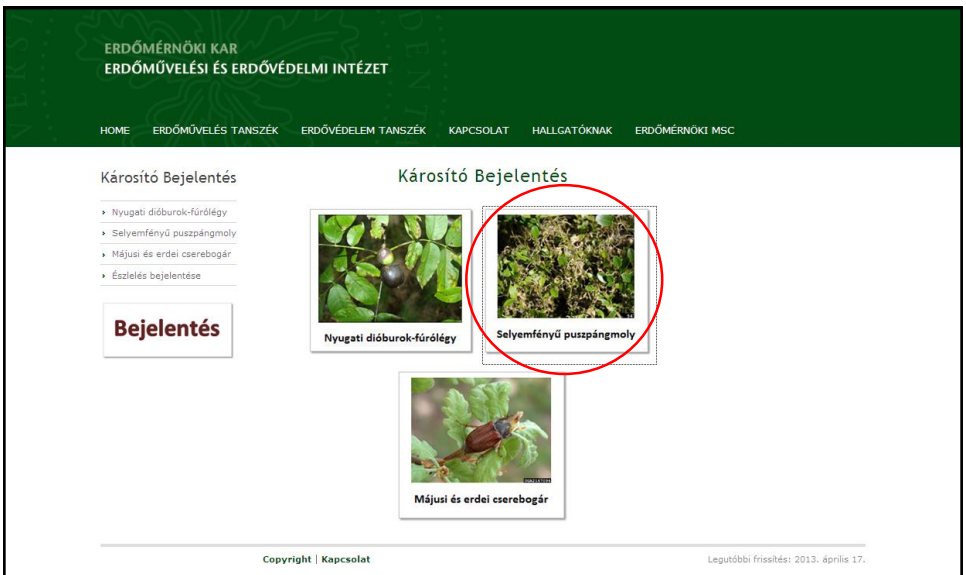
- Native range:
  - Asia
- Known introduced range:
  - Europe, expanding eastward (Turkey, Georgia,…)
- Introduced to Europe:
  - 2006
- Effect:
  - Heavy defoliation on Buxus spp. (e.g. B. sempervirens), sometimes mortality of the host
- Control:
  - Rather difficult, chemical control in early spring reduces population density, but always remaining & immigrant individuals

Ondatra cibethicus

- Native range:
  - N-America
- Known introduced range:
  - Europe, Asia (China, Japan), S-America
- Introduced to Europe:
  - 1805 (CZ)
- Effect:
  - Vegetation impact trough heavy grazing. Threats endemic species, damages irrigation systems, dams.
- Control:
  - Mechanical and chemical control applied, but heavy non target effect also observed.

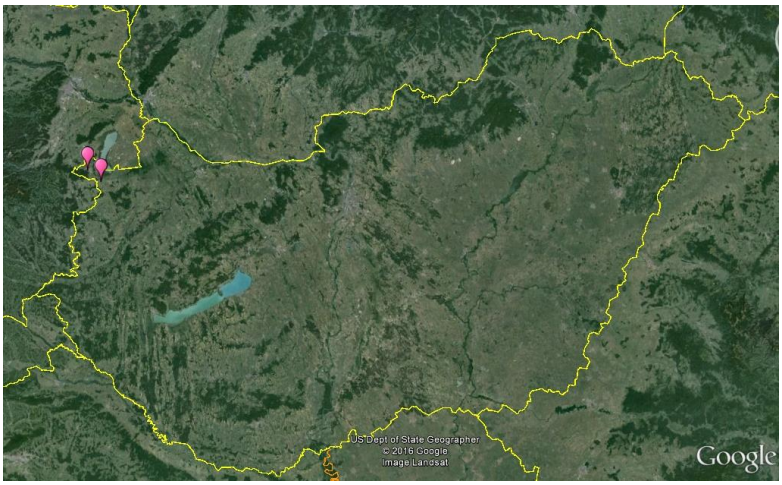
Steps for dealing with Invasive Species

- Prior introduction
  - Assessment and Risk Analysis
- To reduce introduction
  - Prevention
- After introduction
  - Early Detection
  - Rapid Response and Eradication
  - Control and Management
  - Restoration
- Research
- Public Education and Awareness



http://emevi.emk.nyme.hu/index.php/22542/

2012.



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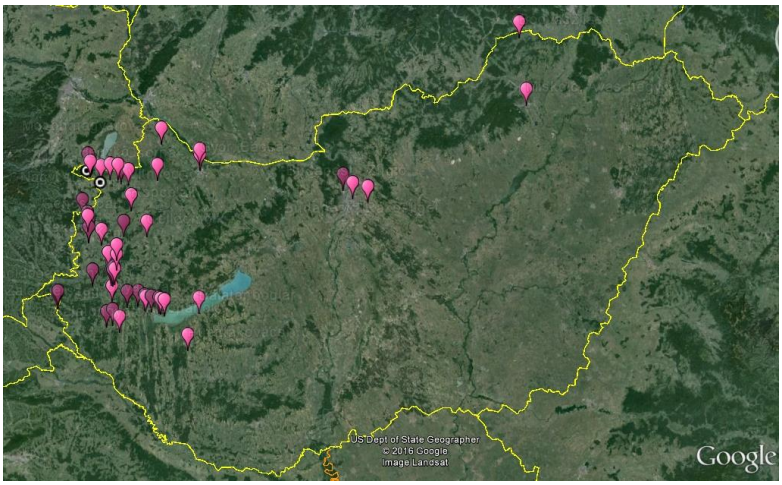
2013.



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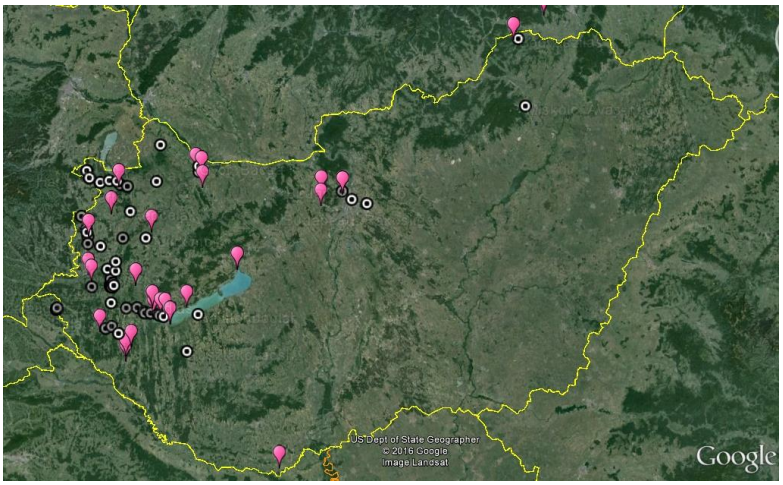
2014. 1st generation



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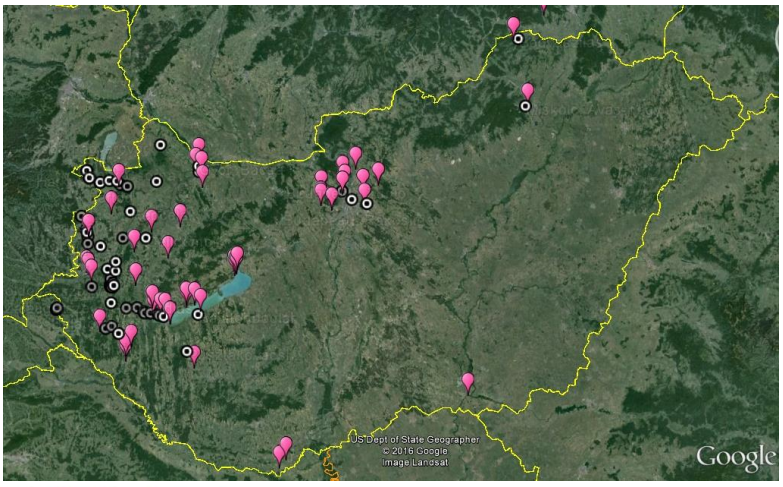
2014. 2nd generation



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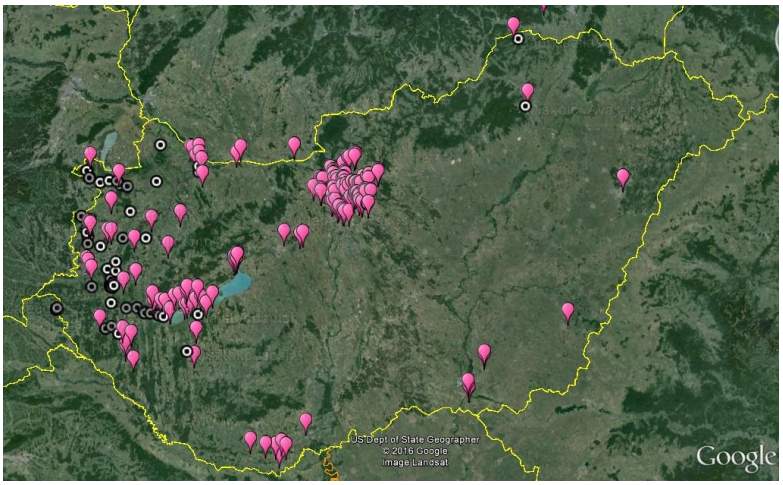
2014. 3rd generation



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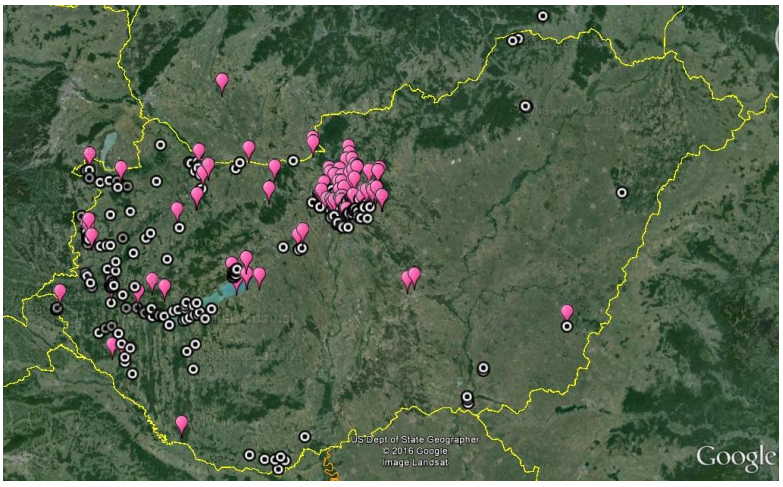

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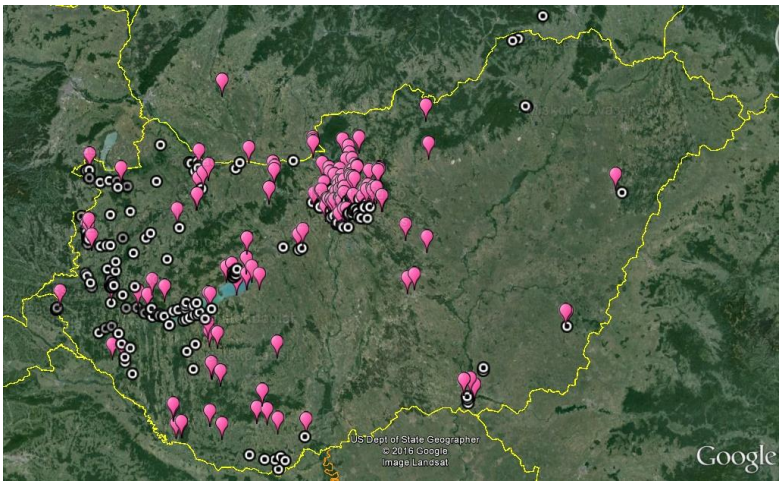
2015. 2nd generation



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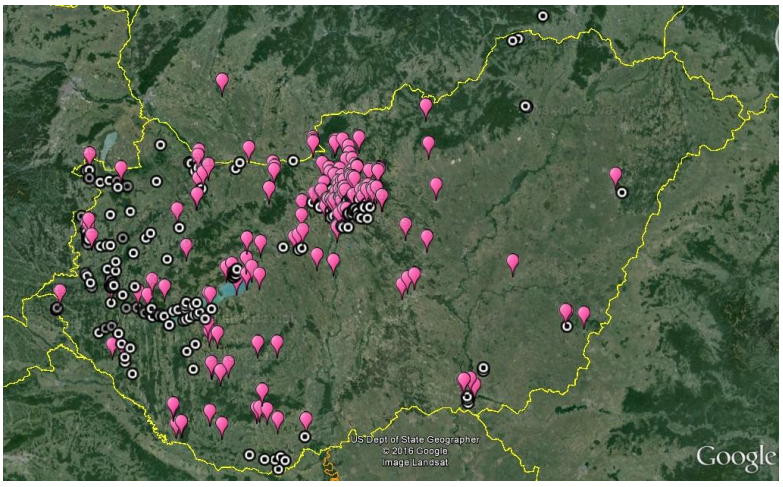

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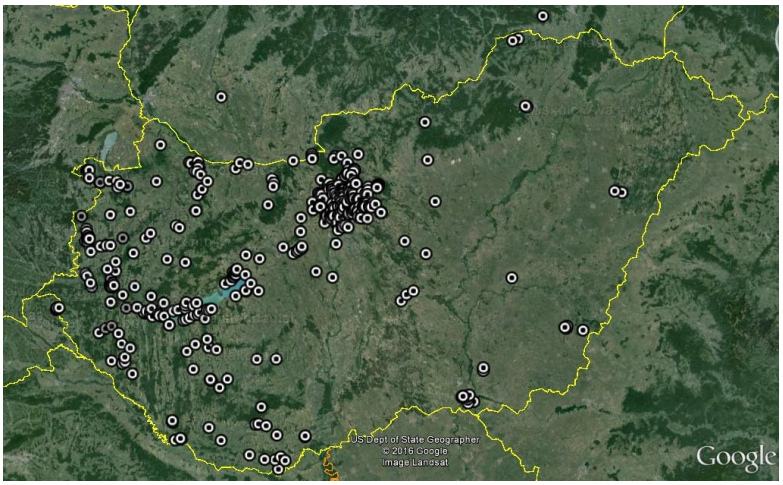
2012-2015



Possible tools, methods

- Information
  - Collection
  - Distribution (international !!!)
    - Networks
    - Web based tools (webpages, social media, …)
    - Printed materials (leaflet, flyer, poster, …)
- Making awareness
- Involvement
  - Specialists (detection, determination, eradication)
  - Pubic (detection)

Resources: Organisations & Institutions

- FAO
  - FAO Forestry
- EPPO
  - European and Mediterranean Plant Protection Organization
- Other online sources
  - DAISIE – Database for European Invasive Species
  - Global Invasive Database
  - …
- The Bugwood network
  - Forestryimages.org
  - Invasives.org

FAO Forestry …

FAO Forestry …

FAO CORPORATE DOCUMENT REPOSITORY

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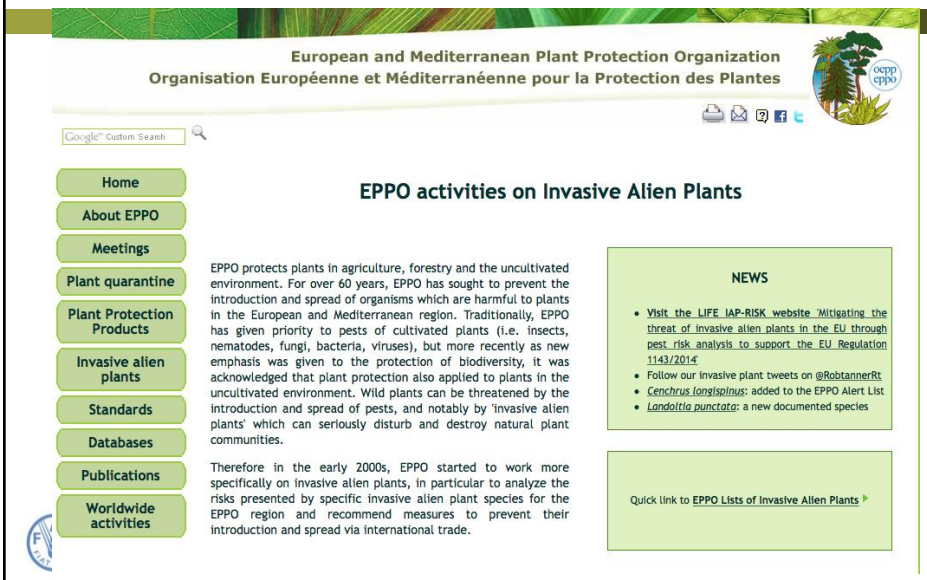

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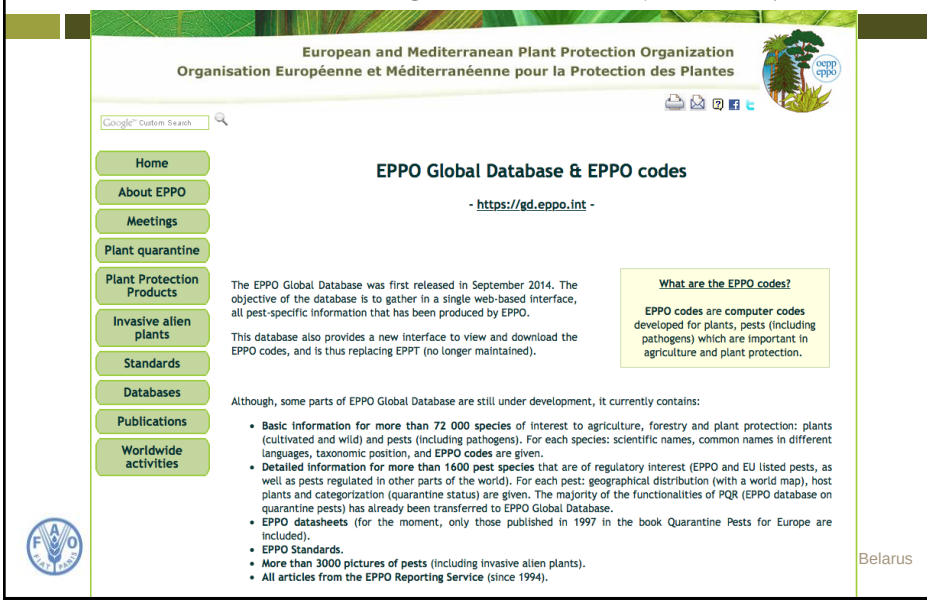

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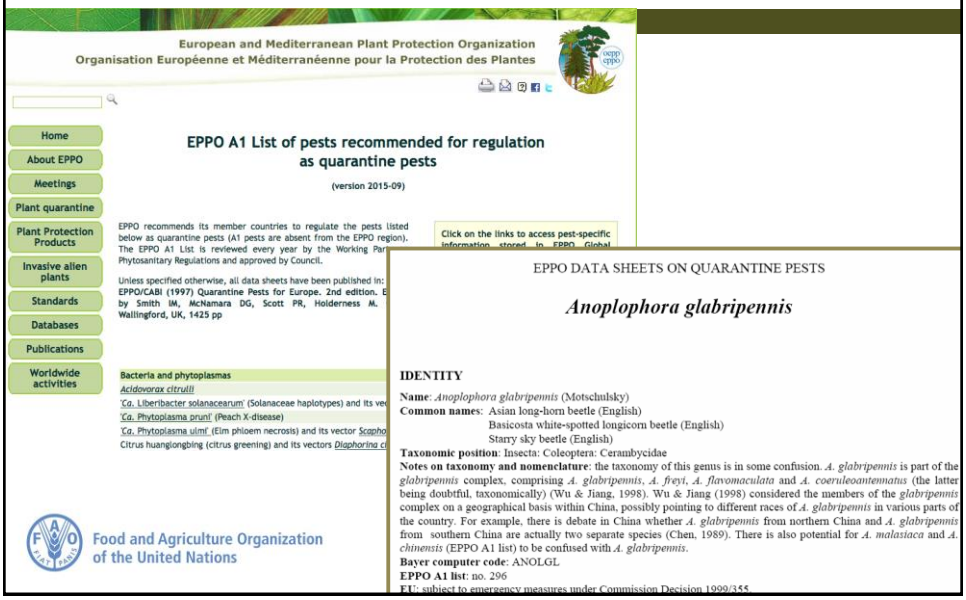

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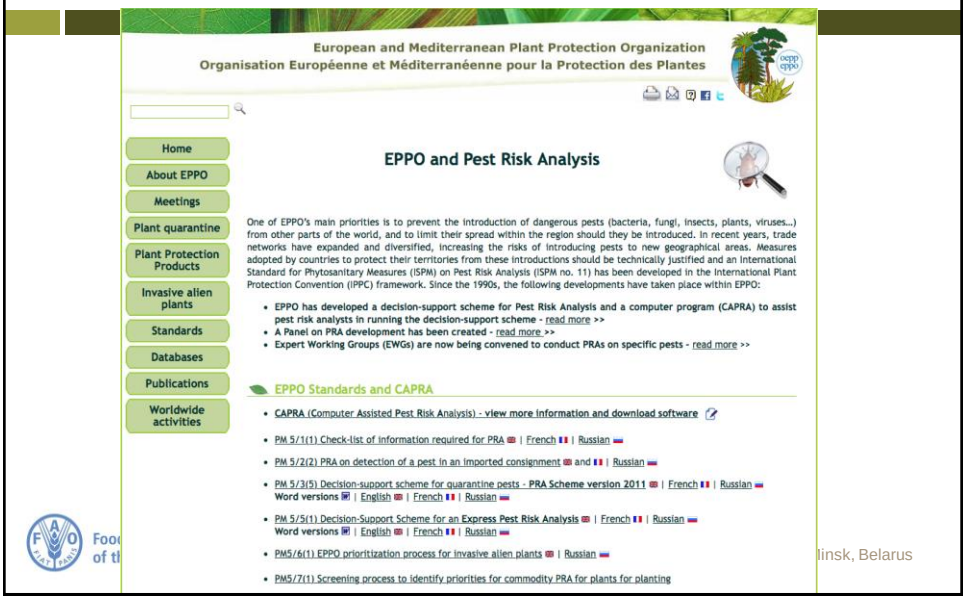

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DAISIE – Database for European Invasive Species

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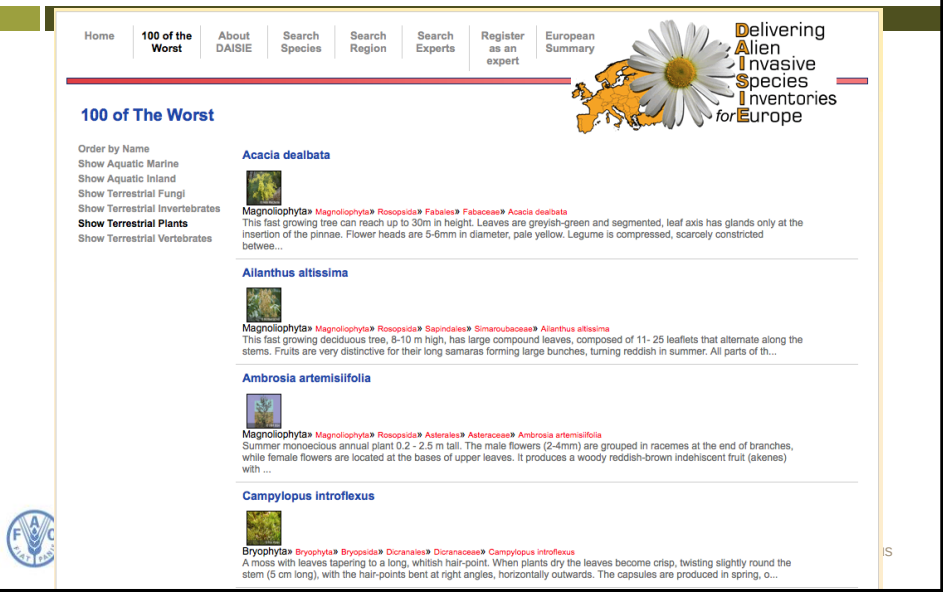

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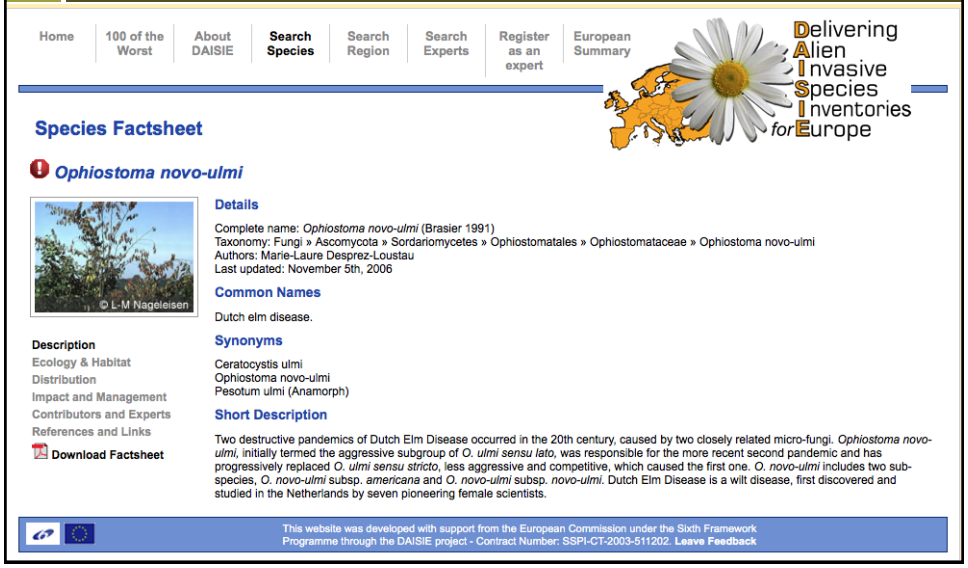
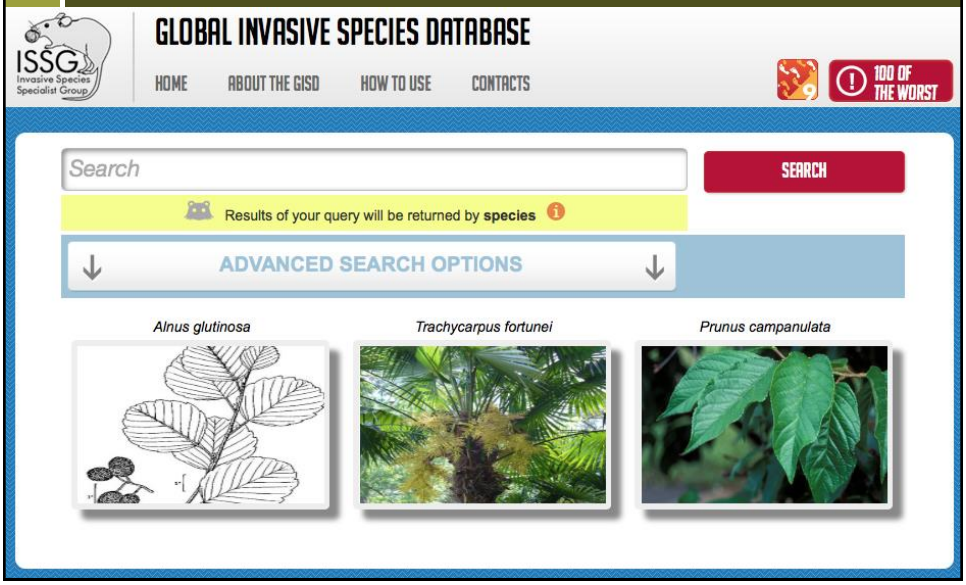
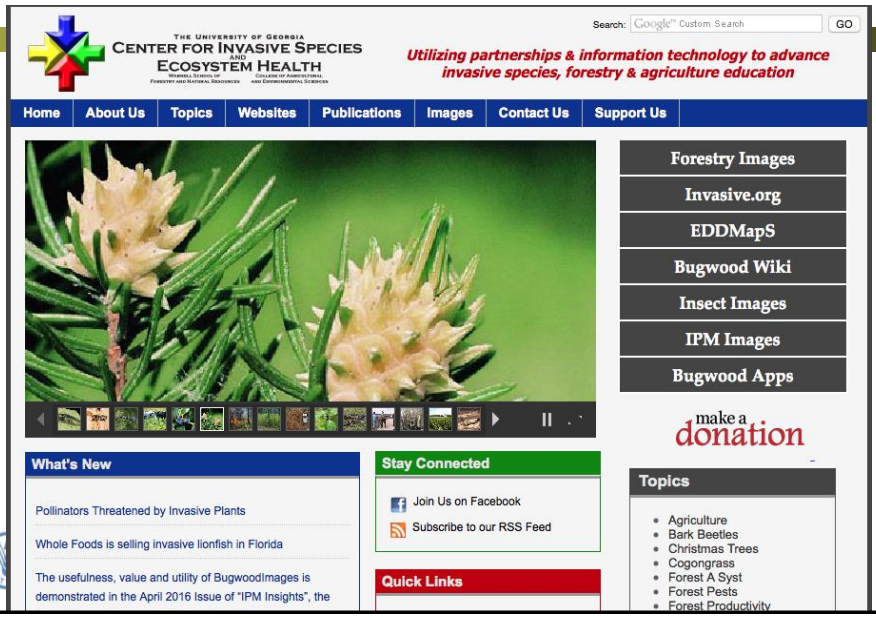


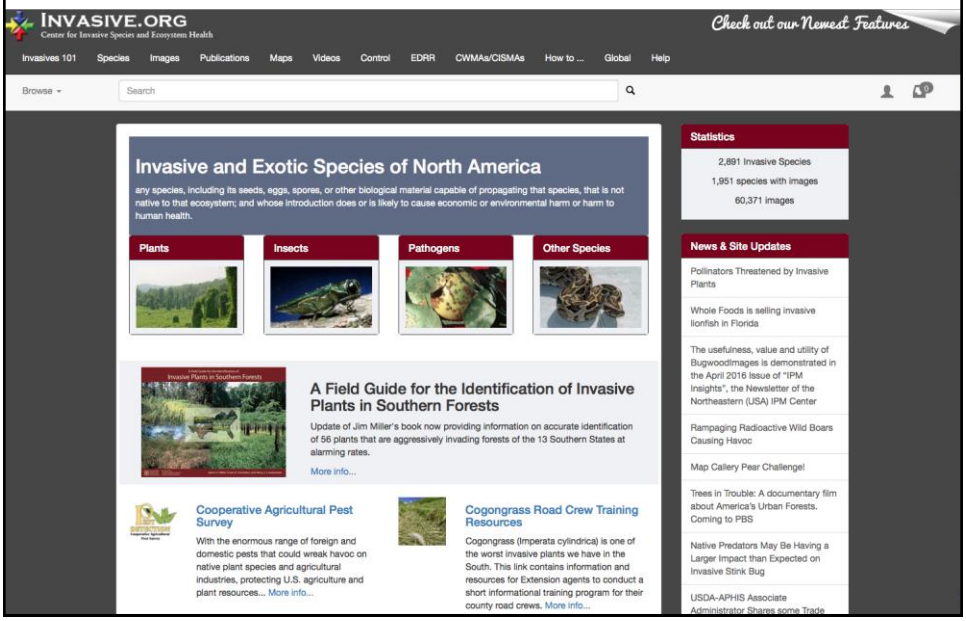
Global Invasive Species Database



Bugwood network



Invasives



"A picture is worth a thousand words" (Keith Douce)

David T. Almquist, University of Florida *Dendroctonus terebrans* **(Olivier)**

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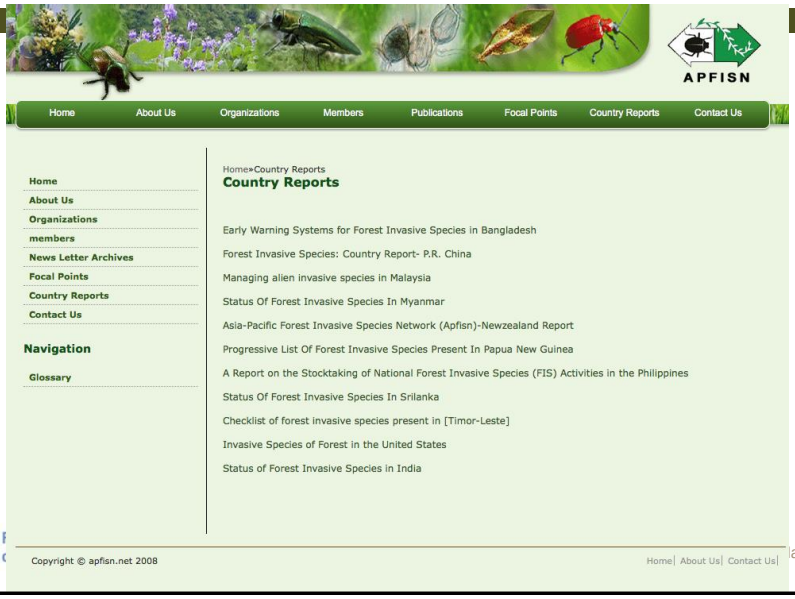

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Regional networks - APFISN

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Summary

- Large number of invasive plants, microorganisms and animals:
  - Introduction of invasive species
    - By human assisted migration
    - 'Natural' range expansion (e.g. due to climate change)
    - Combination of the above two
- To have the right information on time is crucial
- The involvement of the broader public can contribute to be more effective
- Long term (sustainable) monitoring is needed
- Use new technologies!

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"It is not the strongest of the species that survives,
or the most intelligent;
it is the one most capable of change."

(Anonymous)