Biodiversity conservation and forestry is compromise possible?

Zbigniew Borowski

Forest Research Institute in Poland

Department of Forest Ecology

IBL

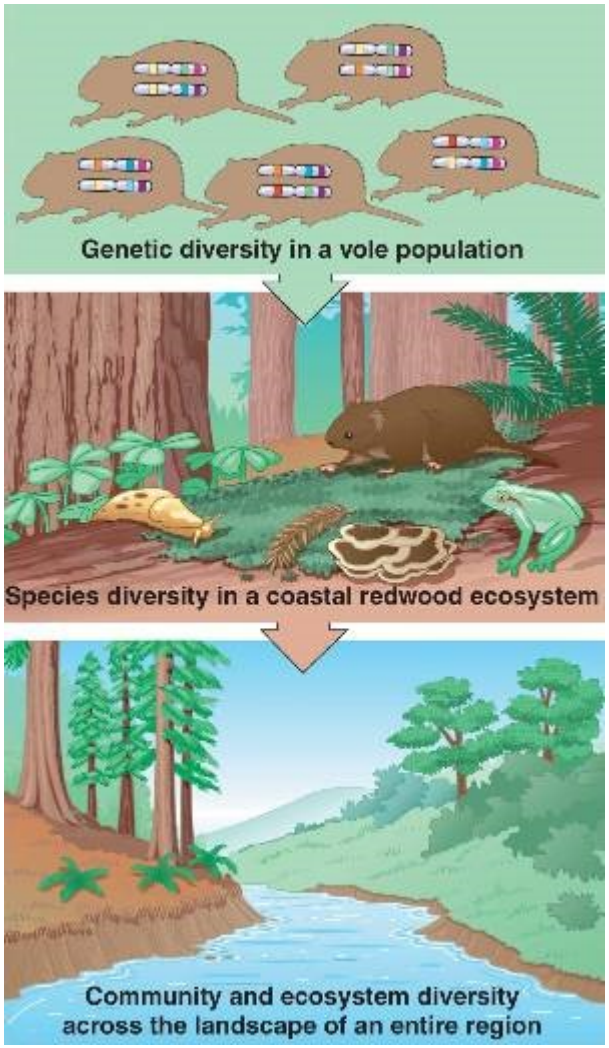
EVROPSKÁ UNIE esf MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY OP Vzdělávání pro konkurenceschopnost

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Tento projekt je spolufinancován Evropským sociálním fondem a Státním rozpočtem ČR InoBio – CZ.1.07/2.2.00/28.0018

Biodiversity

- Variety of living things, number of kinds
- Ecological diversity
  - different habitats, niches, species interactions
- Species diversity
  - different kinds of organisms, relationships among species
- Genetic diversity
  - different genes & combinations of genes within populations



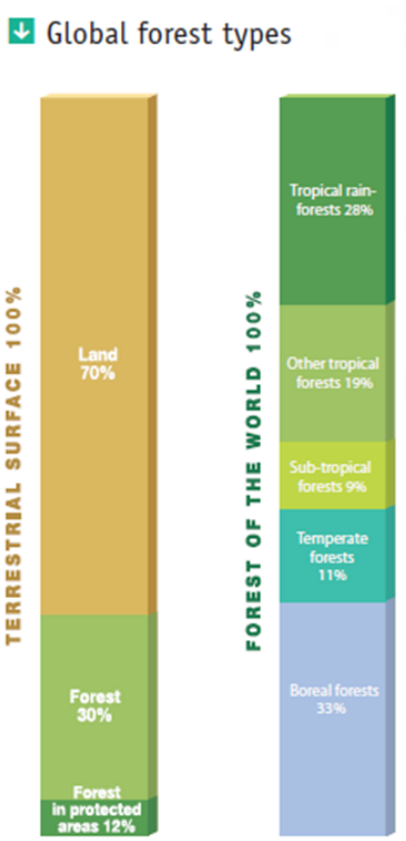
Forest Biodiversity

Forest biodiversity

Forest biodiversity is often referred as very high and valuable.

Conservation of forests has gained a significant part of conventions, treaties and action plans for biodiversity conservation.

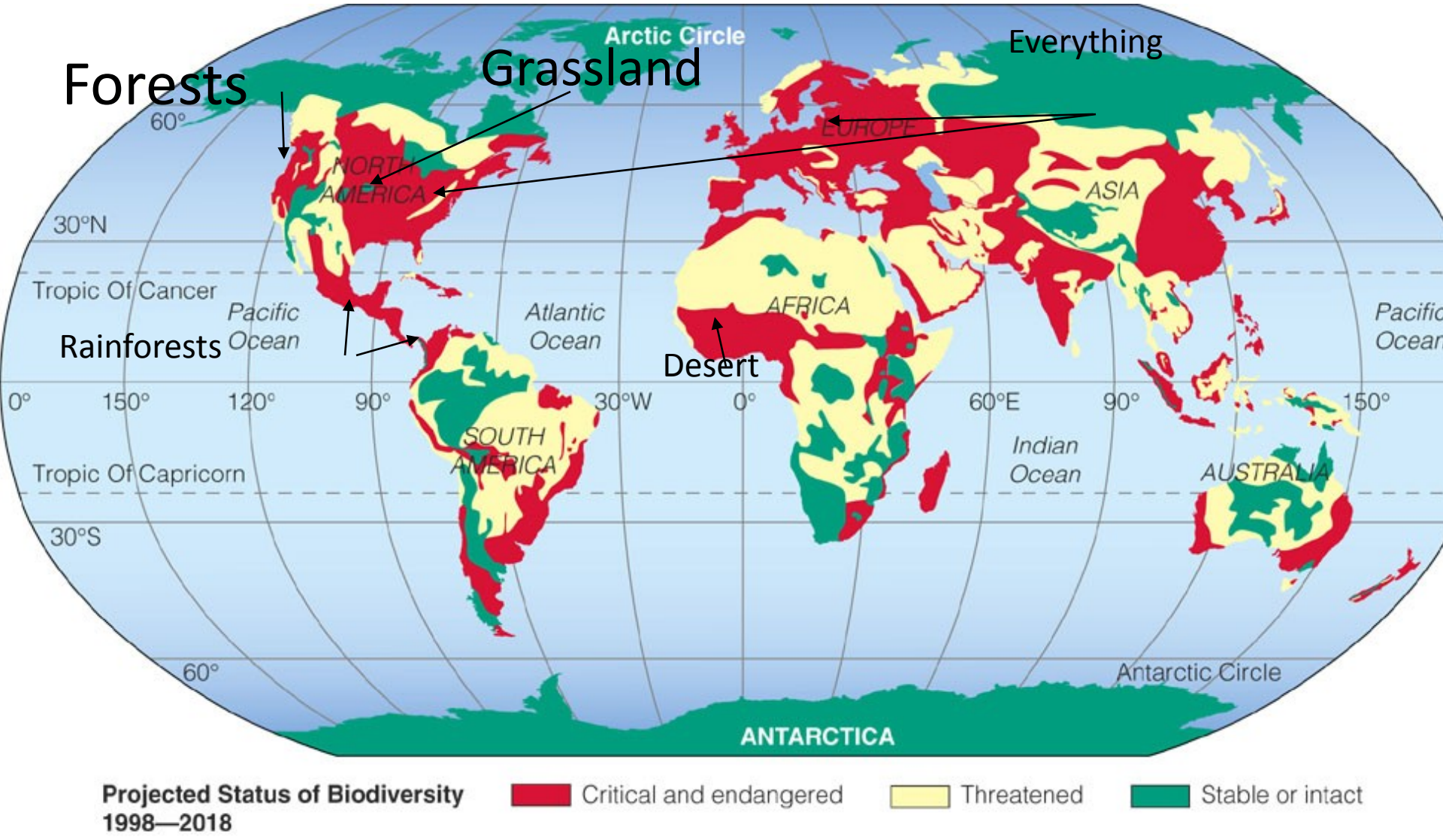
- forests are in many parts of the world the most "wild" and complex terrestrial ecosystems and at the same time the most impressive ones,
- forests are decreasing world-wide,
- forest science is the most developed applied on the ground nature management scientific discipline.



What is wrong?

1. Biodiversity cannot be measured.
2. Most scientists measure **species diversity** only.
3. Even the species level is narrowed down to the units that are easily identifiable, or just cute and recognisable (**charismatic megafauna**).
4. Wrong scientific criteria for **networks of protected areas**, besides their political and managerial failure.
5. Most biodiversity (species richness) is concerned better.
6. The **dynamic character** of biodiversity is ignored (the values that make it evolve).

Global Biodiversity Status



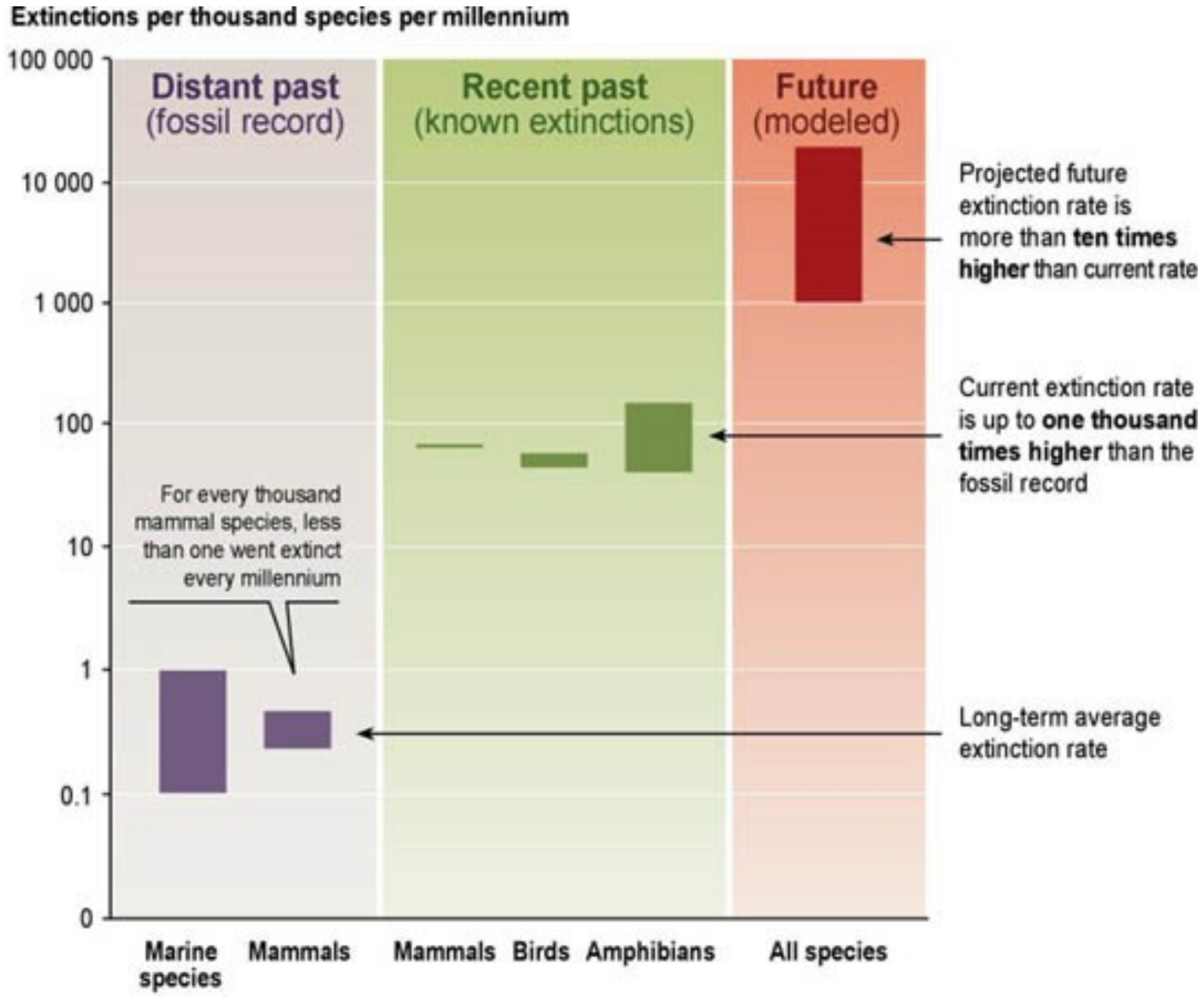
Should we be concerned about biodiversity?

What we know:

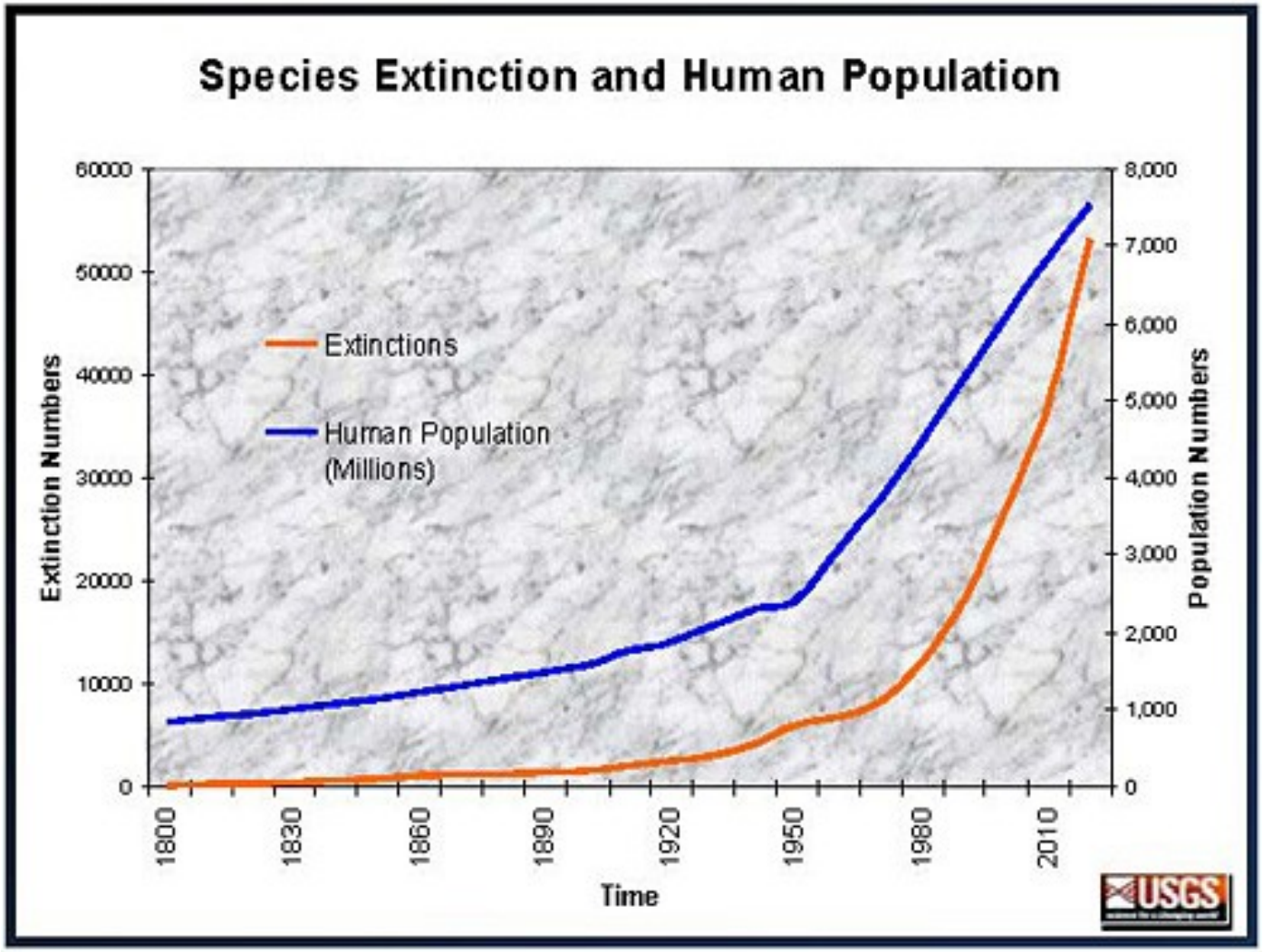
The Earth is losing species at an alarming rate

- Some scientists estimate that as many as 3 species per hour are going extinct and 20,000 extinctions occur each year.
- When species of plants and animals go extinct, many other species are affected.


WILDLIFE IN DANGER
THE MOST
THREATENED SPECIES
1
2
3
4
5
6
7
8
9
10
That's one more creature we can remove from the endangered species list.
It's become extinct.



Source: Millennium Ecosystem Assessment


Species Extinction and Human Population
Extinction Numbers
60000
50000
40000
30000
20000
10000
0
Extinctions
Human Population
(Millions)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Population Numbers
1800
1830
1860
1890
1920
1950
1980
2010
Time
USGS

BIODIVERSITY

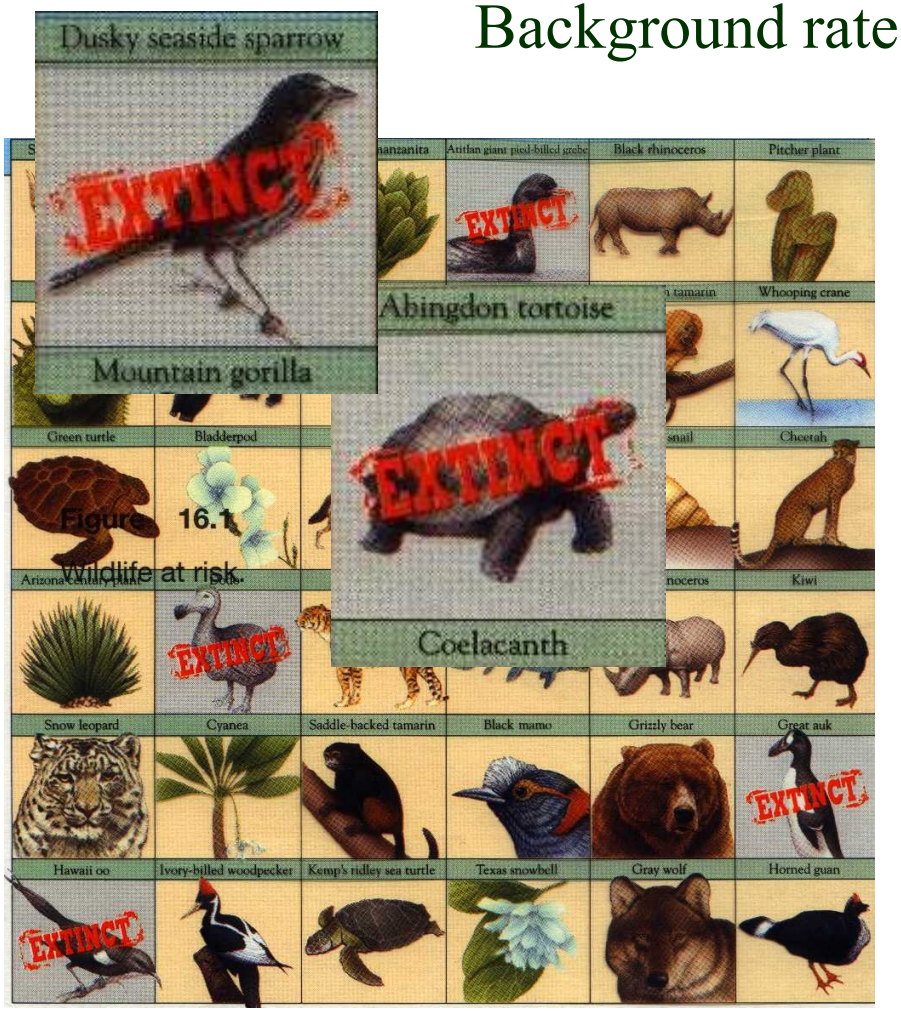


Figure 16.1 Wildlife at risk.

Background rates

- 1 mammal species every 400 years
- 1 bird species/200 yrs

Now……..

- 10,000 times the background rate!
- 20-75 plant/animal species each day?

A continuing threat

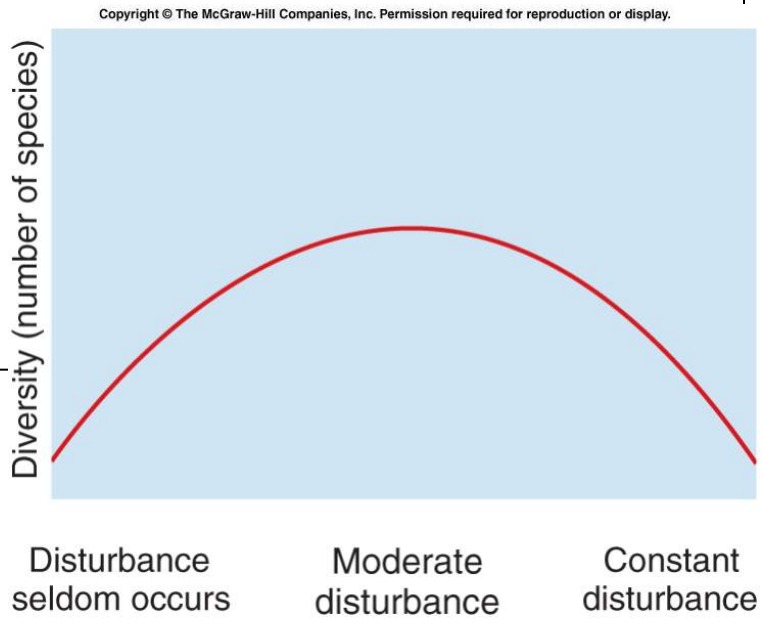
- Forest biodiversity is threatened by rapid deforestation, forest fragmentation and degradation, hunting and the arrival of invasive species from other habitats. (We are losing 12 million hectares of forest a year, much of it tropical rainforest with its unique and rich biodiversity).

How can we protect biodiversity?

- Establish protected forest areas with a well-designed network of forest areas, to allow the local forest ecosystems to continue operating effectively.

Succession

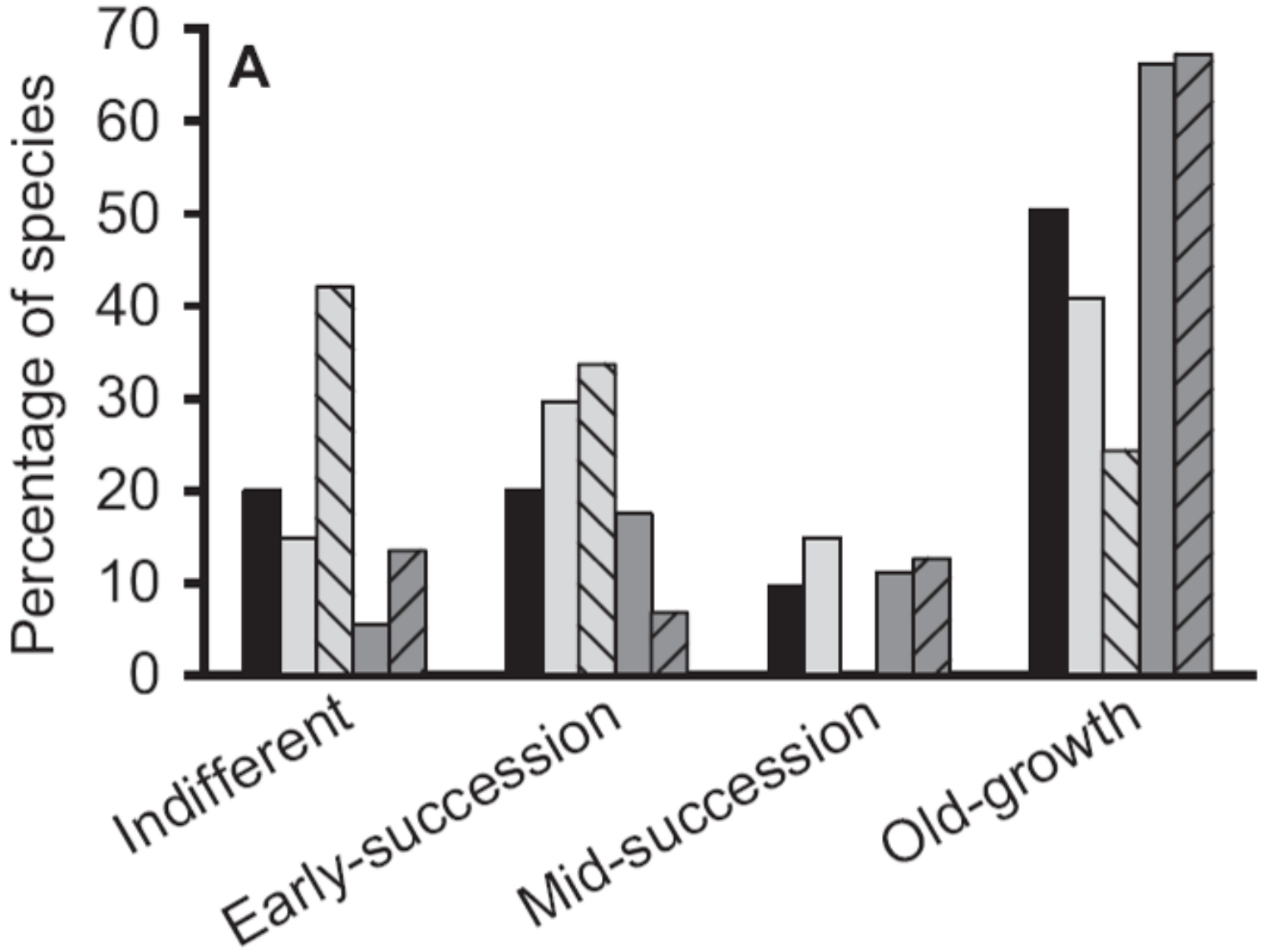
- **Highest diversity occurs when there is enough disturbance to prevent the dominant competitors from taking over, but not so much that the community is unable to develop.**



Major threats & pressures include

- Fragmentation
- Unsustainable management
- Air pollution
- Climate change

Longer rotations will provide a more stable ecosystem and greater biodiversity



Tikkanen *et al* (2006) Red-listed boreal forest species of Finland: associations with forest structure, tree species, and decaying wood. *Ann. Zool. Fennici* 43: 373–383.

THE ONLY THING CONSTANT ABOUT FOREST ECOSYSTEMS THEY NEVER STOP CHANGING!

- **Natural changes:**

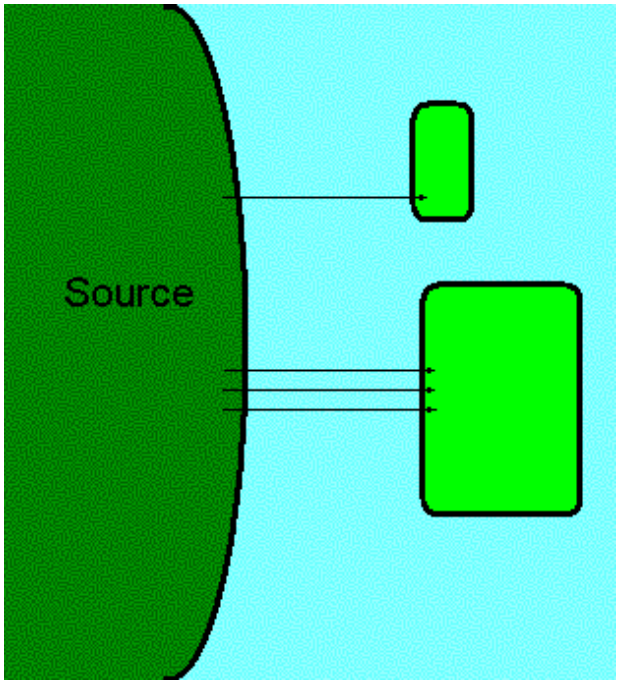
fire, storms, drought, flood, death and disease

- **Man-made changes:**

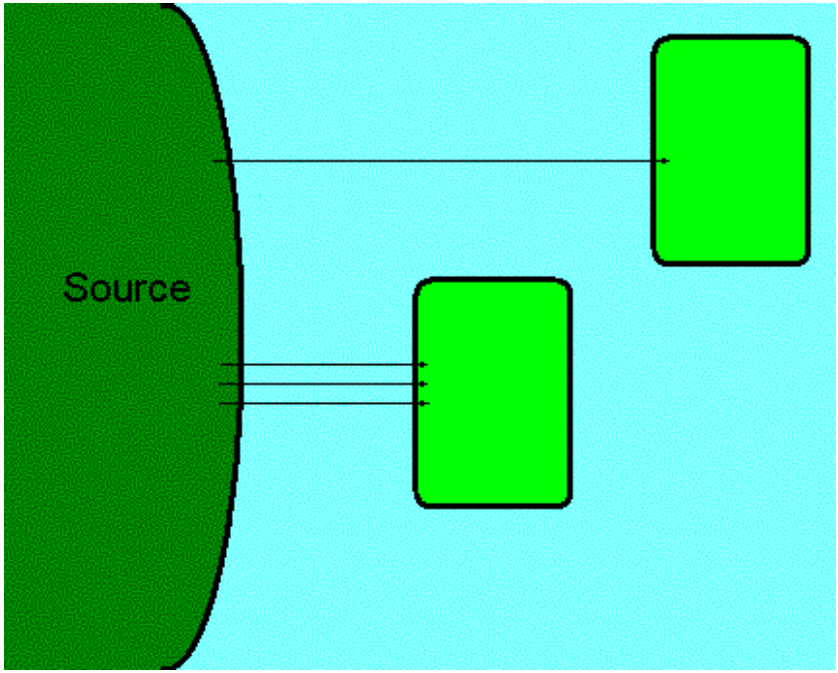
harvesting, farming, trails, development, and recreation

Protecting Biodiversity

- Effect of island size

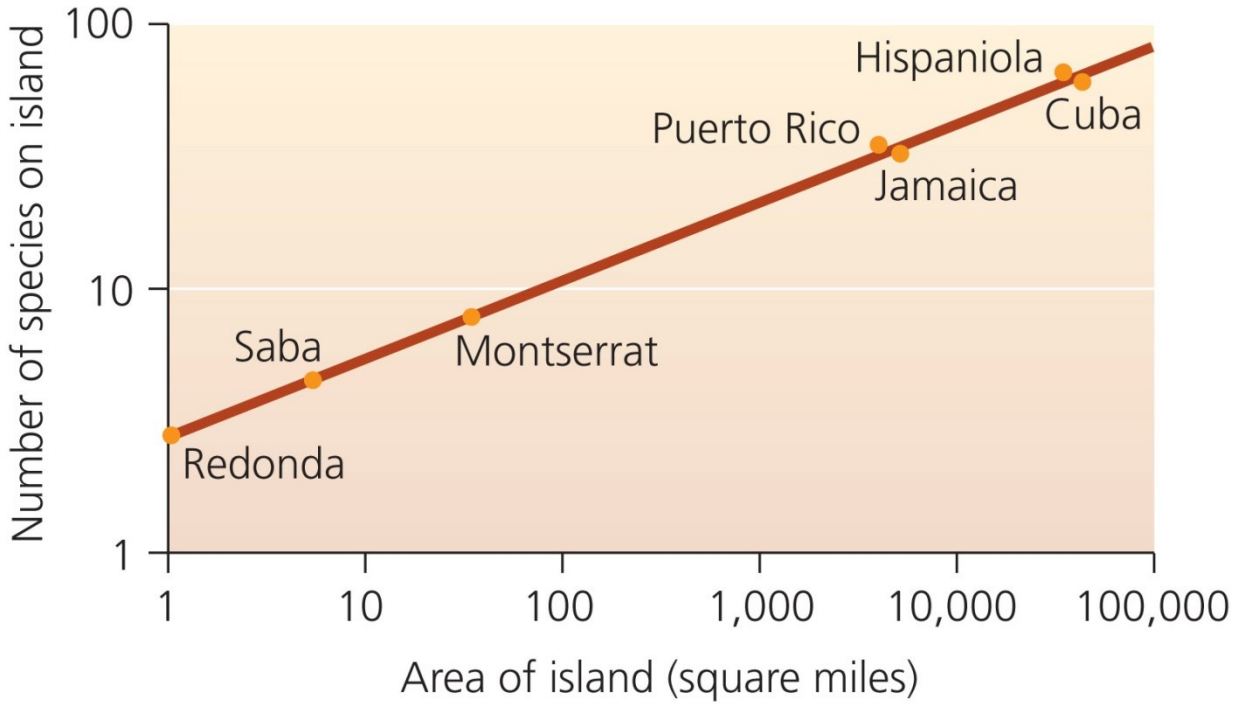


- Effect of island distance



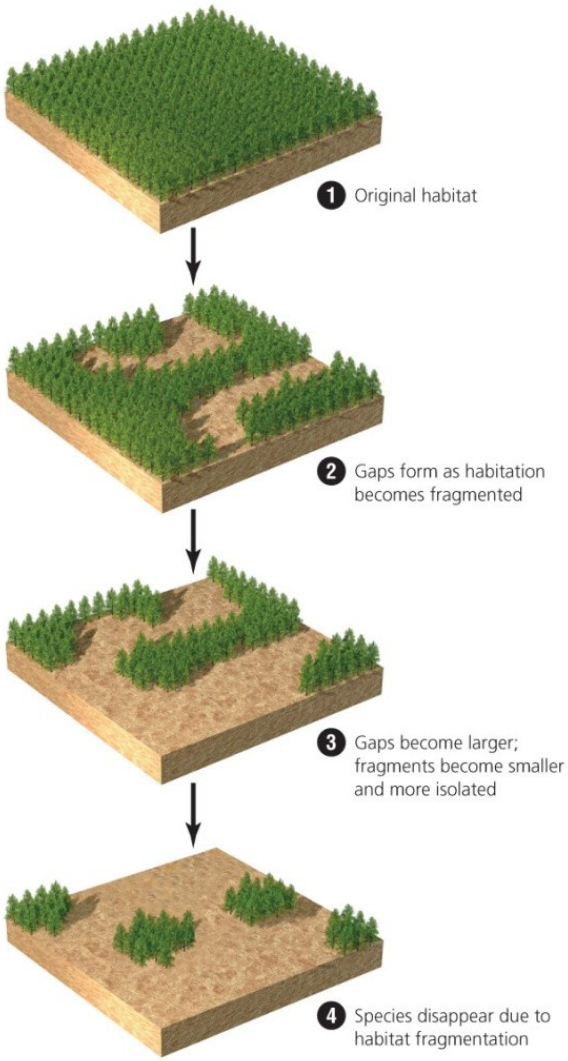
Protecting Biodiversity

- Island Biogeography
  - Island size predicts number of species



Protecting Biodiversity

- Island Biogeography
  - Everyplace is an island
  - Habitat fragmentation
    - Smaller fragments hold fewer species



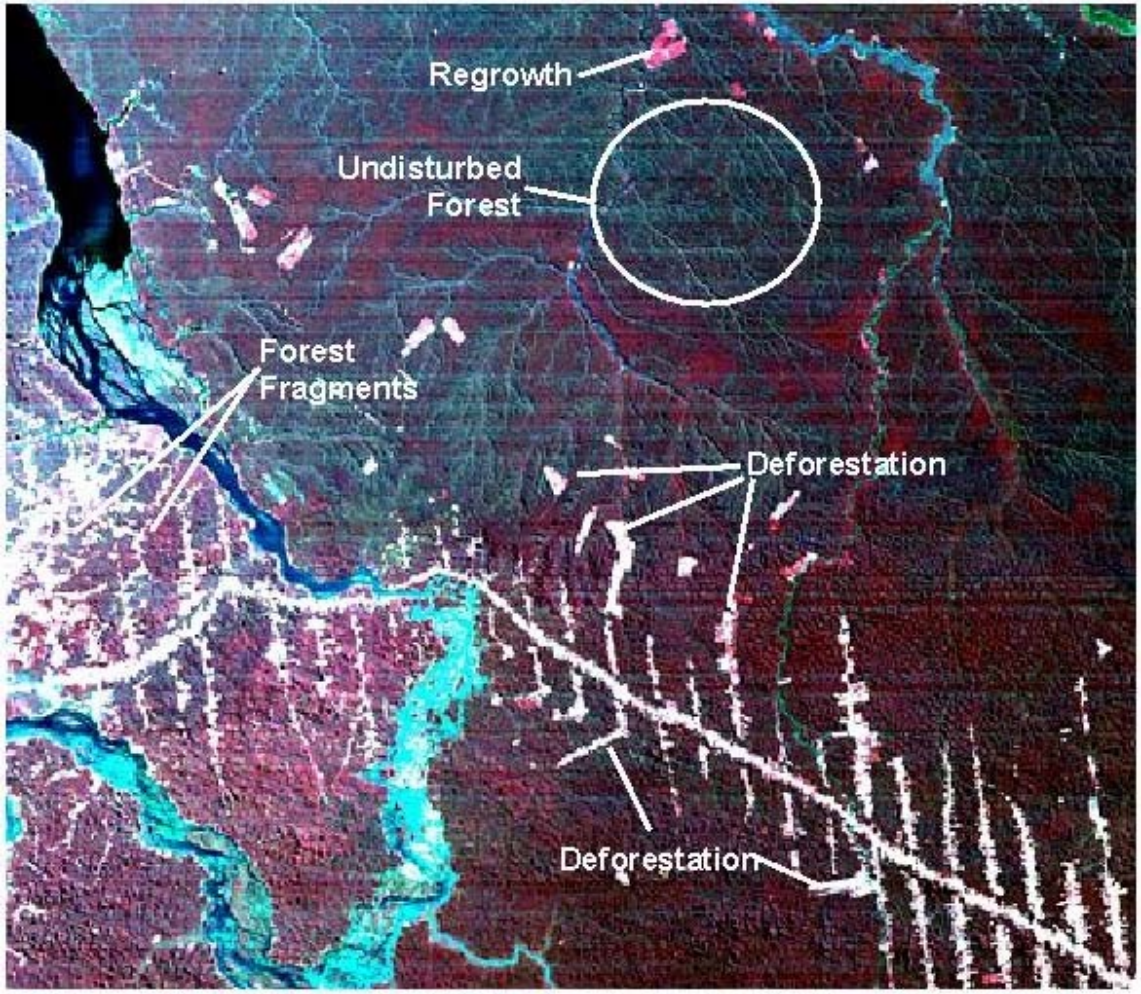
RATES OF DEFORESTATION

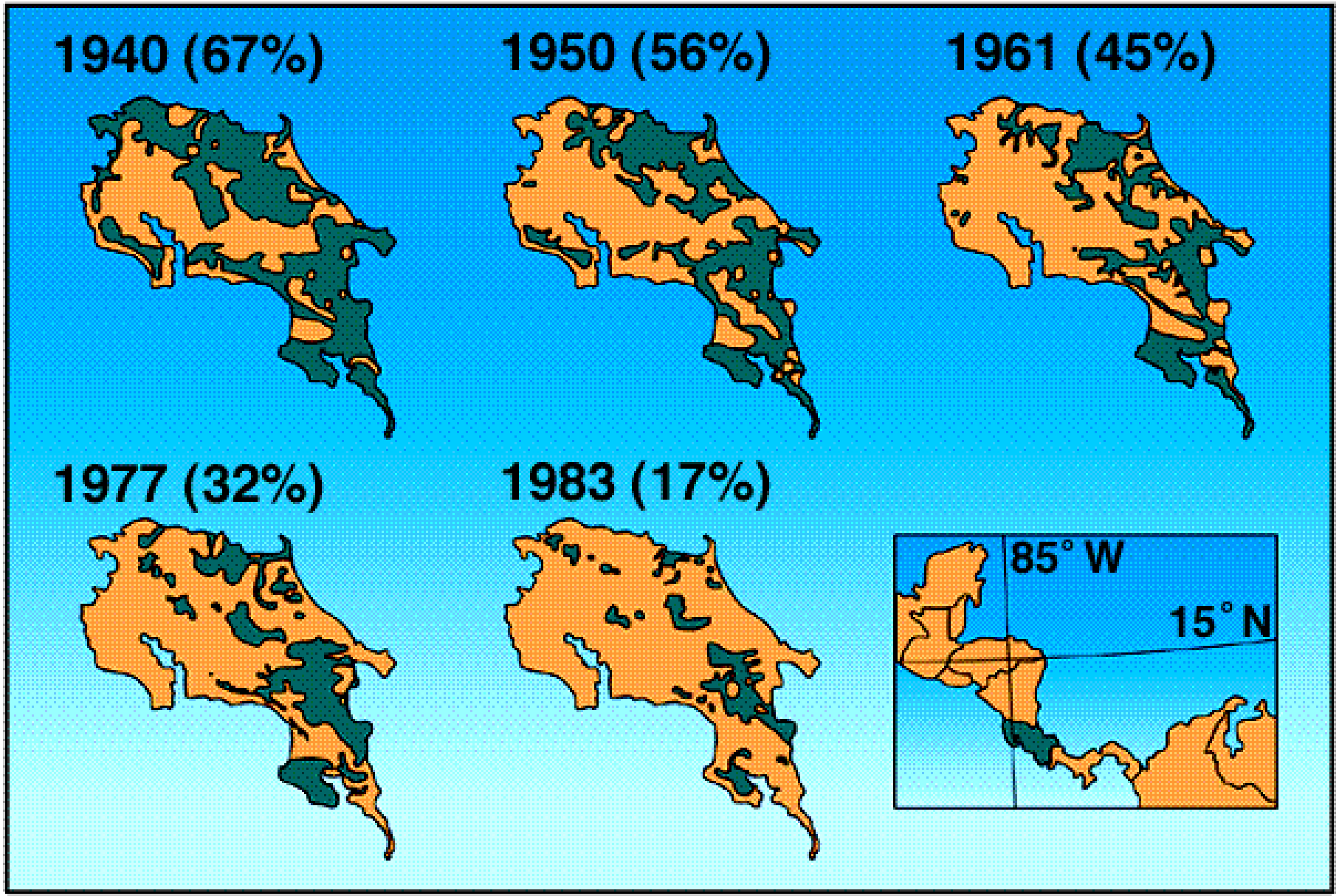
1981-1990:

- **0.9%/year**
- **53,000 sq. mi./year**
- **21,000 sq. mi. in South America (Amz) = area of NC**

- **By 1988, +/- 10% of the Amazon had been cut down**

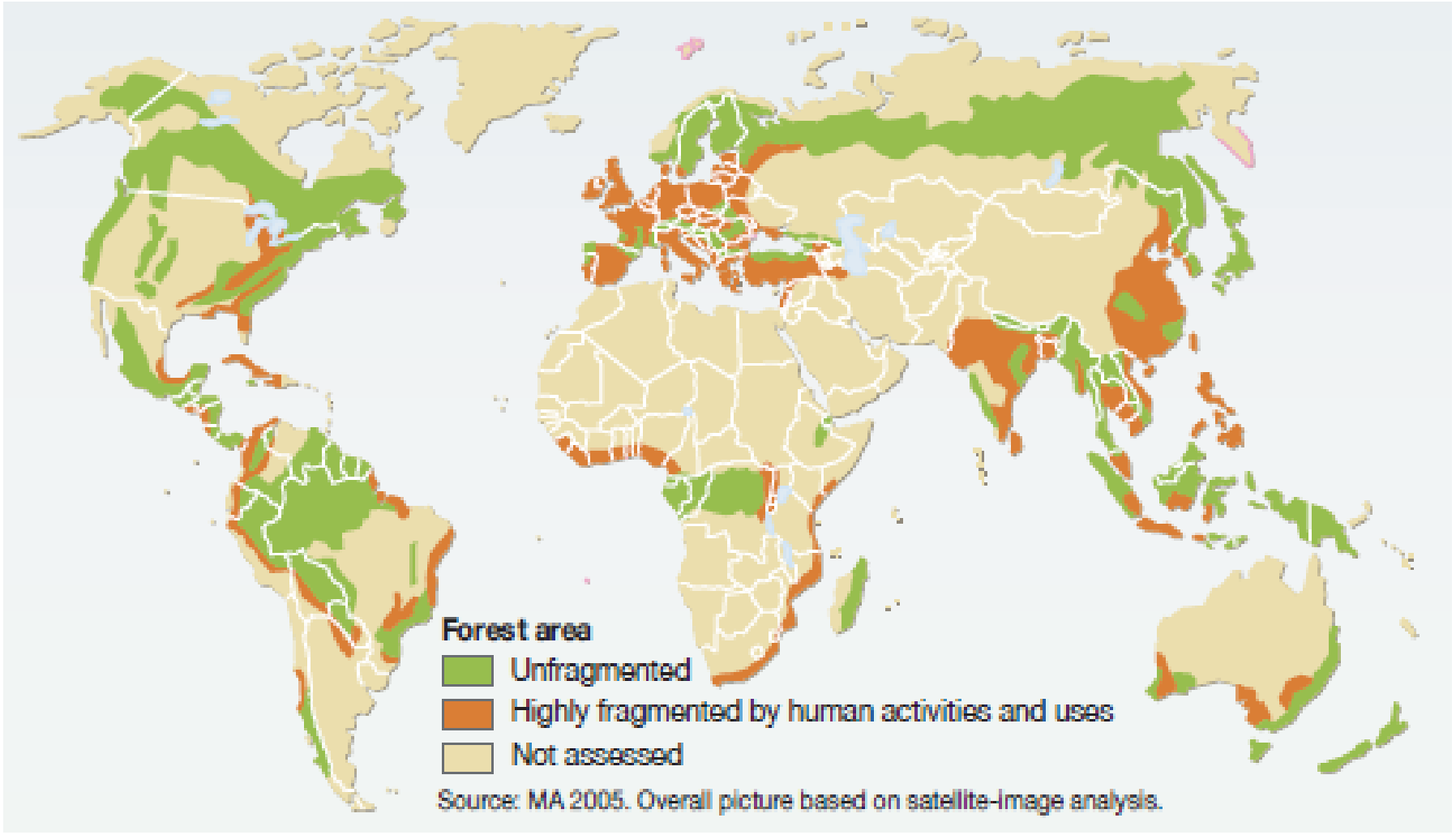
- **Due to isolation of fragments and in forest/clearing boundaries = 16% affected by deforestation**





Loss of primary forest in Costa Rica 1940-1983.

Global forest fragmentation



•Impacts of fragmentation are scale dependent & vary between species

•Some species require large areas on non-fragmented forests eg. capercallie

•Increased risk of local extinction

•Large areas allow natural forest dynamics

Thirty percent forest cover at landscape scale seems to be a threshold for many species

Photo - www.snh.org.uk

Importance of Dead wood

Importance of Dead wood

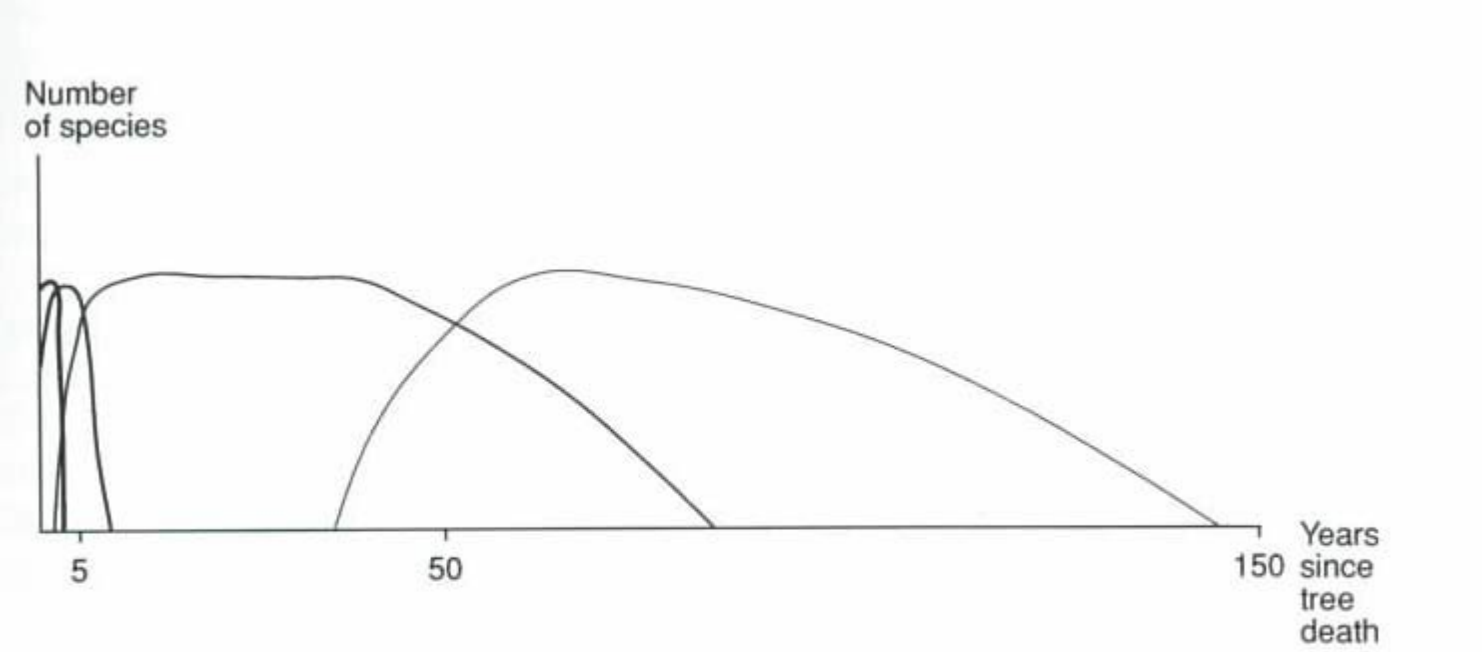


Figure 5. Successive phases in the invertebrate community exploiting dead wood succession 1, 2, 3, 4 (Adapted from Ehnström and Waldén (1986, pp. 80-81)).

Importance of Dead wood

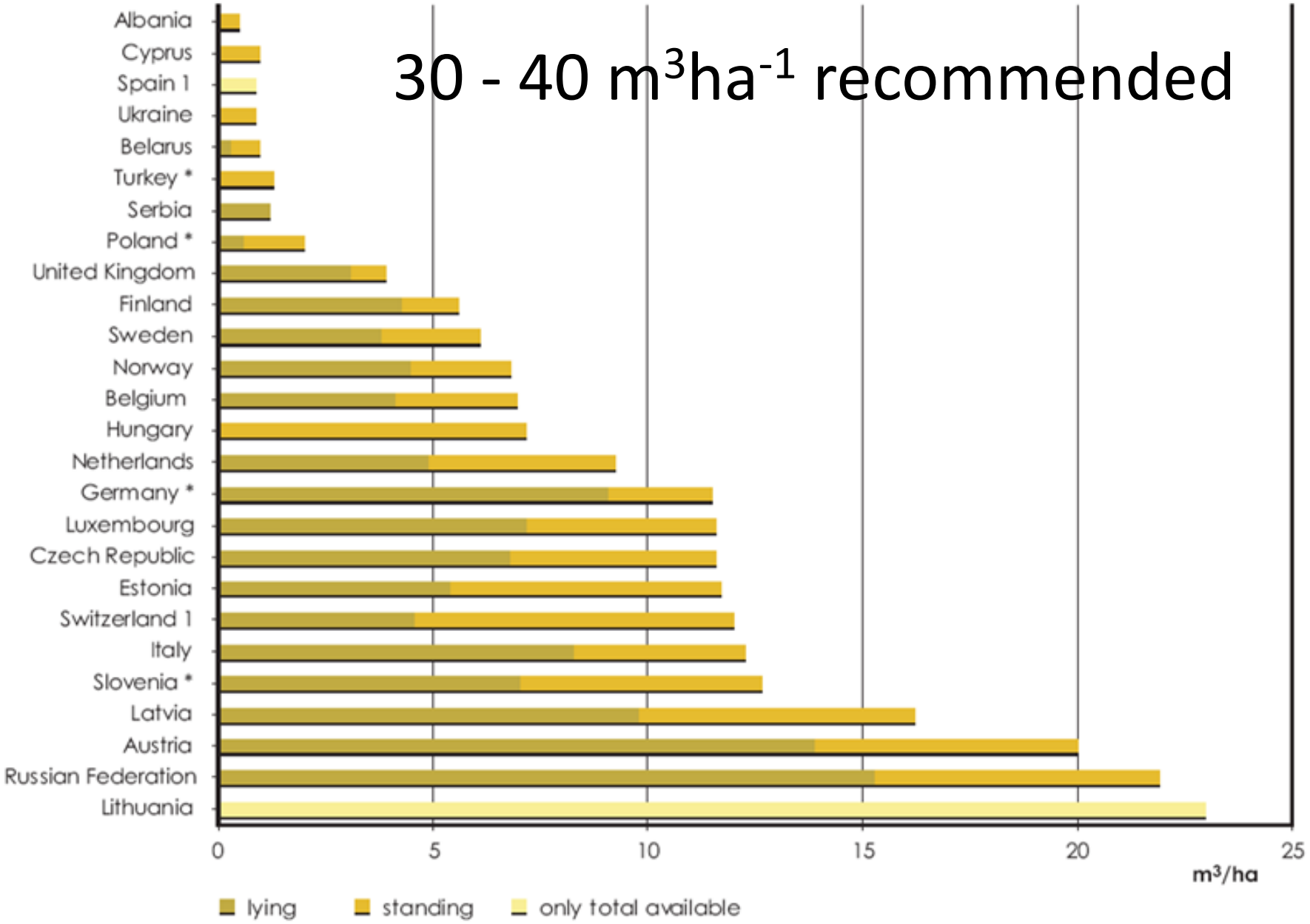
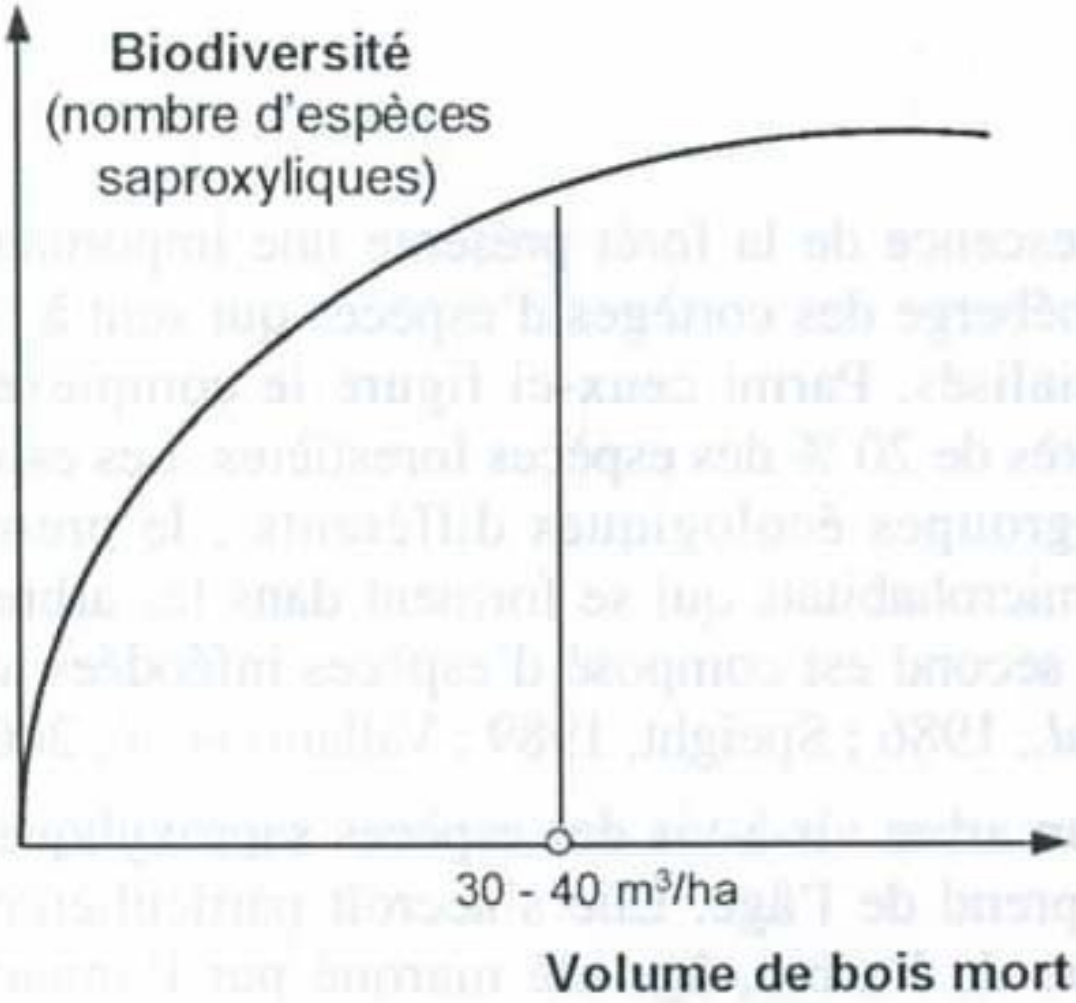


Figure 40. Average volume of standing and lying deadwood, 2005

Importance of Dead wood



Vallaur *et al* (2005)

Use of non native trees

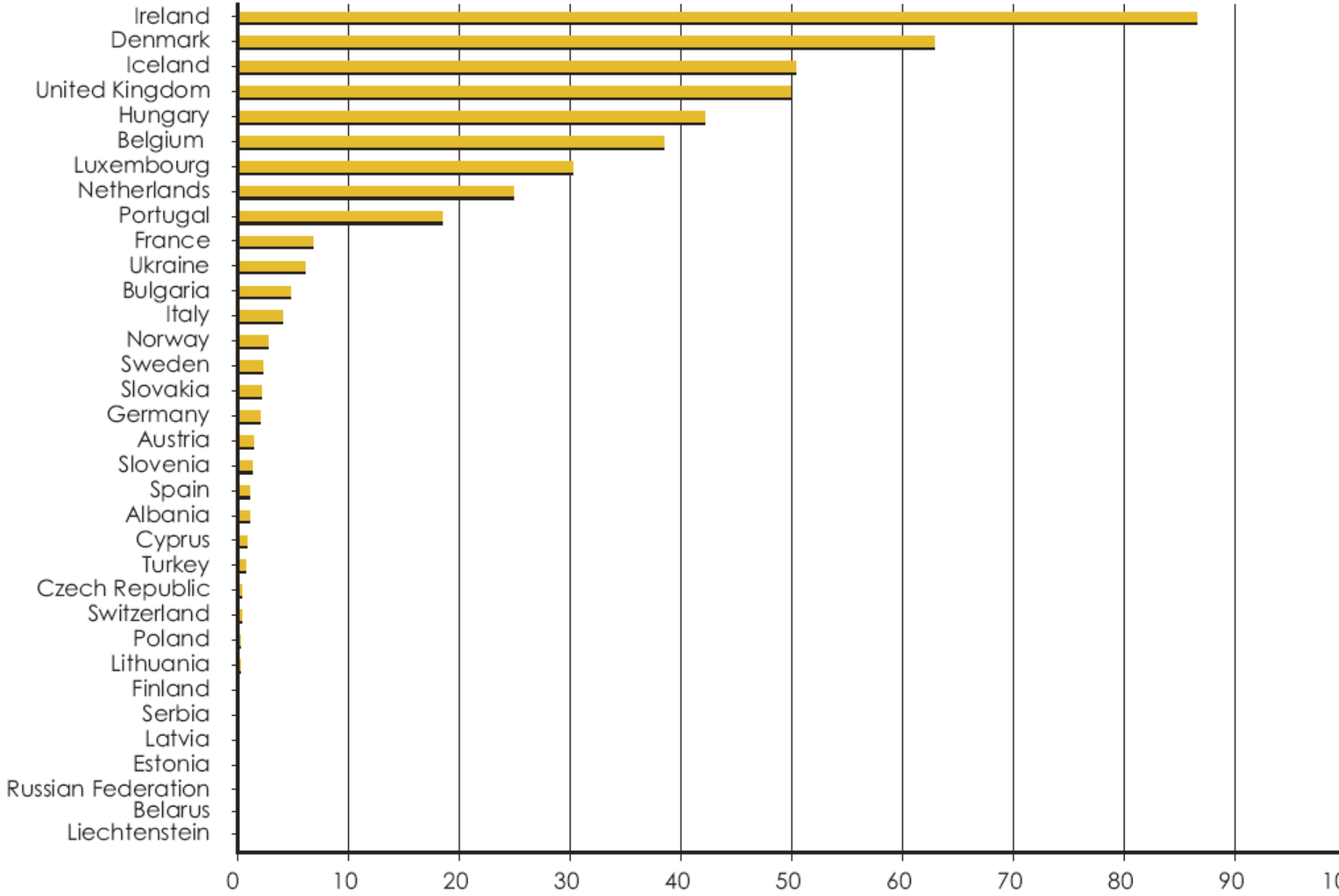
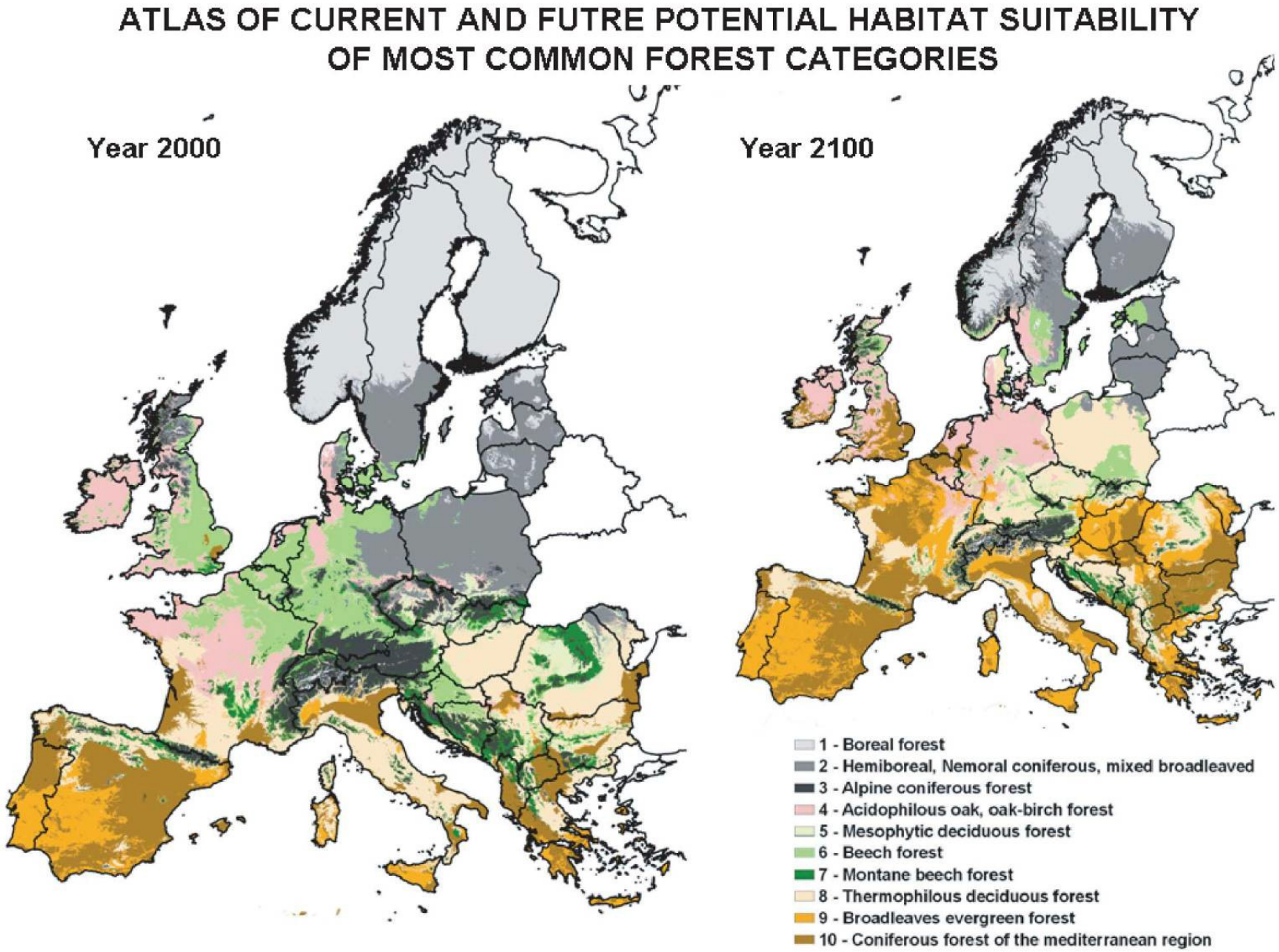


Figure 39. Share of forest area dominated by introduced tree species of the total forest area (%) for countrie

Climate change



http://forest.jrc.ec.europa.eu/climate-change

Facing Climate Change Impacts

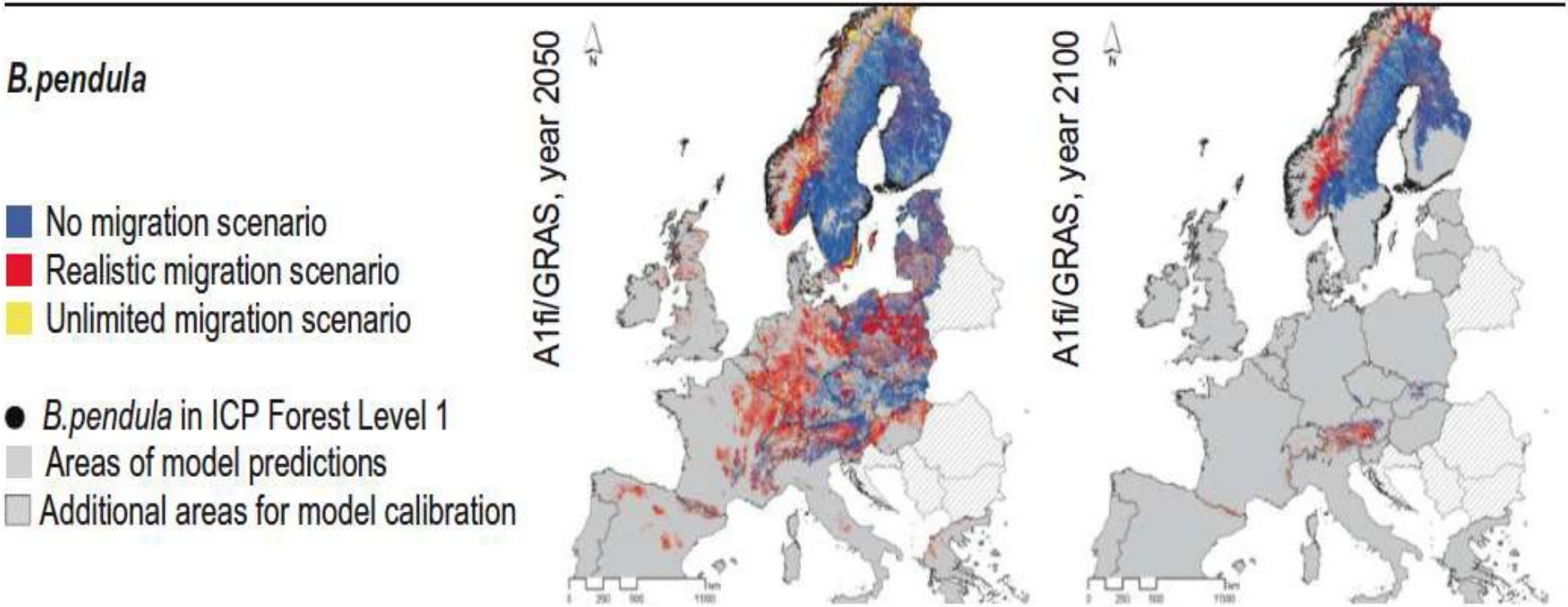
1. Increased growth rates in the North

2. Shifting species suitability

3. Higher risk of storm and insect damages

4. More intense and frequent forest fires

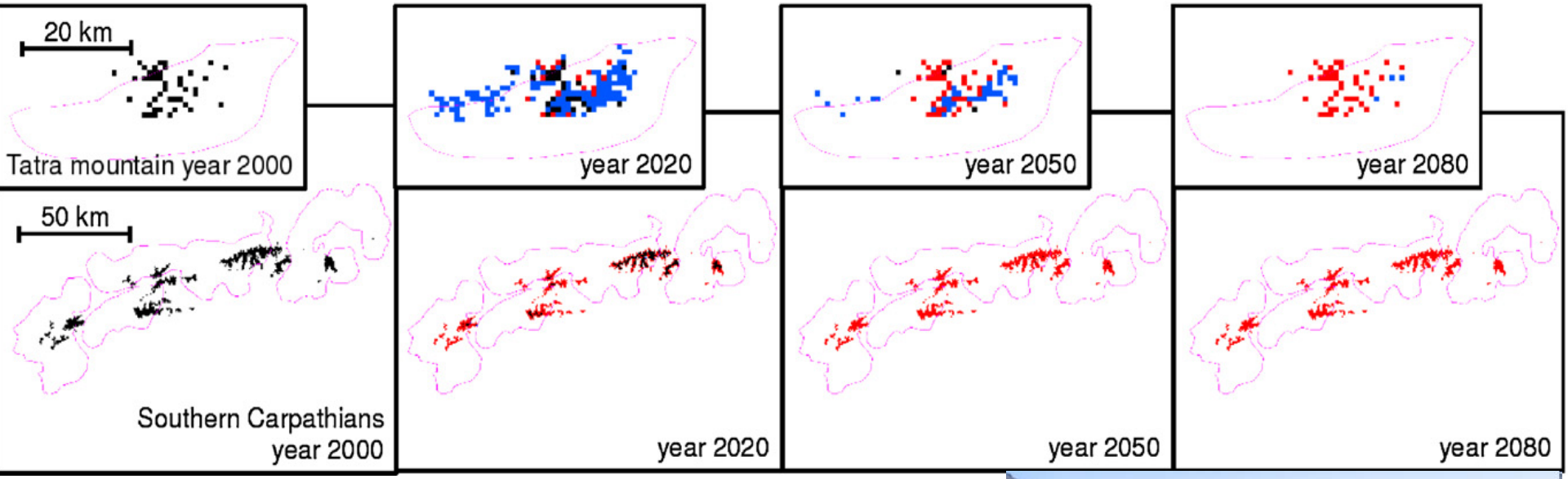
Future projected distribution of birch;



Meier et al. 2011, Global Ecol. Biogeogr.

Random Forest model of suitability for Pinus cembra in the study area according to the present and future (2020, 2050, 2080) projections of climate (ENS model)

(Casalegno et al. (2010)



Pinus cembra L. (Pinaceae)

RF suitability model projected under ENS climatic model:

Suitable or stable suitability in future projections

Loss of suitability

Gain of suitability

Forest Functions:

Forests fulfil diverse functions, either naturally or as a result of human activities:

- **Ecological (protective) functions:** favourable impact on shaping of the local and global climate, regulation of water cycle in nature, prevention of floods, avalanches and landslides, protection of soil against erosion and landscape against steppization;
- **Social functions:** providing health-improving and recreational conditions for society and contributing to the labour market;
- **Productive (economic) functions:** primarily production of renewable biomass, including timber and non-timber products.

Forestry systems

1. Forest protection in order to preserve the natural environment (strengthening bio-ecological functions of the forest, and the preservation of its biodiversity).

2. Production forest (forest management in order to achieve maximum production of wood and non-wood products).

3. „Social – forestry” (recreative)

4. Agroforestry (integrate forestry with agriculture)

Type of management	Economic approach	Semi-natural approach	Conservation approach
Management objectives	timber production	timber production is the primary goal	forest reserves to observe natural processes
Timber production	+++++	++++	+
long-term profit	+++	+++++	+
short-term profit	+++++	+++	+
good raw material production	++++	++++	+
protection of biodiversity	+	+++	+++++
Aesthetic value	+	+++++	+++++
integration with the landscape	++	++++	+++++
space for recreation	++	++++	++
Hunting values	+++	++++	+
health and resilience of forest	+	++++	+++++
sensitivity to distrubances	+	+++++	+

It is very difficult to get together conflicting functions

Two approaches:

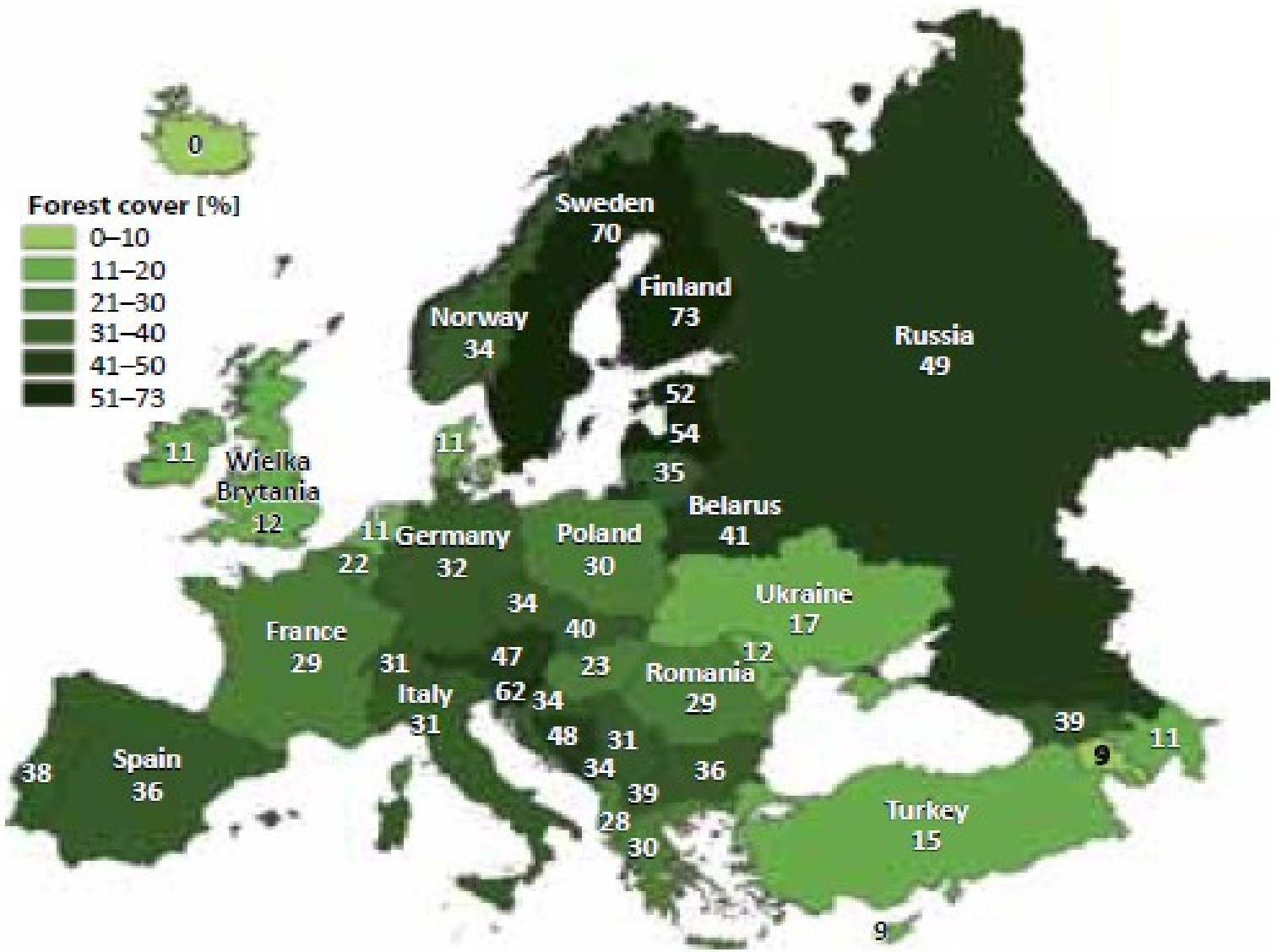
(1) Attempt to compromise and develop all forest functions in the same place and time

(2) Attempt to separate the conflicting function of the forest in time and space

(1) Little chance of success, generating conflicts

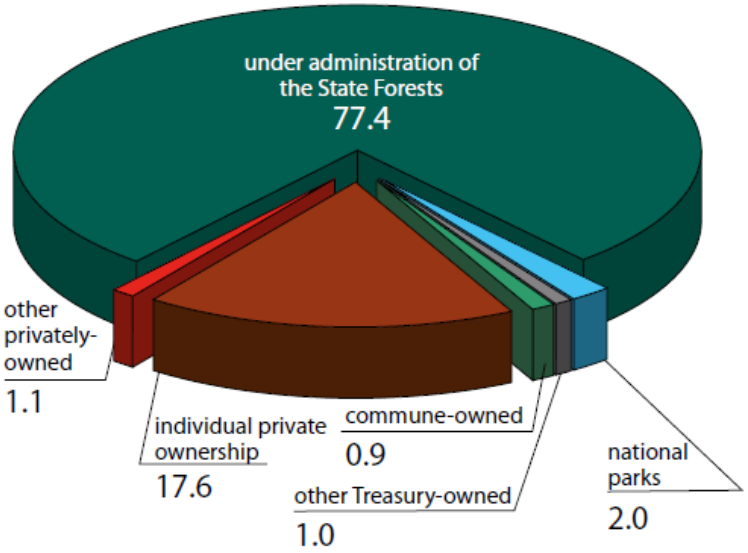
(2) Pushing specific locations to a single clearly defined functions, creating so-called green deserts

Forest Cover in European countries

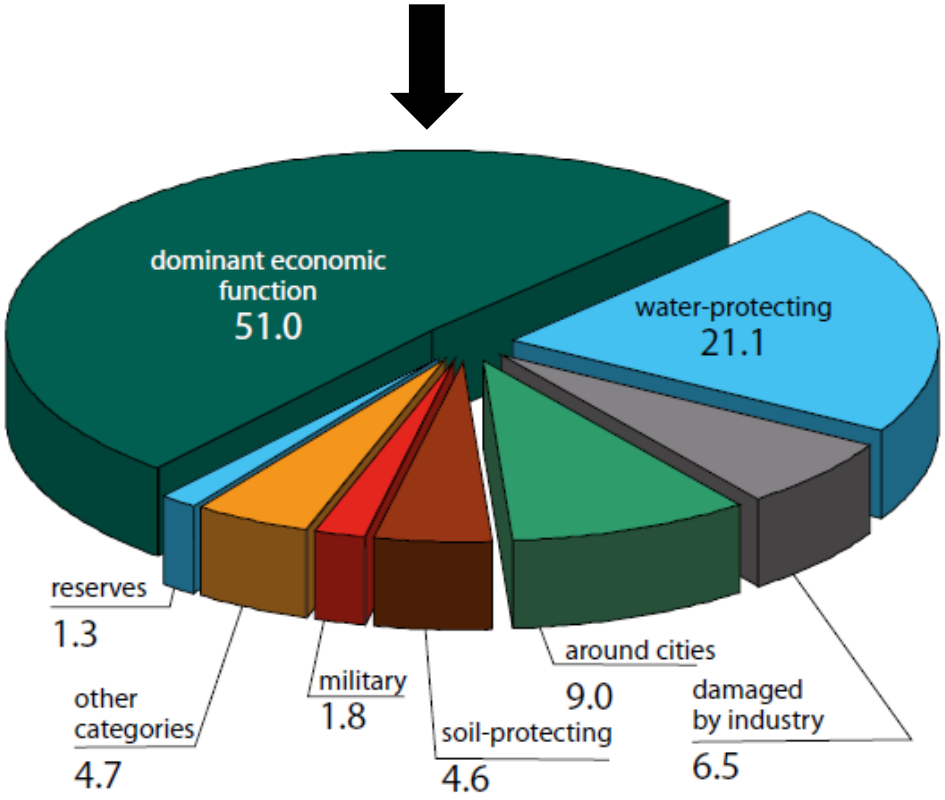


Ownership structure and dominated functions of forests in Poland in % (Central Statistical Office)

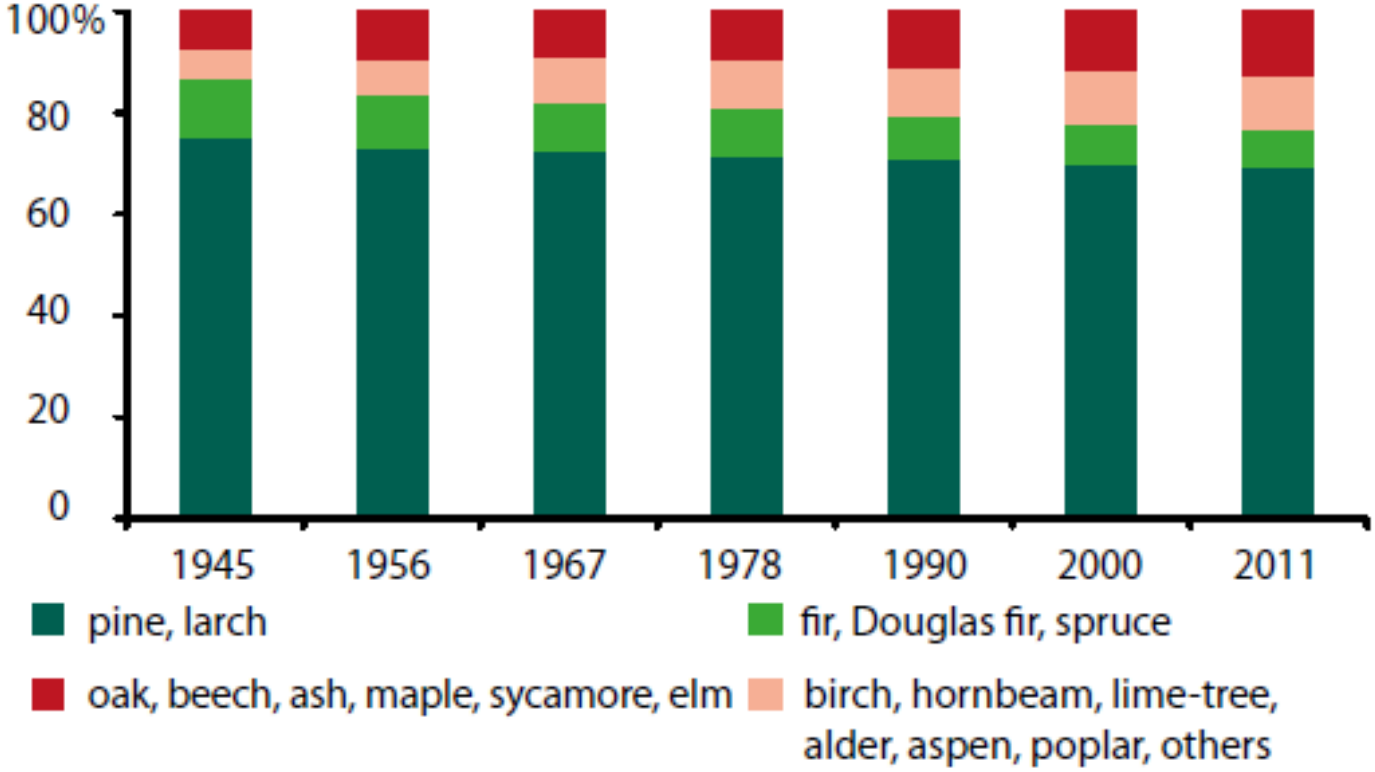
(Forests in Poland 2012)



NO CATEGORY NATURE PROTECTION



Share of protective forests in the State Forests in 2011 (in %)



Areal share of dominant tree species in the forests administered by the State Forests in 1945–2011 (Forest Management and Geodesy Bureau, Central Statistical Office).

Participation species prevailing in the State Forests and the age structure of forests

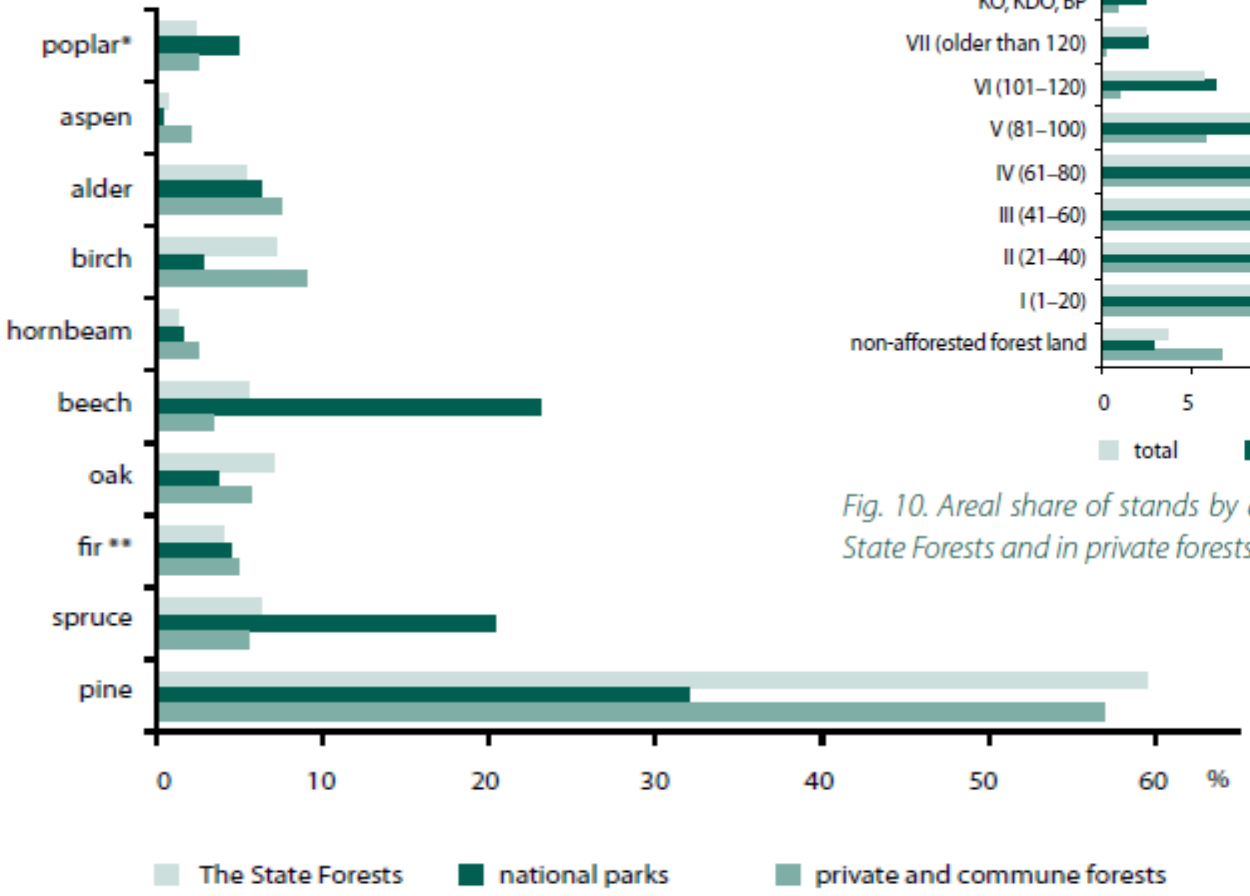


Fig. 9. Areal share of dominant species in the State Forests, national parks and in private and commune forests (Large-Scale Forest Inventory)
* including other broadleaved
** including other conifers

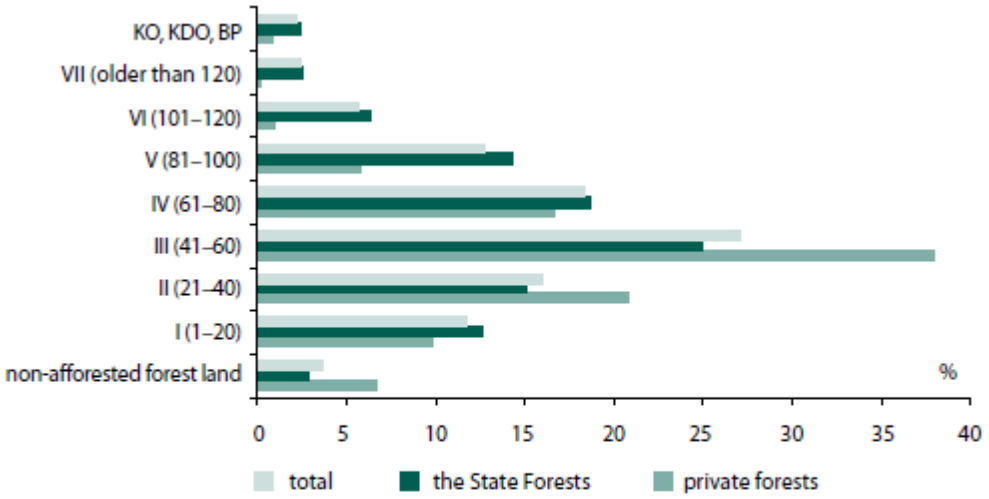
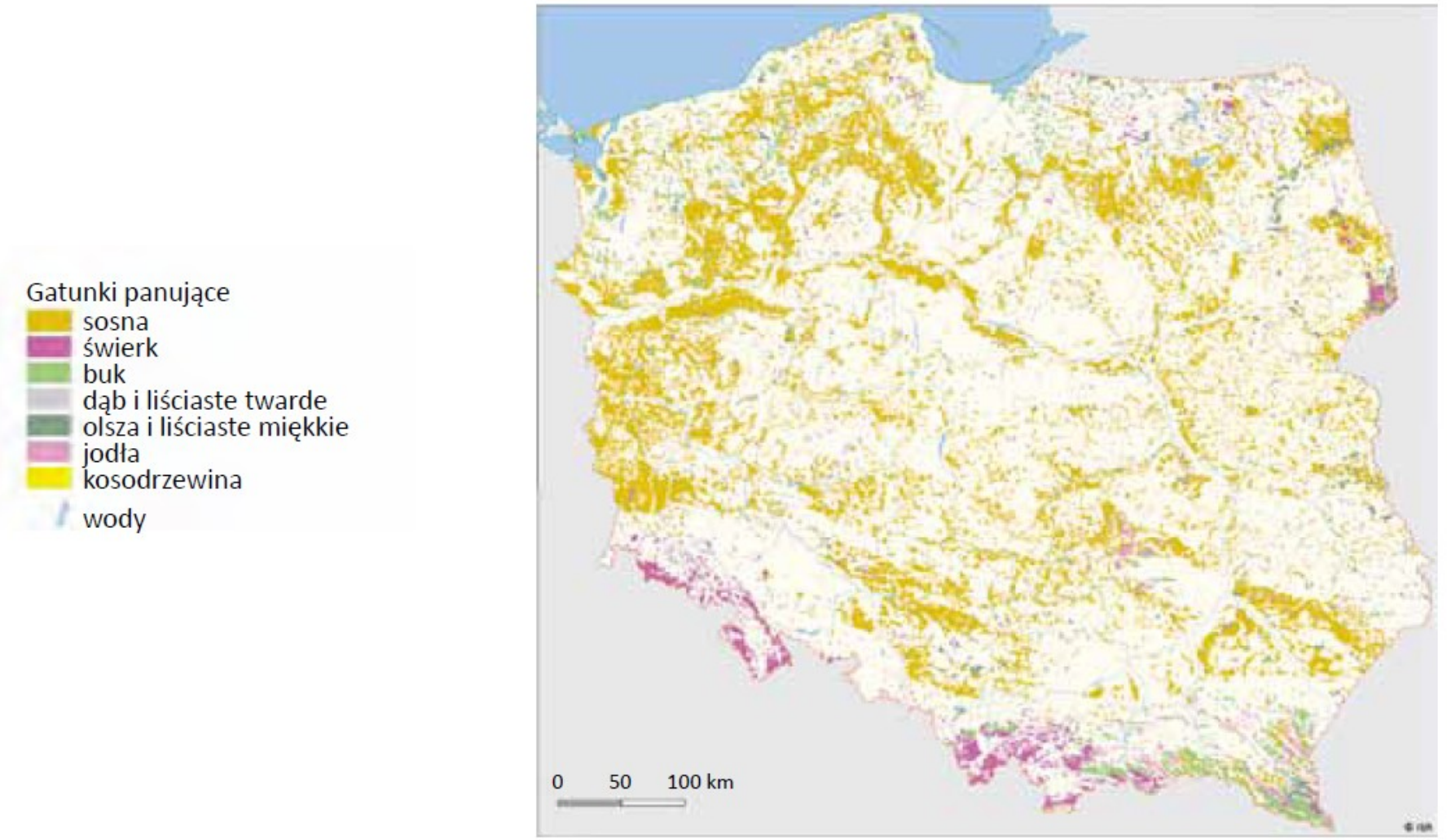


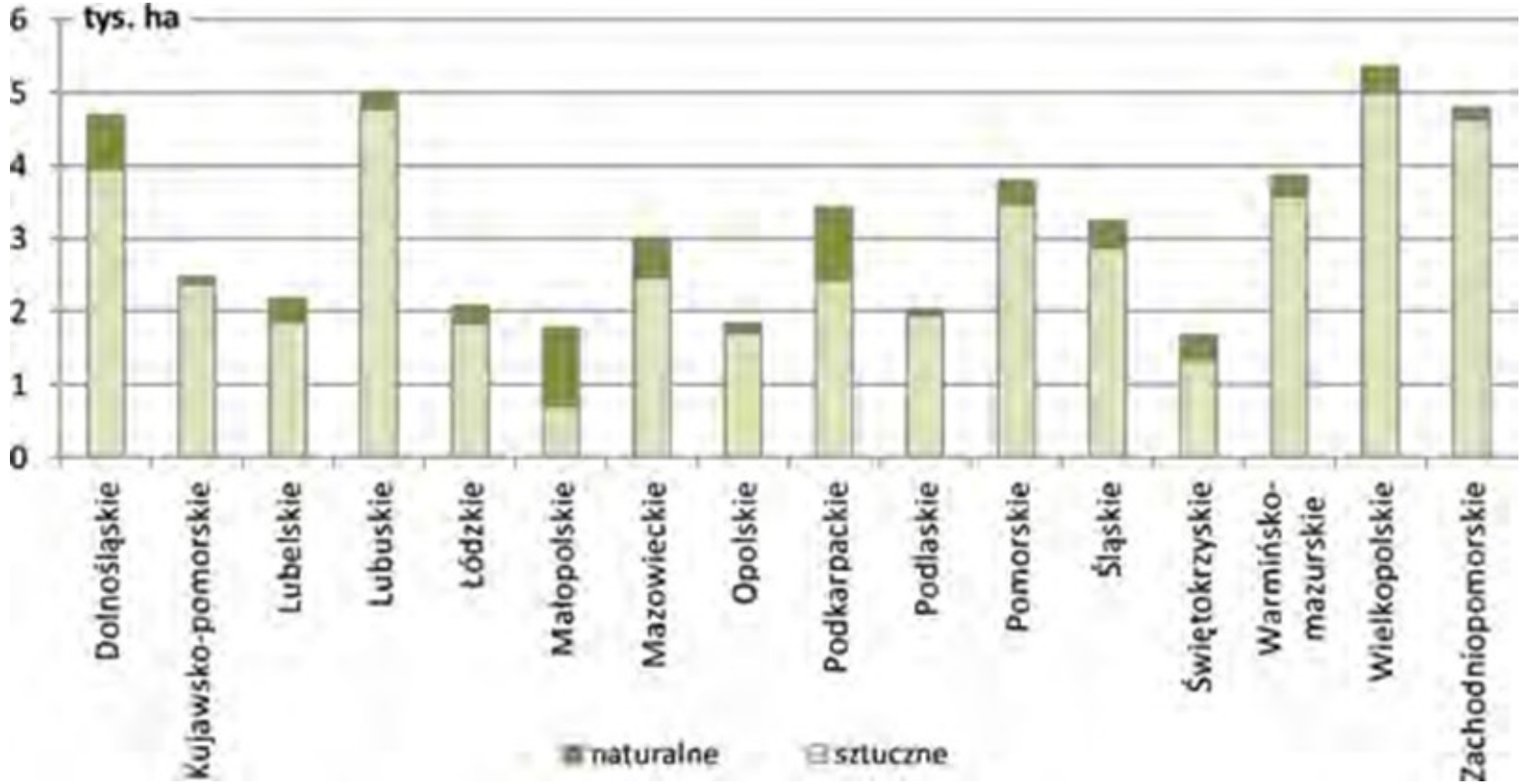
Fig. 10. Areal share of stands by age class under all forms of ownership, in the State Forests and in private forests (Large-Scale Forest Inventory)

Distribution stands by dominant species

(Raport o stanie lasów 2011)



Area of forest regeneration in 2011 r. in particular regions (green colour area of natural regeneration)



The Promotional Forest Complexes

The Promotional Forest Complexes (n=25) implementation of the pilot areas are ecological state forest policy, including selection, large, dense forest areas specific to that area.
Aim: **promote the environmental and multifunctional forest management**

Promotional Forest Complexes reconcile economic goals with the goals of active protection of ecosystems, promote environmentally friendly technologies, promote research and provide education forest community. It is a compromise between timber production, conservation and wildlife values of the forest-doing-friendly in every way man.
Created in the entire country, show variability in habitat conditions, a variety of forest species composition and multiplicity of the functions

The Promotional Forest Complexes

Promotional Forest Complexes in Poland in 2011

Threats to forest ecosystems:

- Failure to tree species composition of species habitat requirements stands
- No differences in species composition of stands, the age structure and genetic diversity
- The forest stands originated from the so-called „strangers" ecotypes
- Low plasticity of forest stands for current and future disturbances (age and diversity).

Threats to forest ecosystems:

Methods of prevention

- Promote natural regeneration of the forest
- Stopping the selection of trees for raw material quality (reduction of genetic variation)
- Adjusting the forest stands
- Observing the natural processes occurring in commercial forests which were excluded from the impact of forest management (the so-called „Forests reference”) and draw conclusions about forest management
- Separation of the various functions of forests in space
- Increasing the resilience of forests to disturbances by shortening the age of felling

Potential conflicts between the activities aiming to preserve the stability of forests and nature conservation

- Rejuvenation of forest stands by reducing the age of felling trees
- Treatments of forest protection
- Conversion of forests to a more resistant to disturbances

Conclusions:

- Location conflicting functions of forests in the same place is inefficient and creates unnecessary conflict at the interface between conservation - forestry
- The compromise between forest management and conservation is possible in multi-forestry, the spatial separation of the conservation of forest management
- We need three types of forests: conservation, production and mixed, in which it is difficult to determine the dominant feature

Thank you for your attention