

Regional perspective on invasive alien vertebrates in forests

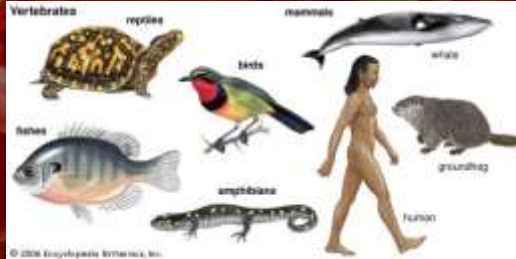
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How many alien vertebrates in forests?

Vertebrates (66 000 species in total) include:

fishes	(33 000 spp.)
amphibians	(7 500 spp.)
reptiles	(10 000 spp.)
birds	(10 500 spp.)
mammals	(5 500 spp.)



66 000 vertebrate species is a considerable number...

...but among alien species, vertebrates are not the dominant group

How many alien vertebrates in forests?

Among alien species, vertebrates are not the dominant group



DAISIE www.europe-aliens.org

How many alien vertebrates in forests?

Among alien species, vertebrates are not the dominant group

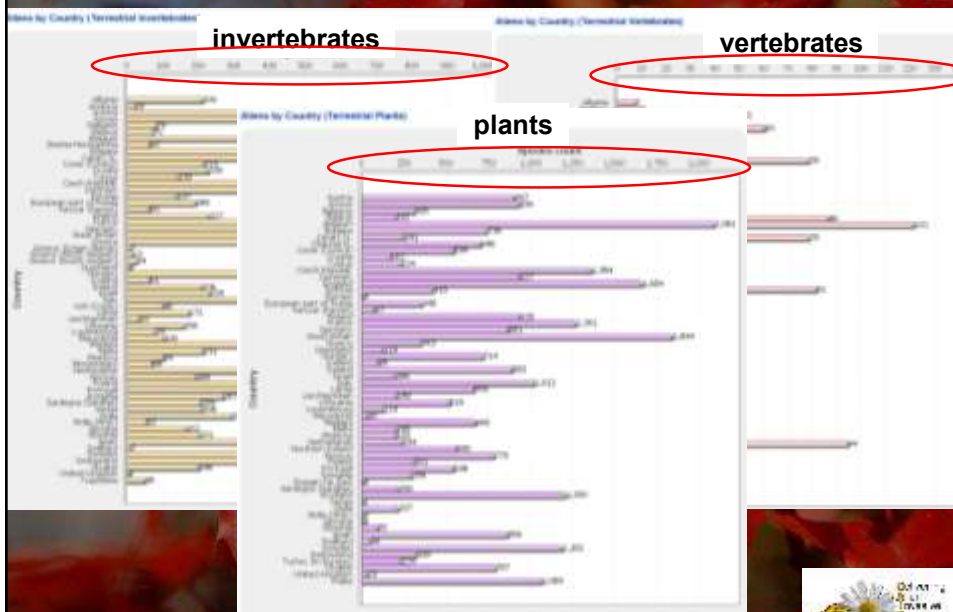


DAISIE database includes 270 terrestrial vertebrate species

DAISIE www.europe-aliens.org



N of terrestrial alien invertebrate vs vertebrate species per country



DAISIE www.europe-aliens.org



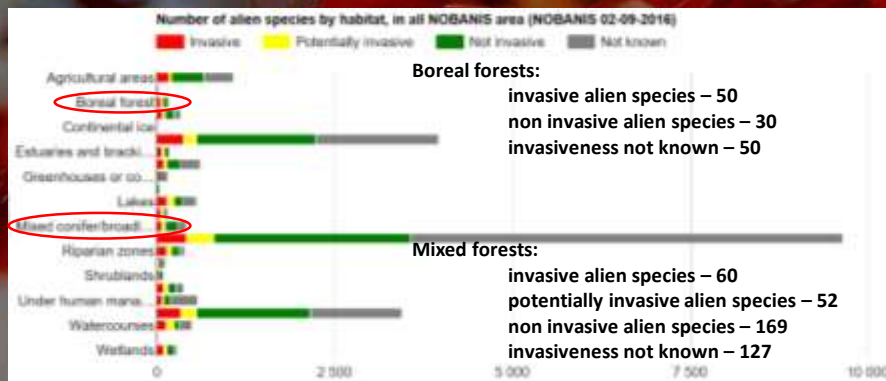
How many alien vertebrates in forests?



Belarus, Russia (European part),
Estonia Latvia, Lithuania, Poland,
Slovakia, Czech Rep., Austria,
Germany, Belgium,
Netherlands, Denmark, Norway,
Sweden, Finland, Ireland, Iceland

NOBANIS www.nobanis.org

How many alien vertebrates in forests?



Boreal forests:

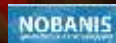
invasive alien species – 50
non invasive alien species – 30
invasiveness not known – 50

Mixed forests:

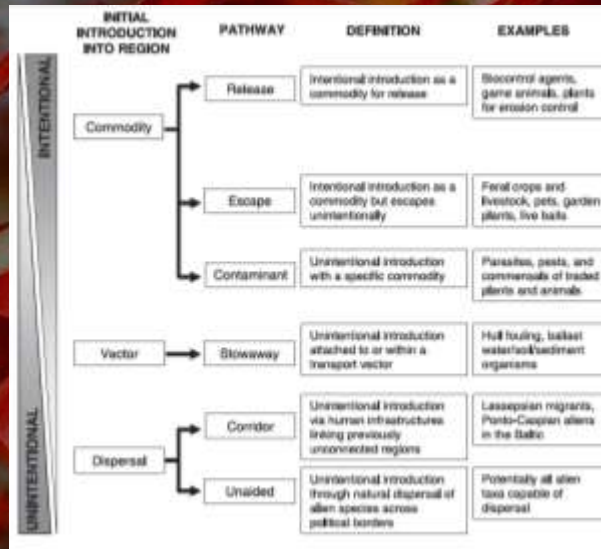
invasive alien species – 60
potentially invasive alien species – 52
non invasive alien species – 169
invasiveness not known – 127

The sum of alien species in boreal and mixed forests is 538
(although some of these species may be counted twice
– in each of the two forest types)

NOBANIS www.nobanis.org

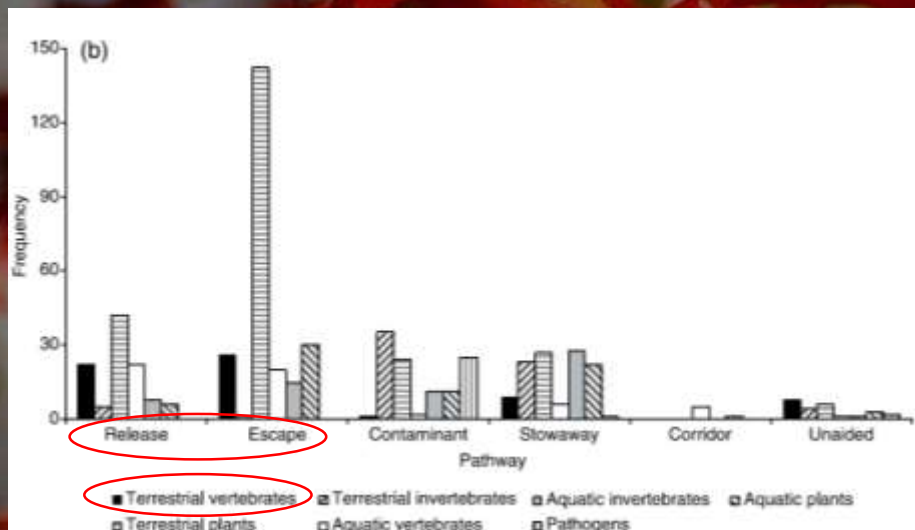


How do alien terrestrial vertebrates find their way to forests?



Hulme et al. 2008

How do alien terrestrial vertebrates find their way to forests?



Hulme et al. 2008

How do alien terrestrial vertebrates find their way to forests?
classification of introduction pathways according to
the Global Register of Introduced and Invasive Species (GRIIS)



GRIIS www.griis.org

How do alien terrestrial vertebrates find their way to forests?
pathways relevant for terrestrial alien vertebrates
(according to GRIIS):

releases

Biological control

Hunting

escapes

Zoo

Farmed animals

Fur farms

Pet species

GRIIS www.griis.org



How do alien terrestrial vertebrates find their way to forests?

release for hunting

Invasive Alien Species IAS

Sika deer *Cervus nippon*

White-tailed deer *Odocoileus virginianus*

Wapiti *Cervus canadensis*

Fallow deer *Dama dama*

Siberian roe deer *Capreolus pygargus*

Mouflon *Ovis montanus*

Canadian beaver *Castor canadensis*

Raccoon dog *Nyctereutes procyonoides*

Raccoon *Procyon lotor*

American mink *Neovison vison*

How do alien terrestrial vertebrates find their way to forests?

release for biological control



Vietnamese potbellied pig *Sus scrofa bittatus*

released for protection of young forest plantations in Poland
against root-damaging larvae

How do alien terrestrial vertebrates find their way to forests?

escape (zoos, farms, pets...)(...fur farms)

Invasive Alien Species IAS

American squirrel *Sciurus carolinensis*

Black squirrel *Sciurus niger*

Siberian chipmunk *Tamias sibiricus*

Ring-tailed koati *Nasua nasua*

Sika deer

White-tailed deer

Wapiti

Fallow deer

Mouflon

Canadian beaver

Raccoon dog

Raccoon

American mink

What is the negative impact of invasive alien vertebrates in forests?

in terms of monetary value of timber production, impact of invasive alien vertebrates is (probably by orders of magnitude) lower than that incurred by alien invertebrates, plants or fungi

the good news is that foresters do not have to be afraid that alien vertebrates will make their forest look like this:



however, their presence in forests is not completely neutral, particularly from the point of view of nature conservation

What is the negative impact of invasive alien vertebrates in forests?
 impact classification according to
 the Global Register of Introduced and Invasive Species (GRIIS)



GRIIS www.griis.org



What is the negative impact of invasive alien vertebrates in forests?
 consequences of impact from terrestrial alien vertebrates
 (according to GRIIS):

**socio-
economic**

Damage to forestry

Damage to agriculture

Threat
to human health

**ecosystem-
habitat**

Modification
of succession

Primary production
alteration

Habitat
degradation

Soil erosion

**species-
population**

Native population
size decline

Native species
range change

Alteration of genetic
resources

GRIIS www.griis.org



What is the negative impact of invasive alien vertebrates in forests?

mechanisms of impact from terrestrial alien vertebrates
(according to GRIIS):

Grazing/herbivory/browsing
Predation
Competition
Hybridisation
Disease/parasite transmission
Poisoning/toxicity
Rooting/Digging
Trampling

GRIIS www.griis.org

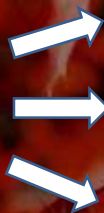


Examples of invasive alien vertebrates in forests



sika deer *Cervus nippon*

Grazing/herbivory/browsing
Hybridisation
Parasite transmission
Competition
Trampling



Damage to forestry
Damage to agriculture

Modification of succession
Primary production alteration

Alteration of genetic resources

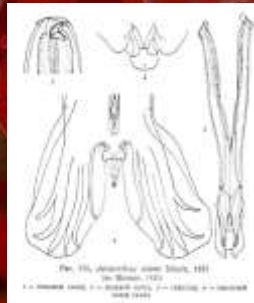
Examples of invasive alien vertebrates in forests

sika deer *Cervus nippon*

Hybridisation
affected species:
Red deer *C. elaphus*



Parasite transmission
Ashworthius sidemi
(Asiatic bloodsucking nematode)
affected species:
European bison,
roe deer, red deer,
domestic cattle, sheep



Examples of invasive alien vertebrates in forests

Herbivory/browsing
Competition
Disease transmission

Damage to forestry

Native population size decline
Native species range change



Grey squirrel *Sciurus carolinensis*

Examples of invasive alien vertebrates in forests

Grey squirrel *Sciurus carolinensis*

Herbivory/browsing



Competition

Disease transmission:
squirrel pox virus
affected species:
Red squirrel *S. vulgaris*



Examples of invasive alien vertebrates in forests

Disease/parasite transmission
Predation

Threat to human health

Native population size decline



Raccoon
Procyon lotor



Raccoon dog
Nyctereutes procyonoides



American mink
Neovison vison

Examples of invasive alien vertebrates in forests

Raccoon *Procyon lotor*, Raccoon dog *Nyctereutes procyonoides*,
American mink *Neovison vison*

Disease/parasite transmission
rabies,
Baylisascaris procyonis



Predation



Examples of „non-invasive“ alien vertebrates in forests

Because of negative impact, sika deer and grey squirrel are controlled

There are, however, alien species tolerated despite being invasive

Grazing/herbivory/browsing
Trampling



Damage to forestry
Damage to agriculture



Modification of succession
Primary production alteration



Fallow deer *Dama dama*

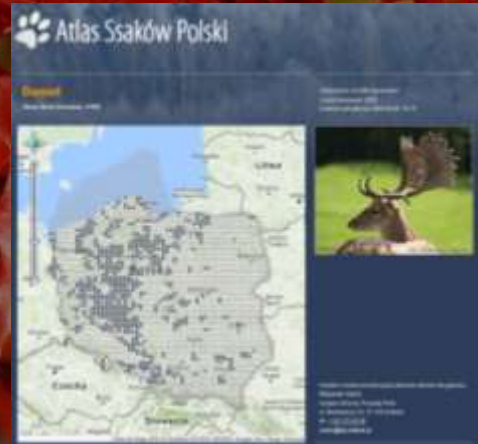
Examples of „non-invasive” alien vertebrates in forests

Fallow deer *Dama dama*

N of Fallow deer in Poland:

1990 – 5 400

2014 – 28 000



Examples of „non-invasive” alien vertebrates in forests

Trampling



Modification of succession
Primary production alteration
Habitat degradation
Soil erosion



Mouflon *Ovis montanus*

Examples of „non-invasive” alien vertebrates in forests

Mouflon *Ovis montanus*



How to mitigate the problem of biological invasions in forests?

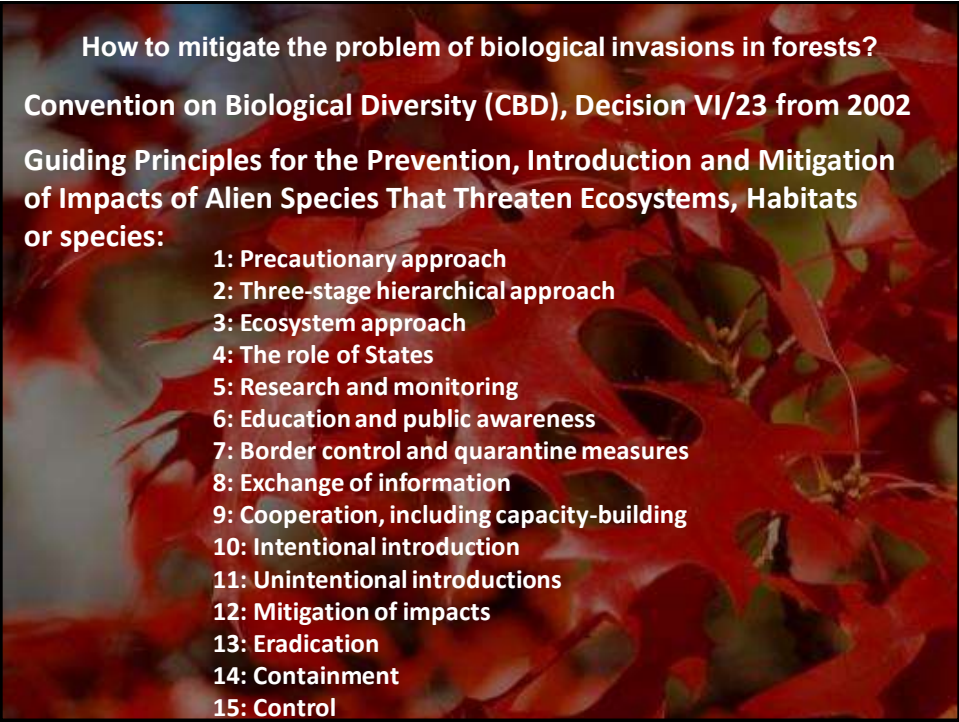
Efforts of forestry services towards mitigating the problem of biological invasions are obviously focused on alien species affecting timber production

These efforts are also important from nature conservation perspective, because alien species that severely affect timber production, at the same time usually have detrimental influence also on biological diversity (forests are biodiversity hotspots)

However, it may be more challenging for forestry services, to address threats from forest alien species whose impact is only on biodiversity (and not on economy)

The challenge may be insufficient financing and manpower...

...but also insufficient awareness of the problems caused by invasive alien species

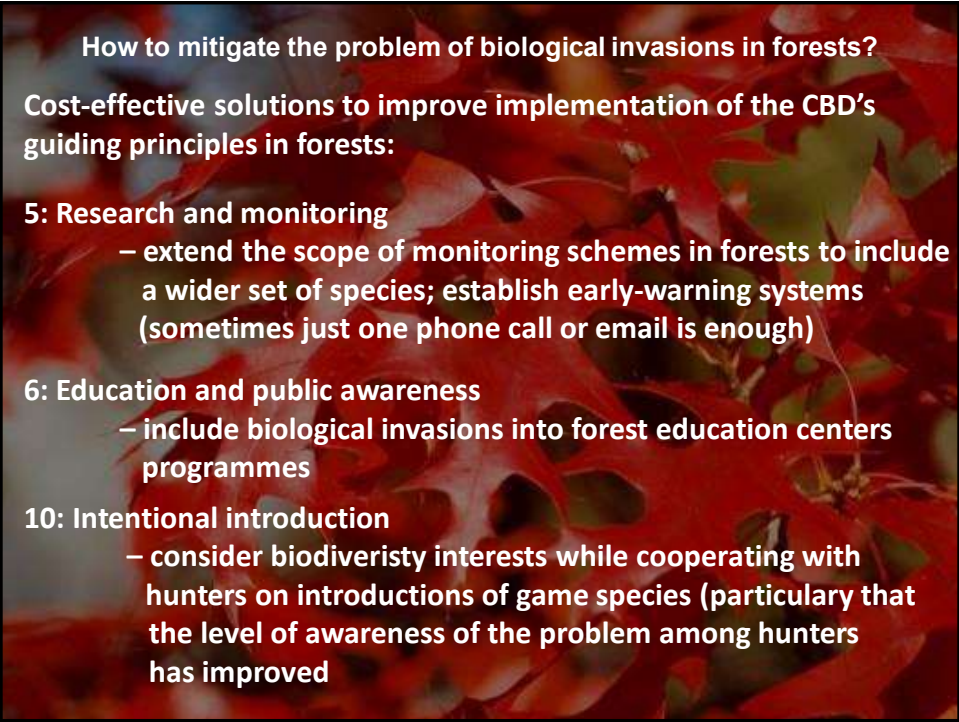


How to mitigate the problem of biological invasions in forests?

Convention on Biological Diversity (CBD), Decision VI/23 from 2002

Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species That Threaten Ecosystems, Habitats or species:

- 1: Precautionary approach
- 2: Three-stage hierarchical approach
- 3: Ecosystem approach
- 4: The role of States
- 5: Research and monitoring
- 6: Education and public awareness
- 7: Border control and quarantine measures
- 8: Exchange of information
- 9: Cooperation, including capacity-building
- 10: Intentional introduction
- 11: Unintentional introductions
- 12: Mitigation of impacts
- 13: Eradication
- 14: Containment
- 15: Control



How to mitigate the problem of biological invasions in forests?

Cost-effective solutions to improve implementation of the CBD's guiding principles in forests:

- 5: Research and monitoring
 - extend the scope of monitoring schemes in forests to include a wider set of species; establish early-warning systems (sometimes just one phone call or email is enough)
- 6: Education and public awareness
 - include biological invasions into forest education centers programmes
- 10: Intentional introduction
 - consider biodiversity interests while cooperating with hunters on introductions of game species (particularly that the level of awareness of the problem among hunters has improved)

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Thank you!

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