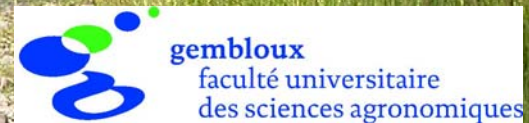


Forest in Wallonia

*PAST,
PRESENT,
FUTURE (?)*

Jacques Rondeux



Regional permanent forest inventory

1984 - 1996

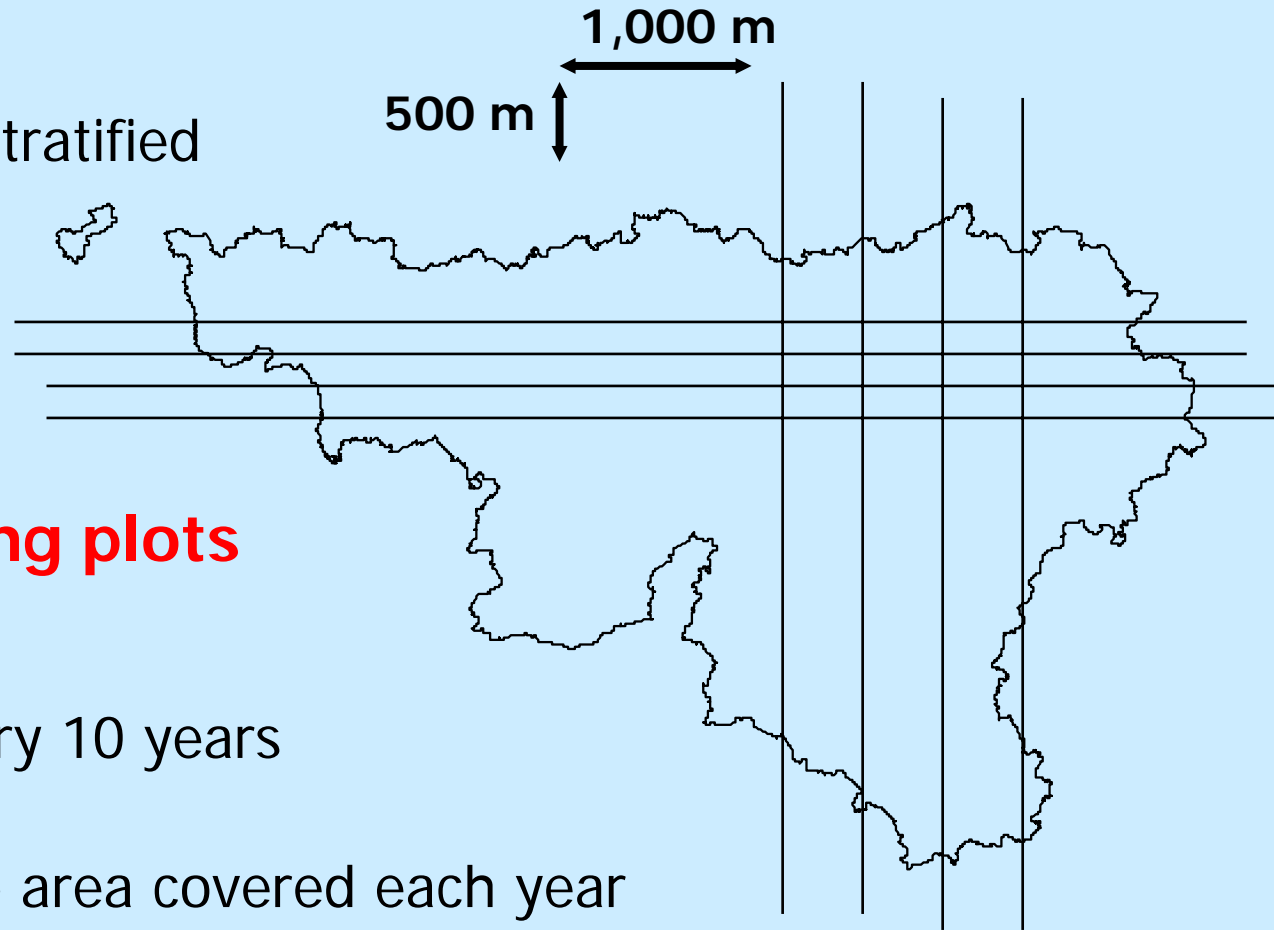
- systematic non-stratified

1 plot / 50 ha

11,000 sampling plots

- periodicity : every 10 years

- one tenth of the area covered each year



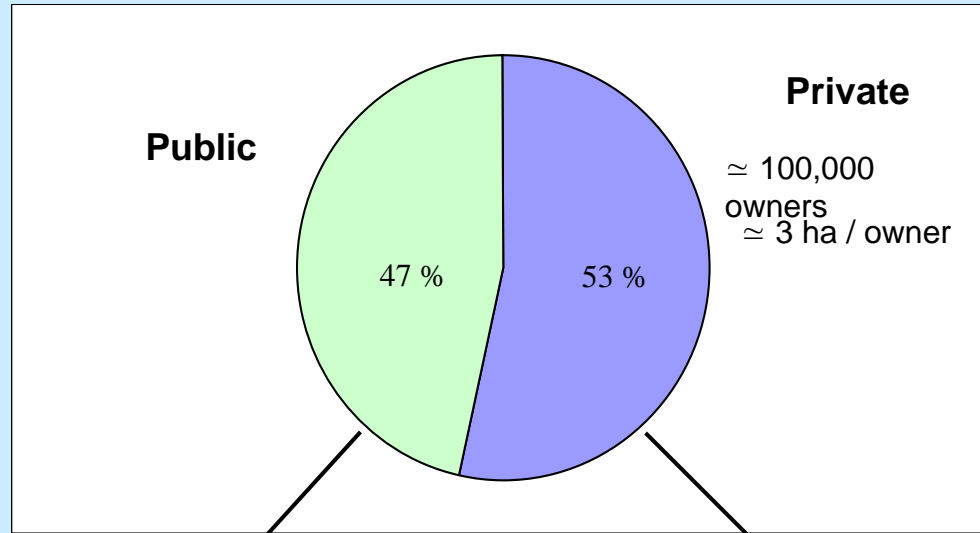
0 - Walloon forest today

Walloon forest (1999)

Forested areas :
544,800 ha (32 %)

Productive forest :
477,800 ha (88 %)

Non productive :
67,000 ha (12 %)
(roads, moors, muds,...)

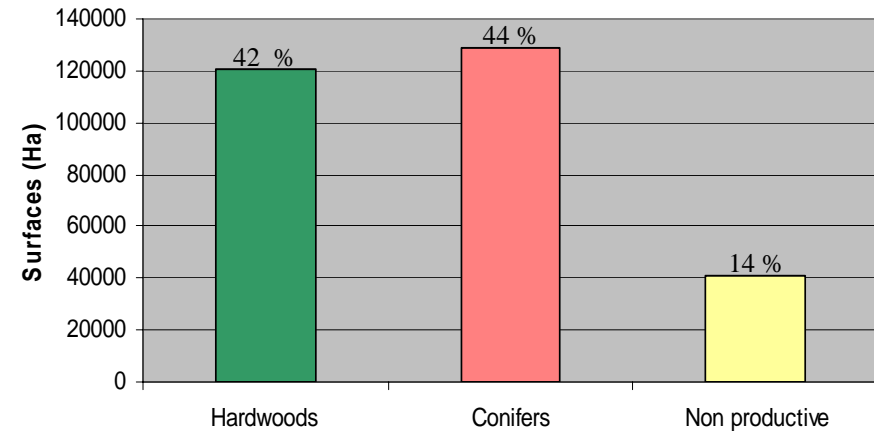
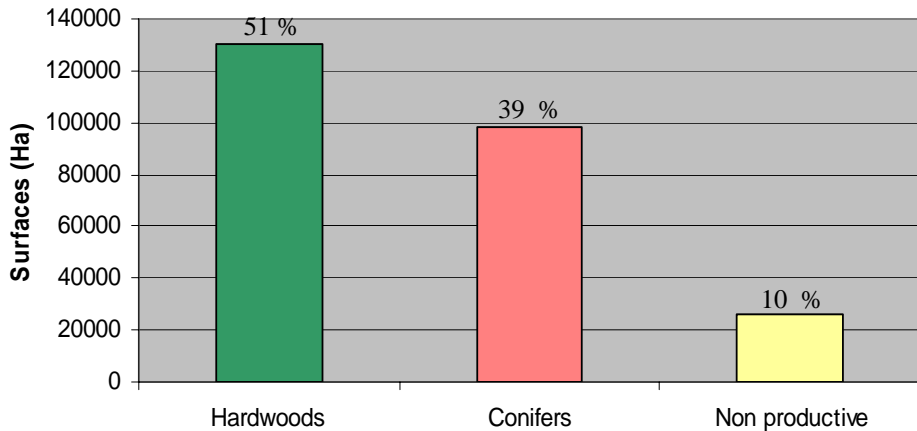


Cover rate : 32.3%

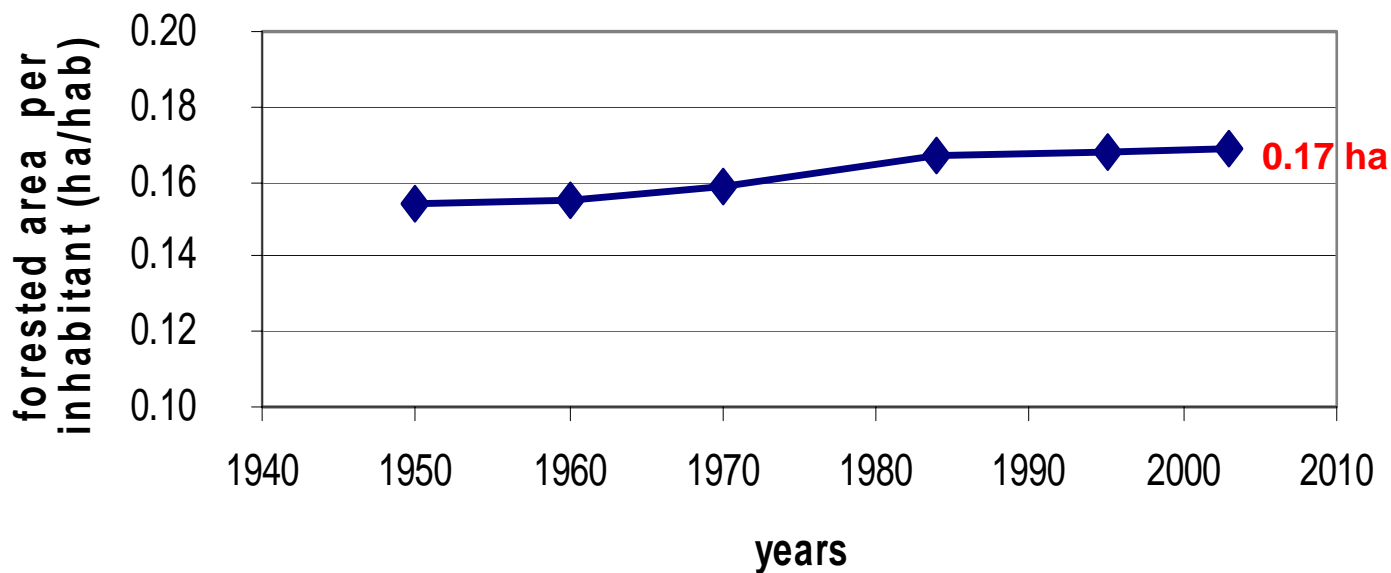
France : 31.4%

Germany : 31.0%

Europe : >40%



Evolution of the forested area per inhabitant (last 50 years)



Finland : 4.0 ha

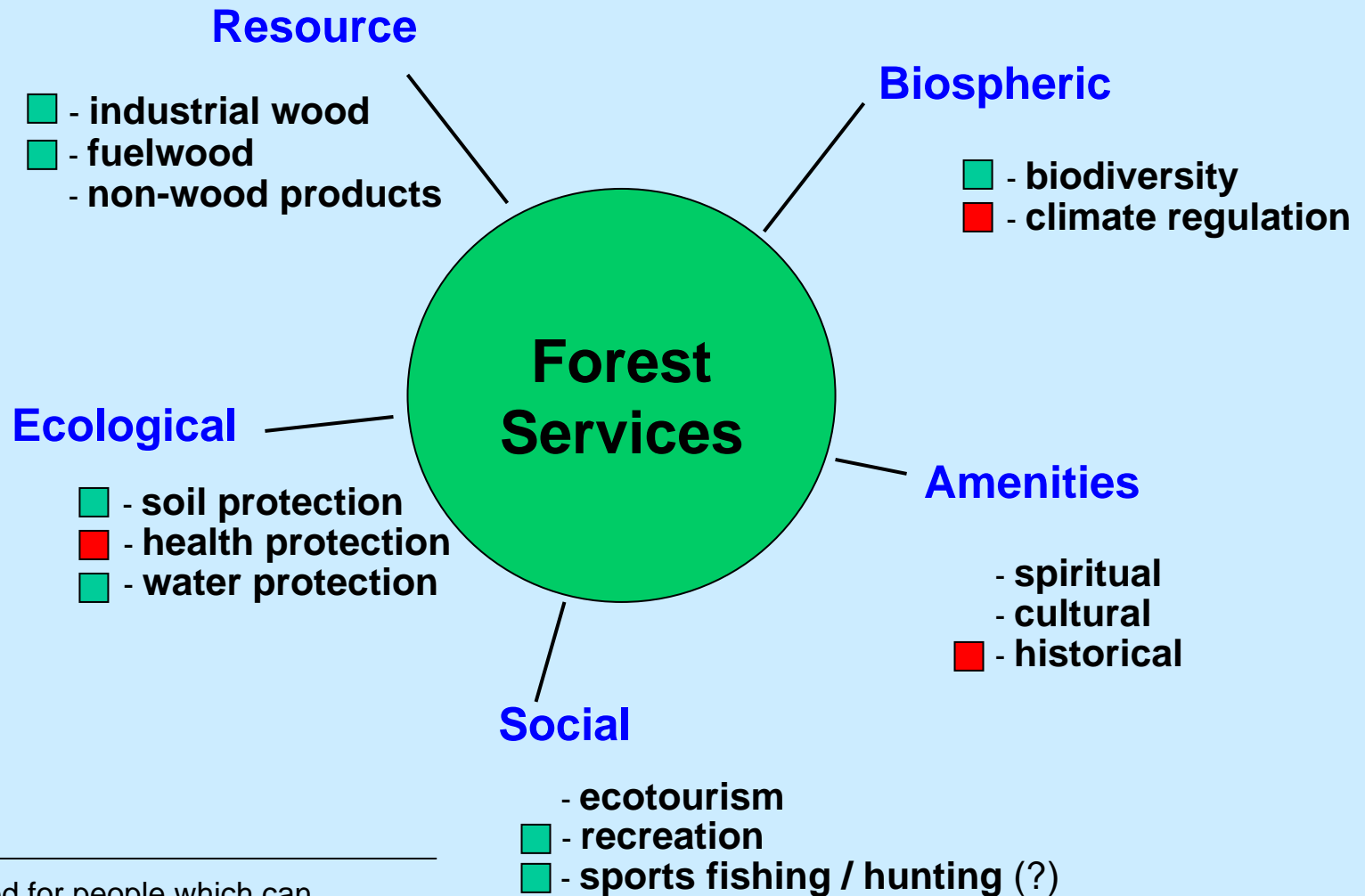
France : 0.3 ha

Belgium : 0.07 ha

Austria : 0.5 ha

Germany : 0.13 ha

1 - What ecosystem services ?



- supplied for people which can benefit directly (local, national scale)
- supplied for the society at a global scale

1 - What ecosystem services ?

Usually expressed in terms of « functions » :

- **economic** : mainly timber **production** (industry, energy,..)

- **ecological** :

protection : soil, water, landscape

conservation : biodiversity (species, habitats,..)

- **socio-cultural** : recreation, hunting (?)

Special attention to : regional level (ex : wood, quality of life,..) *and* global scale (ex : carbon sequestration,..) , definition of « social »

Special case of hunting (3 « functions »)

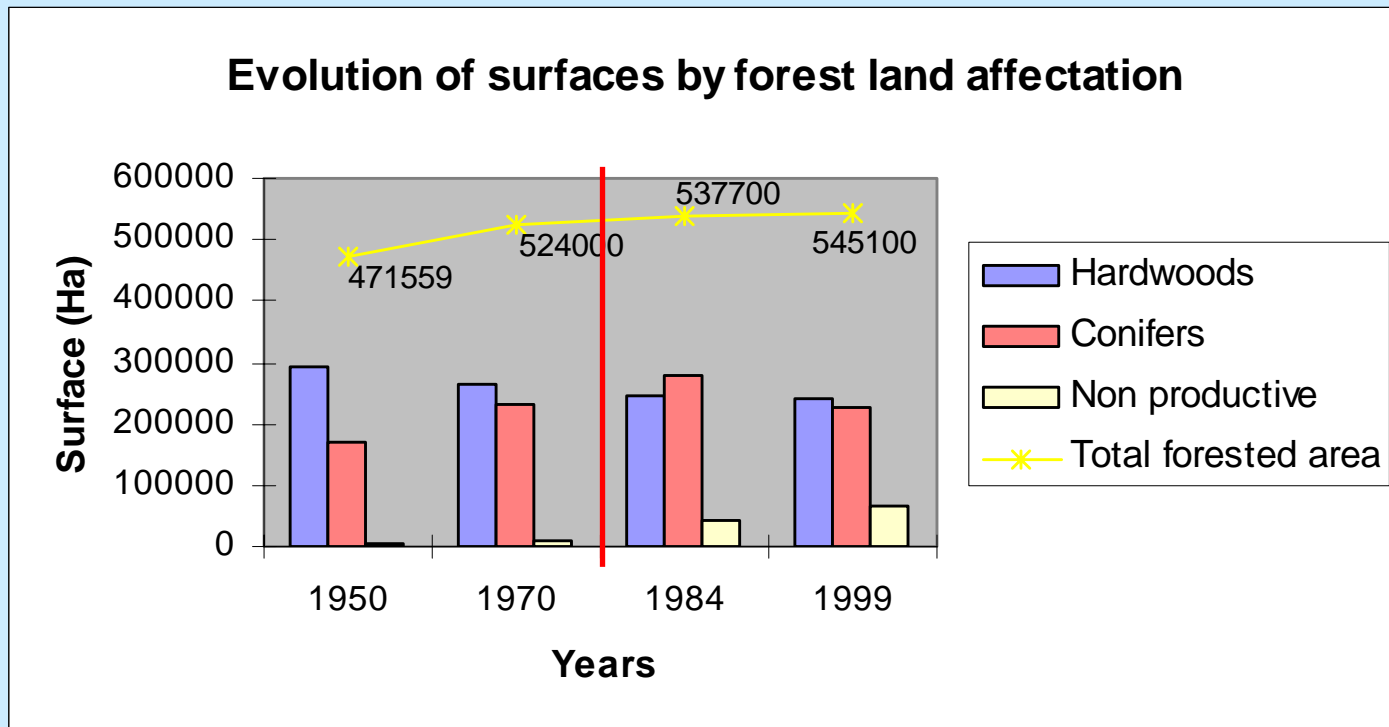
2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

Forest policy

- general increase in the forested area

	1950	1970	1984	1999
Hardwoods	291816	265297	247900	240400
Conifers	171135	229738	279627	227500
Non productive	5558	10301	43700	67200
Total forested area	471559	524000	537700	545100



↓

Total increase : 16%

2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

Forest policy

- general increase in the forested area
- international resolutions (protection on forests, sustainable management)

Forest and « protection » or « conservation » service

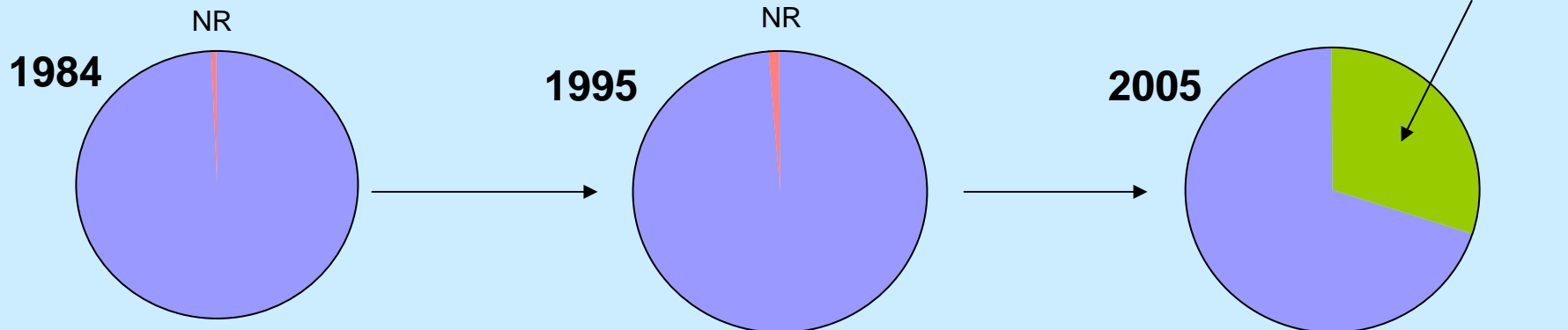
1984 — Nature reserves (NR) \approx 3,000 ha
(0.5 %)

1995 — Nature reserves
Forest reserves
Agreed nature reserves } \approx 6,000 ha
(1.1 %)

2005 — Natura 2000
Walloon Government (2005)
220,944 ha (240 sites)



Forest
161,000 ha (72.8 %)
(30 % of total forest)



2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

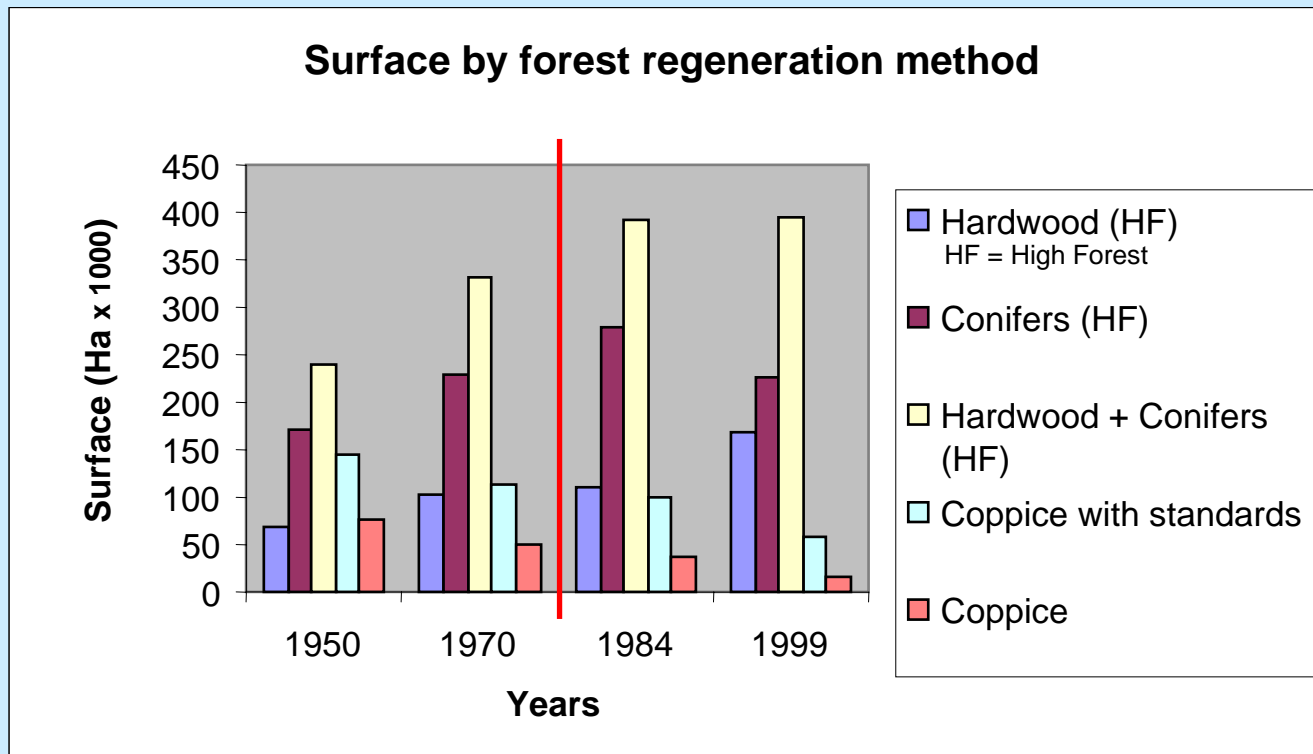
Forest policy

- general increase in the forested area
- international resolutions (protection on forests, sustainable management)
- reglementations for forest accessibility (« recreation »)

Silvicultural / economical factors

- evolution of regeneration methods

	1950	1970	1984	1999
Hardwood (HF)	68409	101924	111400	168300
Conifers (HF)	171135	229738	279627	227500
Hardwood + Conifers (HF)	239545	331662	391027	395800
Coppice with standards	145802	113168	99650	56800
Coppice	77605	50205	36850	15300



↓ of C (- 80%) and CWS (- 60%)

↑ of HF (+ 67%)

2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

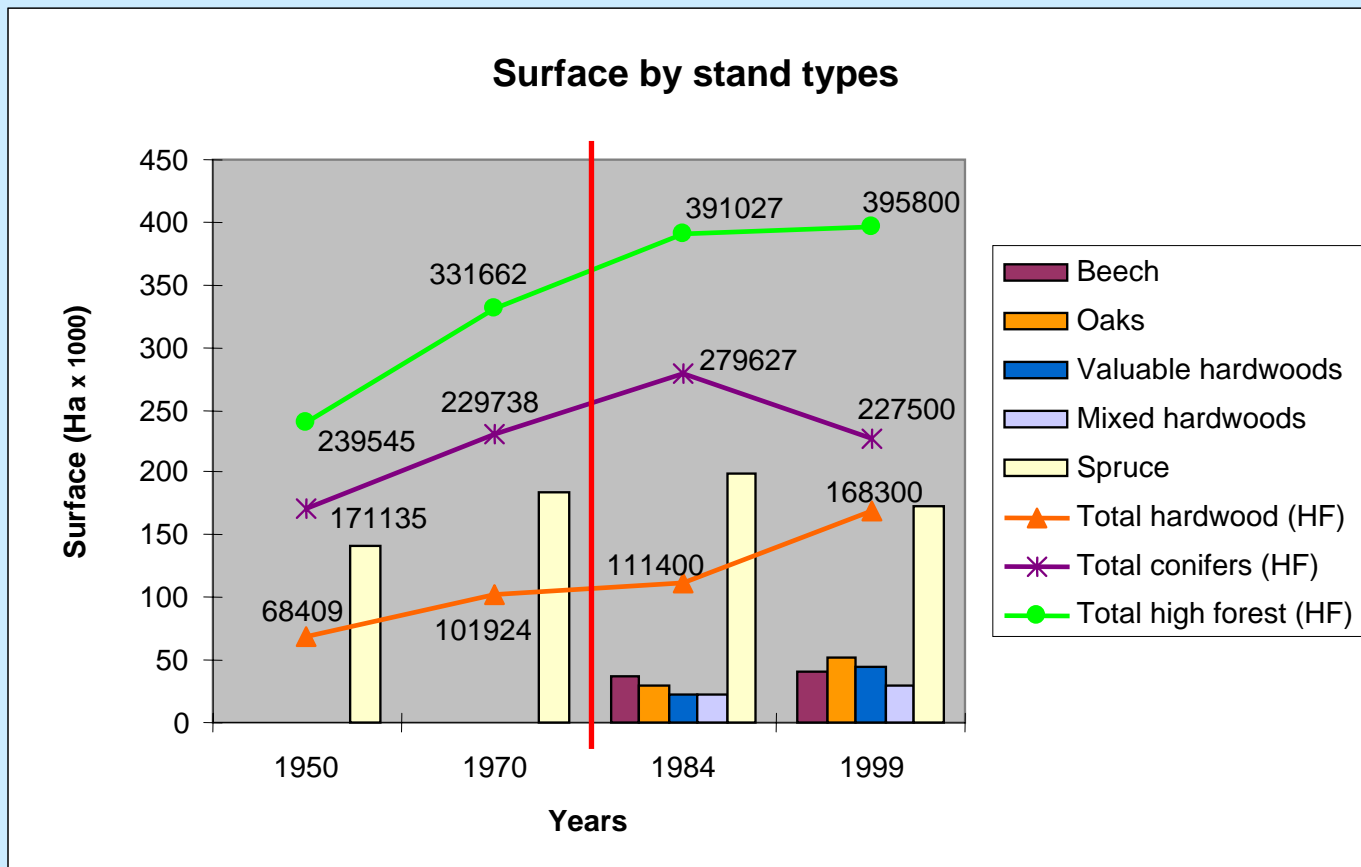
Forest policy

- general increase in the forested area
- international resolutions (protection on forests, sustainable management)
- regulations for forest accessibility (« recreation »)

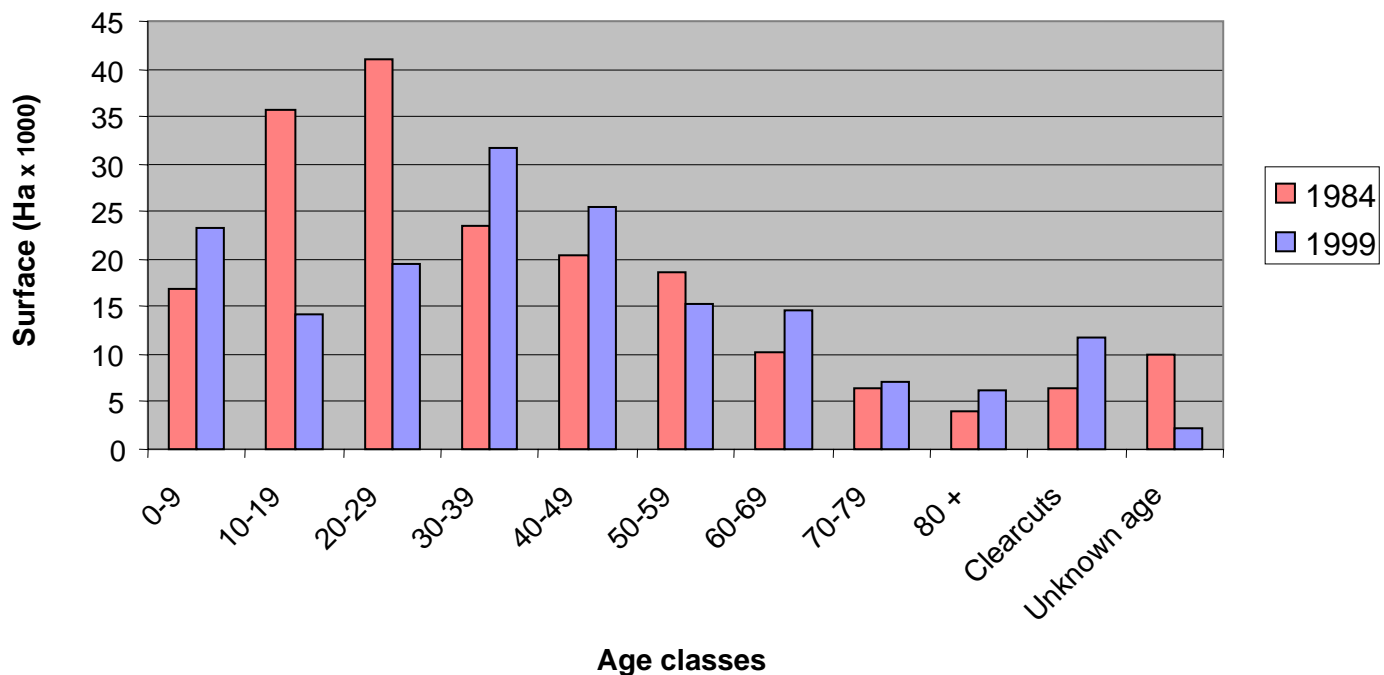
Silvicultural / economical factors

- evolution of regeneration methods
- species composition, age-classes and stand structures

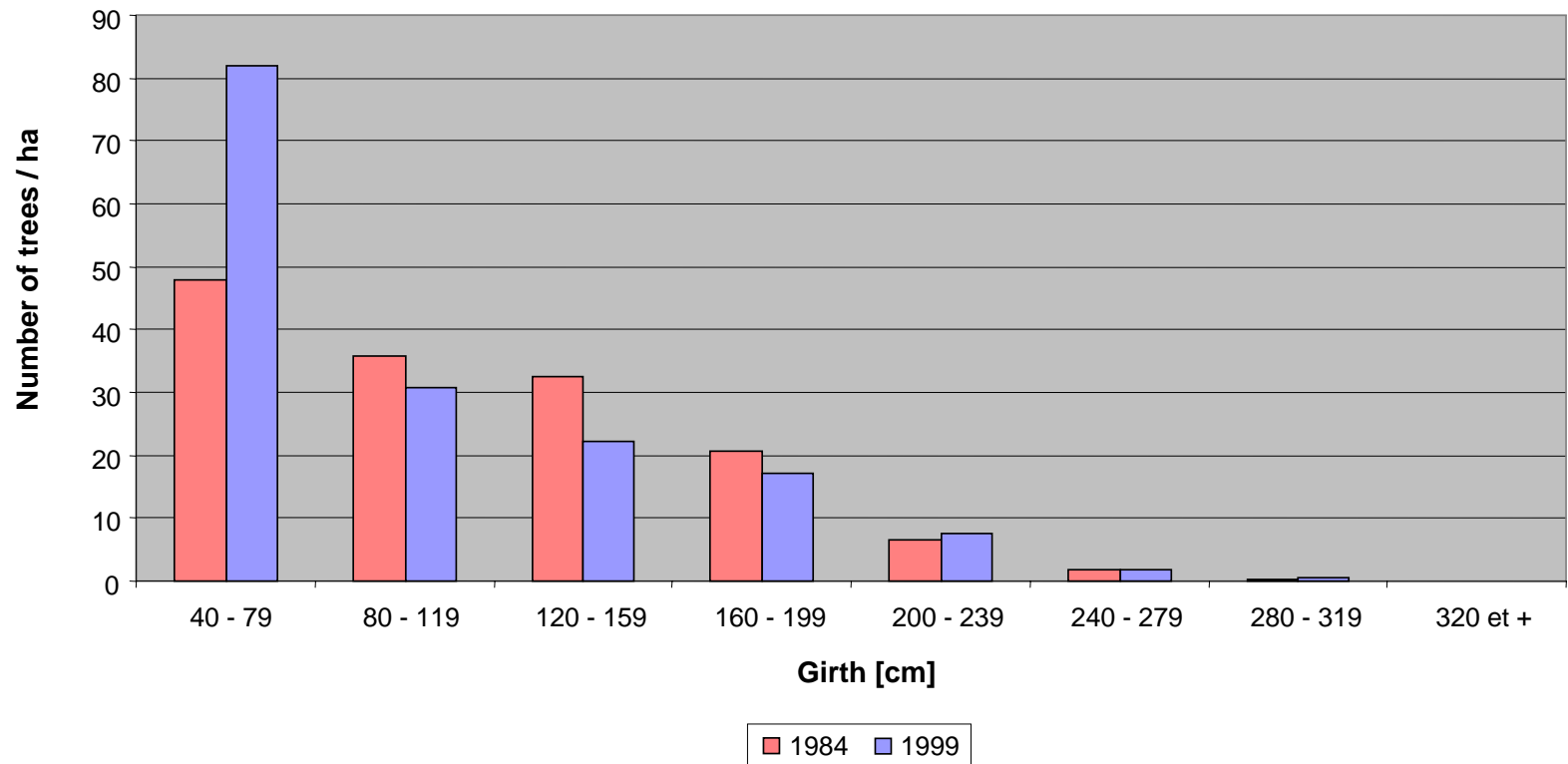
	1950	1970	1984	1999
Beech			36550	41300
Oaks			29300	51900
Valuable hardwoods			22850	45500
Mixed hardwoods			22700	29600
Spruce	141566	183782	199217	172400
Total hardwood (HF)	68409	101924	111400	168300
Total conifers (HF)	171135	229738	279627	227500
Total high forest (HF)	239545	331662	391027	395800



Spruce repartition (by age classes) in the Walloon Region in 1984 and 1999



Beech stands
Number of trees / ha (beech)



2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

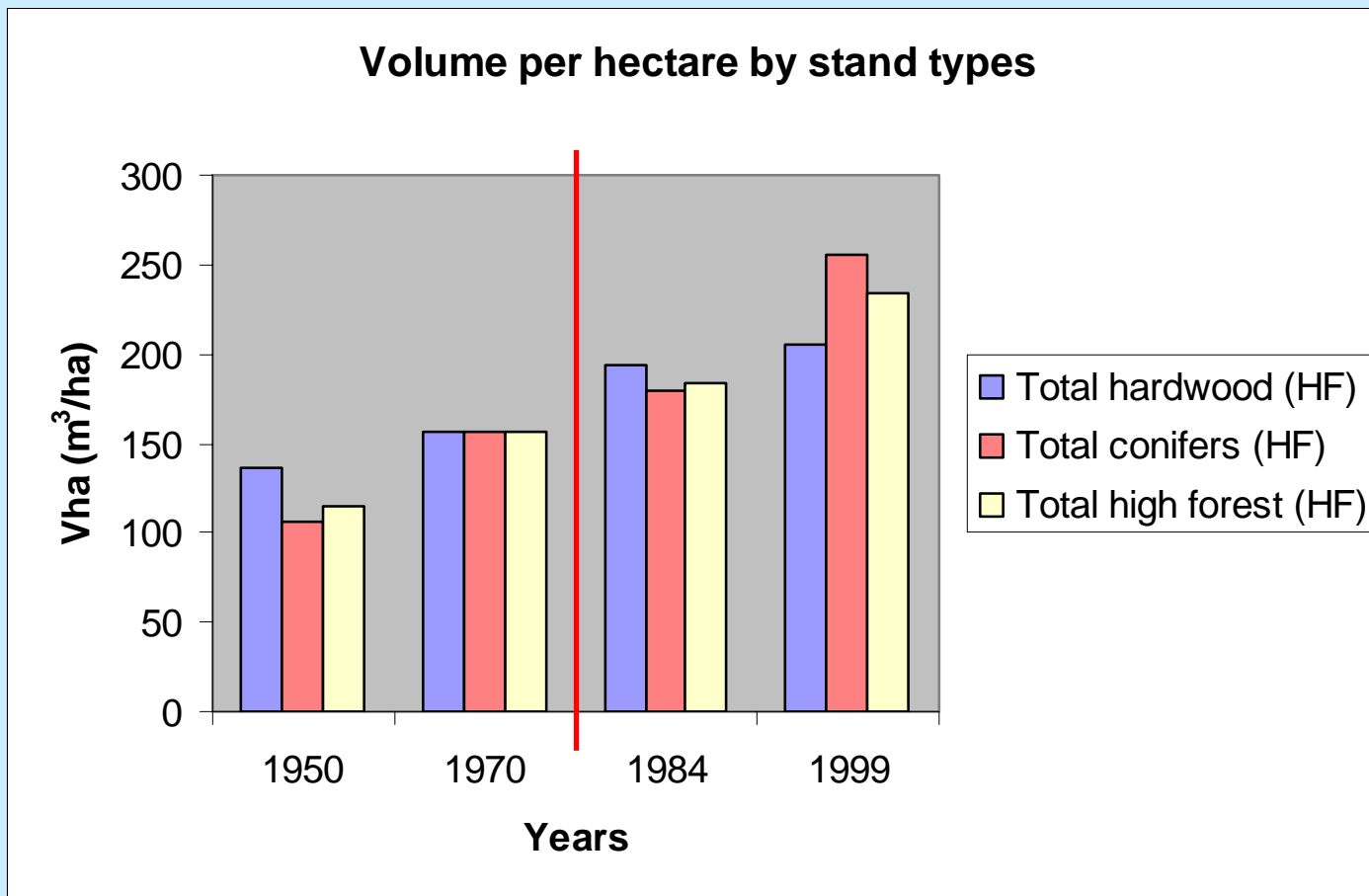
Forest policy

- general increase in the forested area
- international resolutions (protection on forests, sustainable management)
- regulations for forest accessibility (« recreation »)

Silvicultural / economical factors

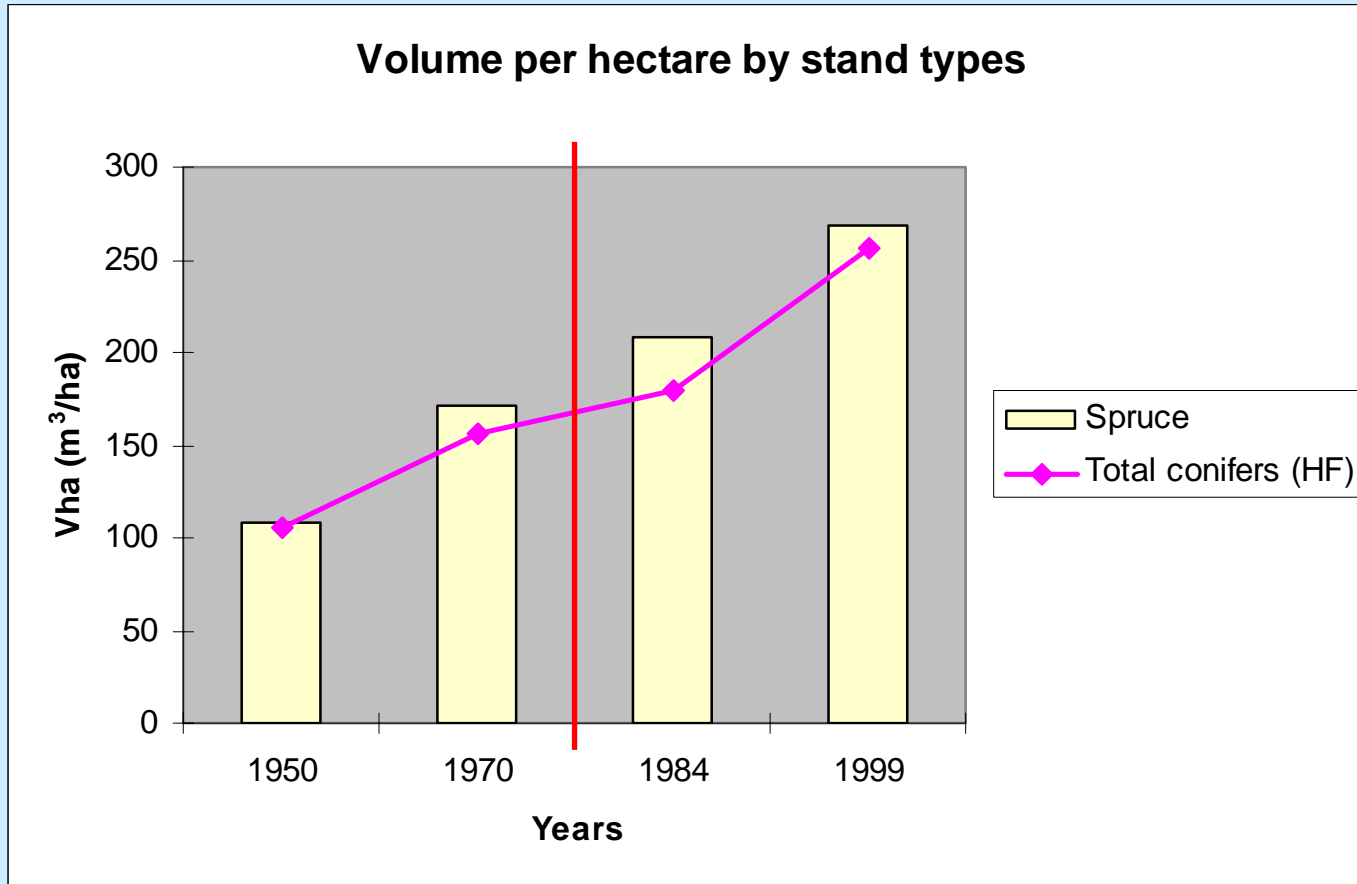
- evolution of regeneration methods
- species composition, age-classes and stand structures
- increase in the growing stock

	1950	1970	1984	1999
<i>Total hardwood (HF)</i>	136	156	194	206
<i>Total conifers (HF)</i>	106	156	180	256
<i>Total high forest (HF)</i>	114	156	184	235



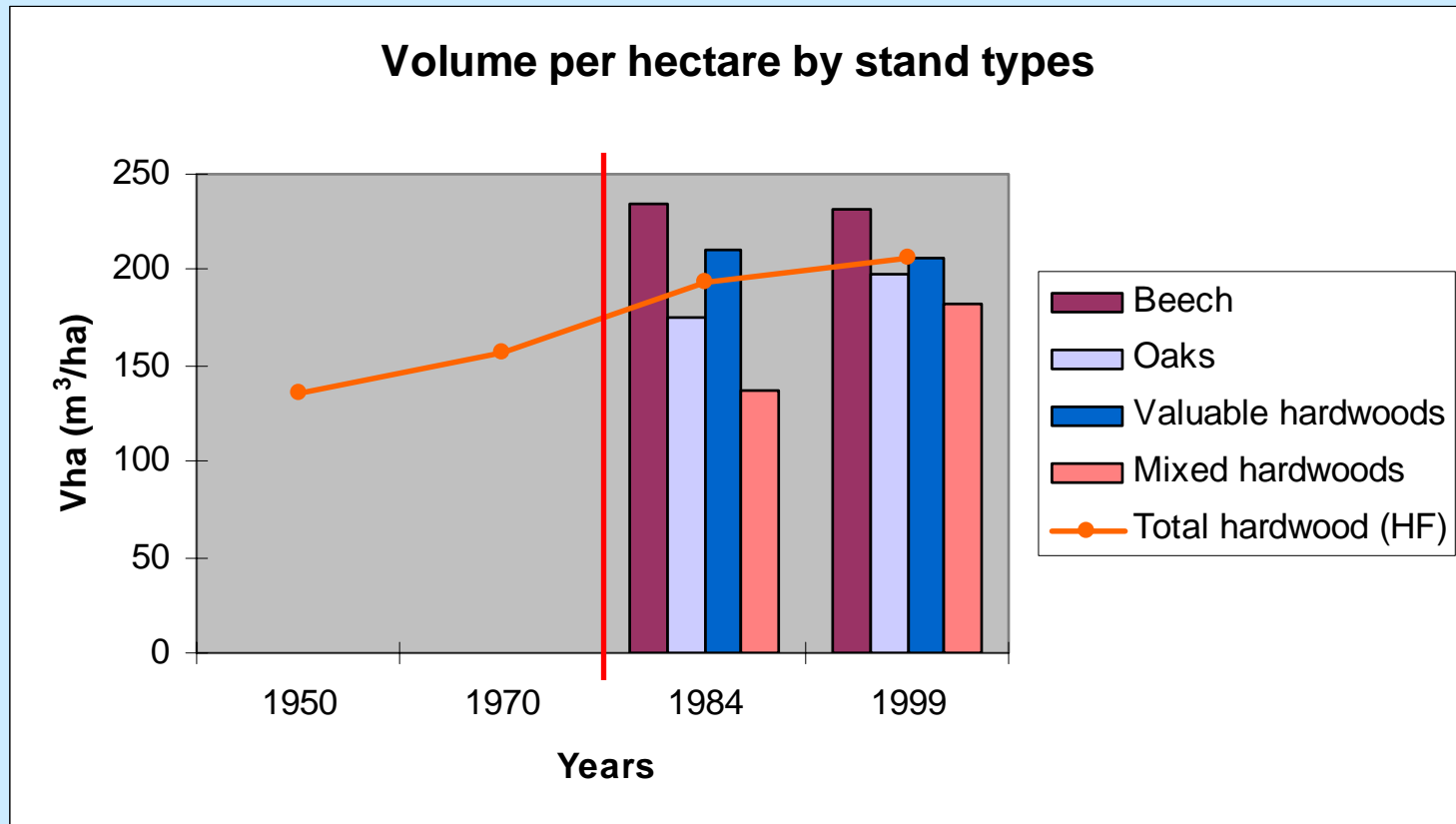
HARDWOODS + CONIFERS

	1950	1970	1984	1999
Spruce	108	172	209	268
Total conifers (HF)	106	156	180	256



SPRUCE

	1950	1970	1984	1999
Beech			235	232
Oaks			175	198
Valuable hardwoods			210	207
Mixed hardwoods			137	182
Total hardwood (HF)	136	156	194	206



HARDWOODS

2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

Forest policy

- general increase in the forested area
- international resolutions (protection on forests, sustainable management)
- regulations for forest accessibility (« recreation »)

Silvicultural / economical factors

- evolution of regeneration methods
- species composition, age-classes and stand structures
- increase in the growing stock
- more intensive harvesting mechanization



2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

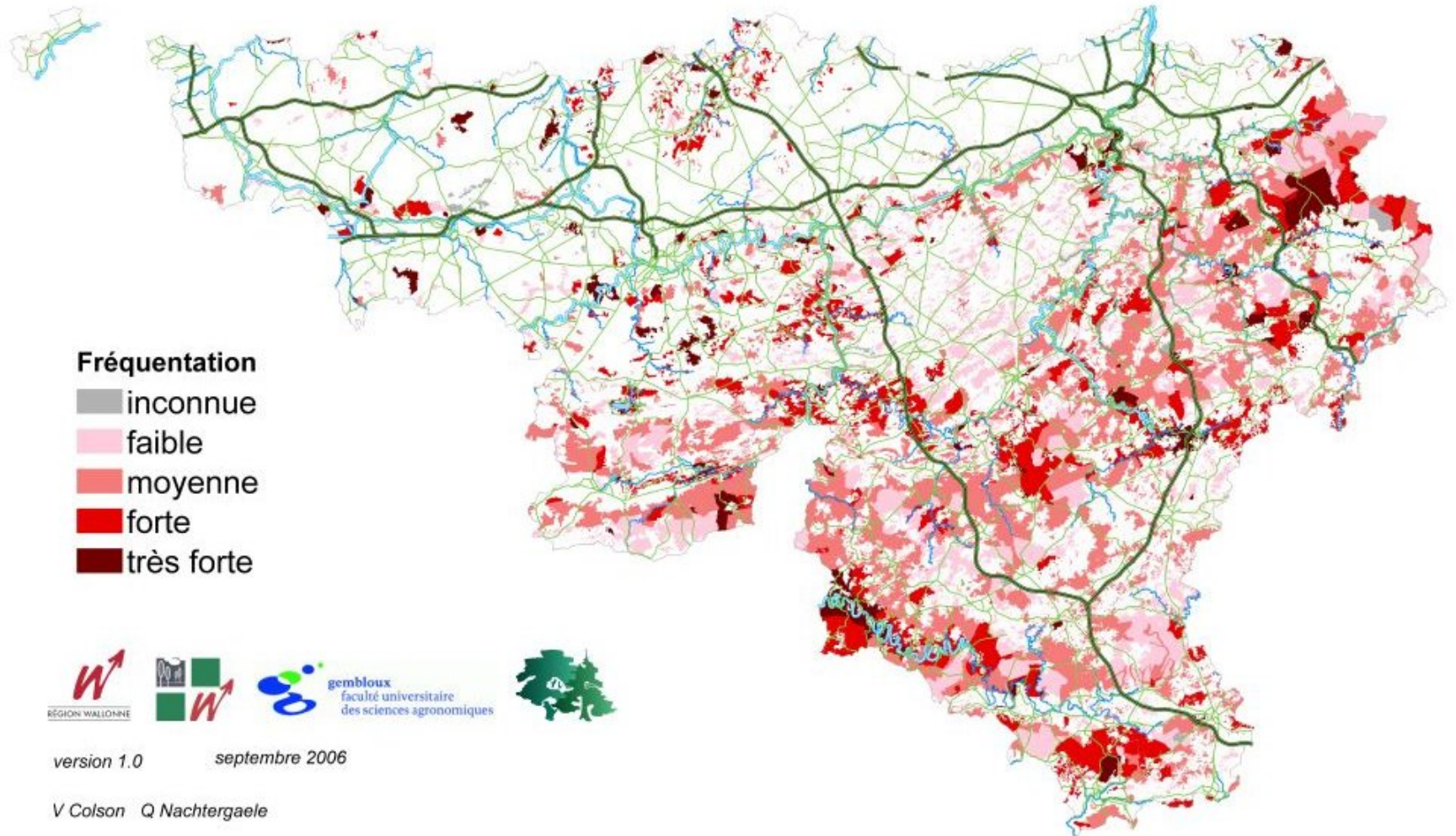
Climatic factors

- windstorms 1984 and 1991
- beech damages 2000-2004

« Socio-cultural » factors

- high increase in recreation demand

Forest recreation : map of frequentation



Fusagx – reserved rights

2 - Ecosystem change over the last 50 years ?

Direct or indirect factors or indicators

Climatic factors

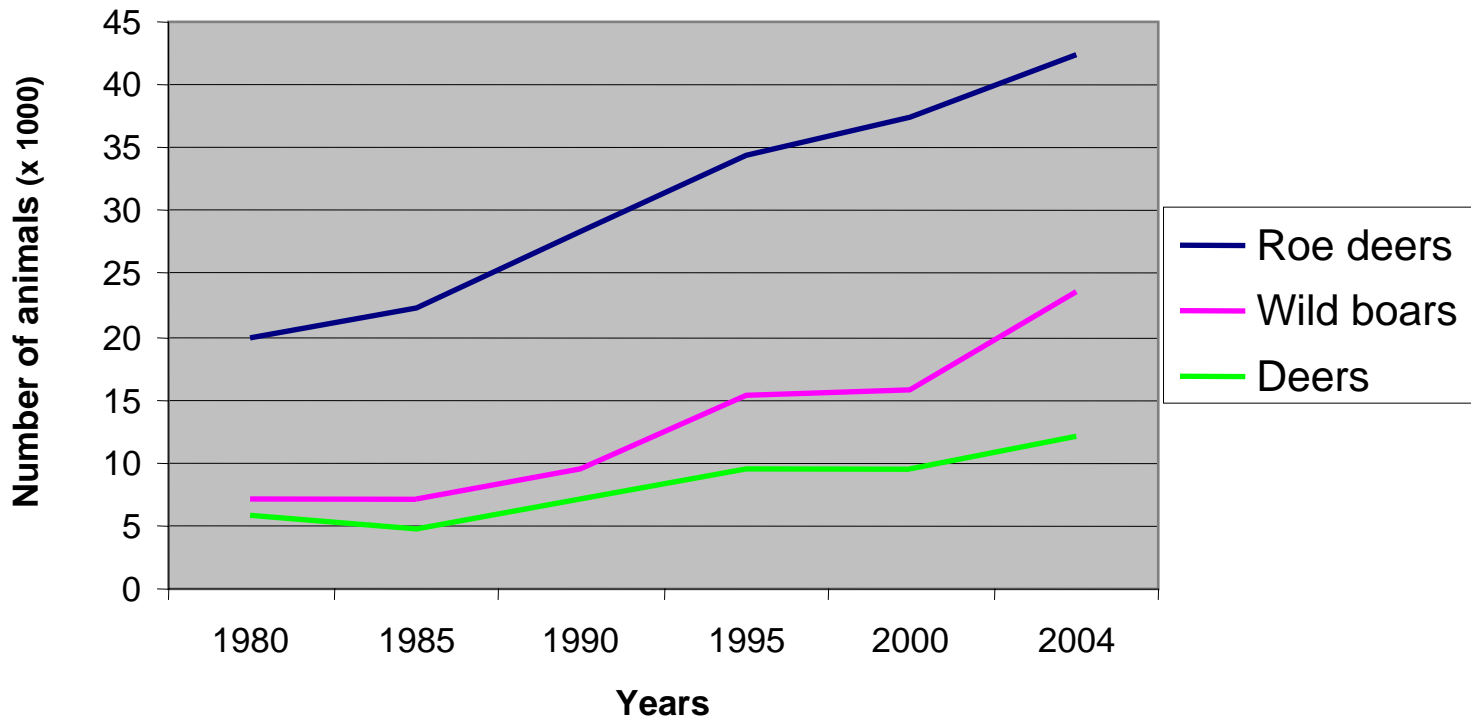
- windstorms 1984 and 1991
- beech damages 2000-2004

« Socio-cultural » factors

- high increase in recreation demand
- constant increase in game

	1980	1985	1990	1995	2000	2004
Roe deers	20000	22353	28235	34412	37353	42353
Wild boars	7059	7059	9412	15294	15882	23529
Deers	5882	4706	7059	9412	9412	12059

Estimation of big game populations (Spring before births)



Source: MRW – DGRNE – DNF – Direction de la Chasse et de la Pêche

Game's damages (%) affecting mature stands

	1999
Hardwoods	6
Conifers	30

	Intensity	1999
Hardwoods	< 25 %	57
	25 % - 50 %	29
	50 % - 75 %	12
	75 % - 100 %	2
Conifers	< 25 %	45
	25 % - 50 %	24
	50 % - 75 %	15
	75 % - 100 %	16

3 – Consequences of ecosystem change for its services

Economical services

- more strict adequation of the wood production / market demand
- game's damages : browsing : natural and artificial regeneration problems,
debarking : loss of wood quality and financial return

Ecological services

- decrease in species of clear forests and open areas, increase in HF
- soil destruction (mechanization)

Others

- decrease in quiet zones + physical perturbations if public access not strictly managed

4 - How will services change under current practices..and in the future ?

Current practice

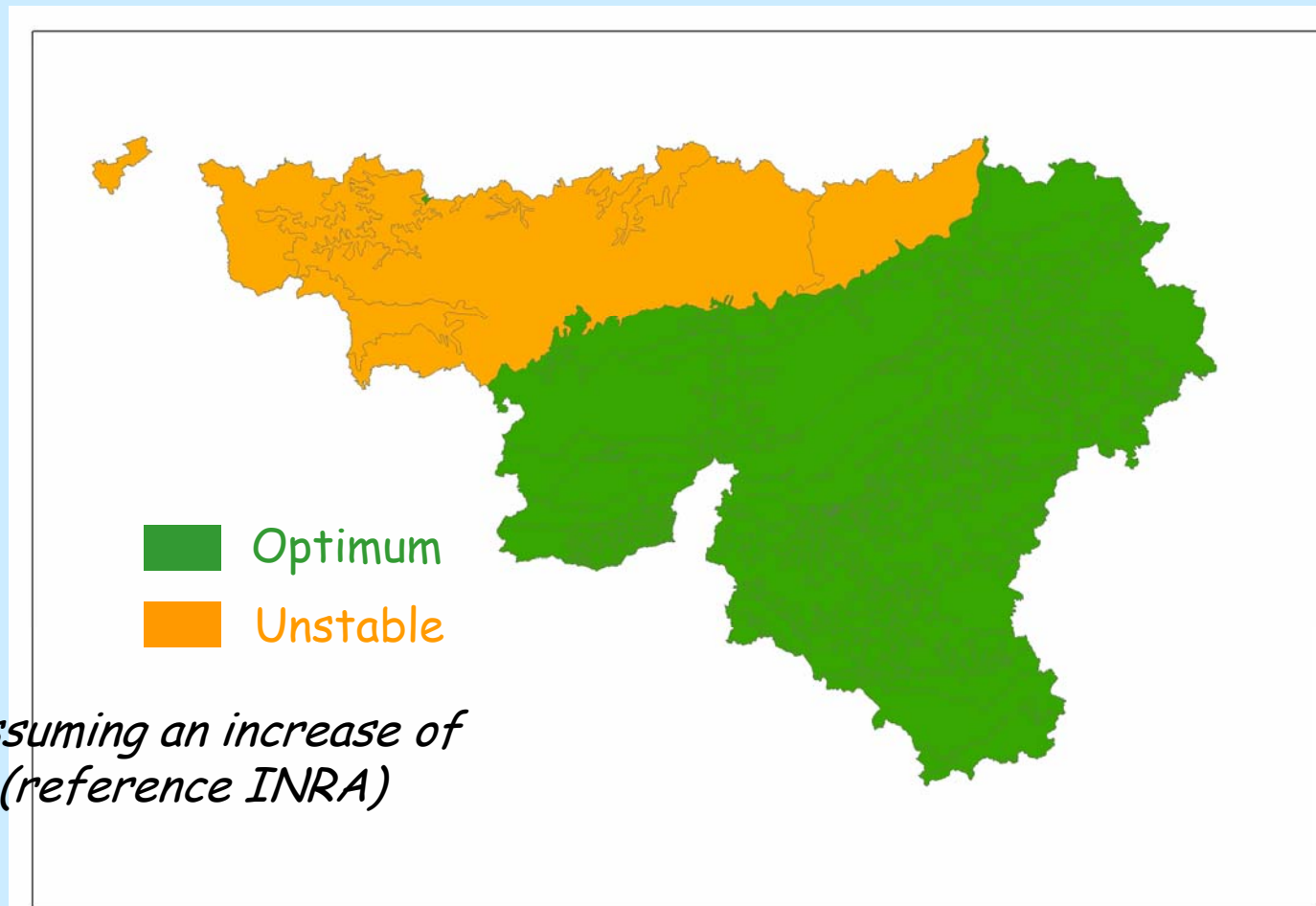
- conversion and transformation of stand structures (coppices,..)
- impact of biological conservation(ex : Natura 2000) on the importance and location of provided services
- ecocertification (consequences for forest management and wood chain)
- EU enlargement and « weight » of emergent countries (wood market evolution)
- balance between wood energy supply and biodiversity requirements

In the future

- « adaptative management » = monitoring the results of the silvicultural system considered as a working hypothesis
- climatic change and its effects on species distribution, silvicultural practices, site productivity

Potential impact of global warming on the adequacy of beech stands to climatic factors

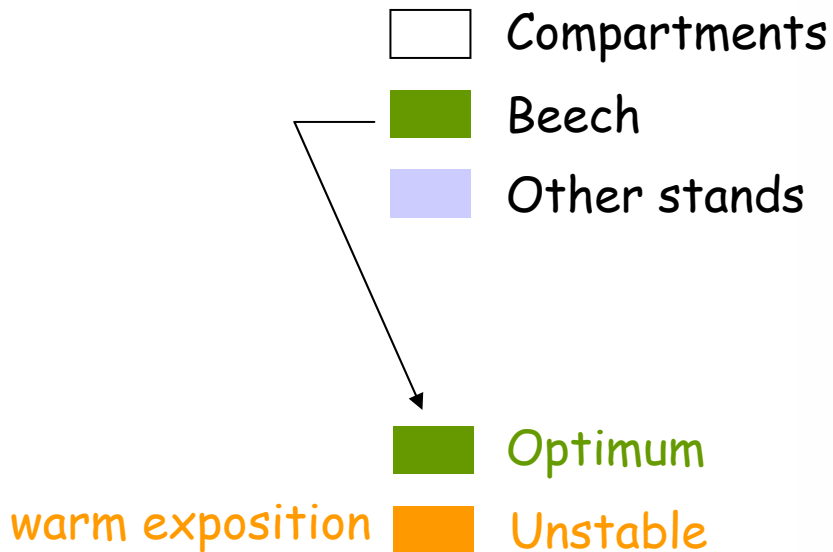
Use of ecological territories



Situation in 2050 assuming an increase of temperature 1.5 °C (reference INRA)

Potential impact of the global warming on **present beech site conditions**

Modelling of its repartition at the forest compartment scale

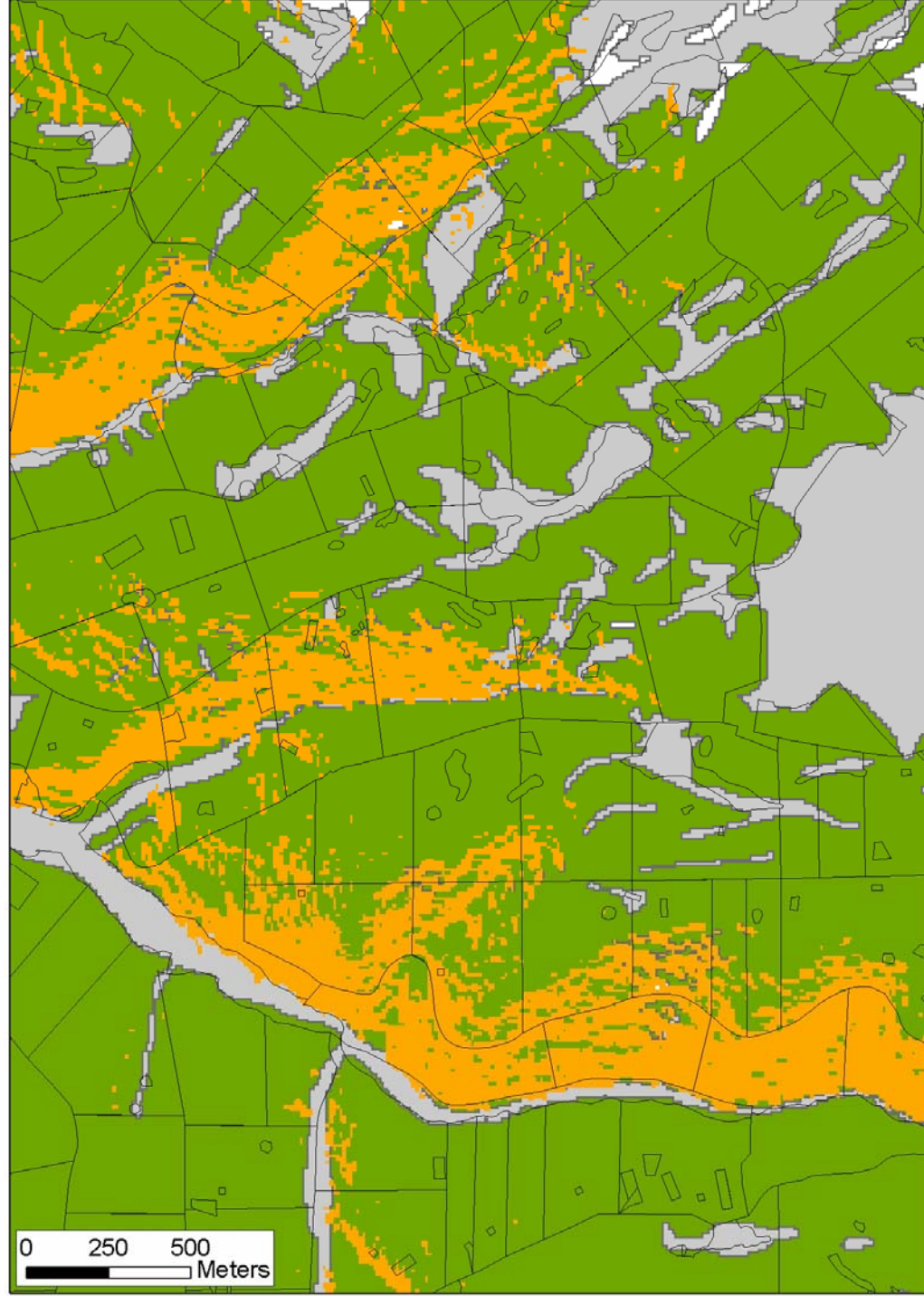


Potential impact of the global warming on **present beech site conditions**

Modelling of its repartition at the forest compartment scale

- Compartment
- Beech
- Other stands

- Shadow soils
- warm exposition
- Optimum
- Unstable



4 - How will services change under current practices..and in the future ?

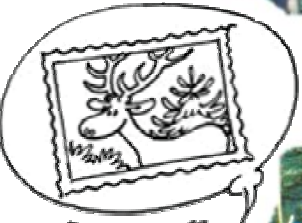
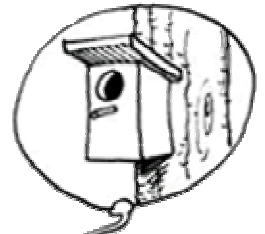
- progressive transition from forest management to natural resources management including forests
- increasing role of the patrimonial value, quality of life, leisure activities
- « close to nature » silviculture : diversity, stability, multifunctionality,..
- more importance of wood *quality* production

5 – Ecosystem service losses – What measures ?

At the moment : more a change of the « hierarchy of services » due to the diversity of demands than a loss of ecosystem services

Multiple use concept

- clarification of the setting-up of the multiple-use management concept
- ranking the demanding objectives, some of them becoming excessive and a source of conflicts



J. Bouharmont

5 – Ecosystem service losses – What measures ?

At the moment : more a change of the « hierarchy of services » due to the diversity of demands than a loss of ecosystem services

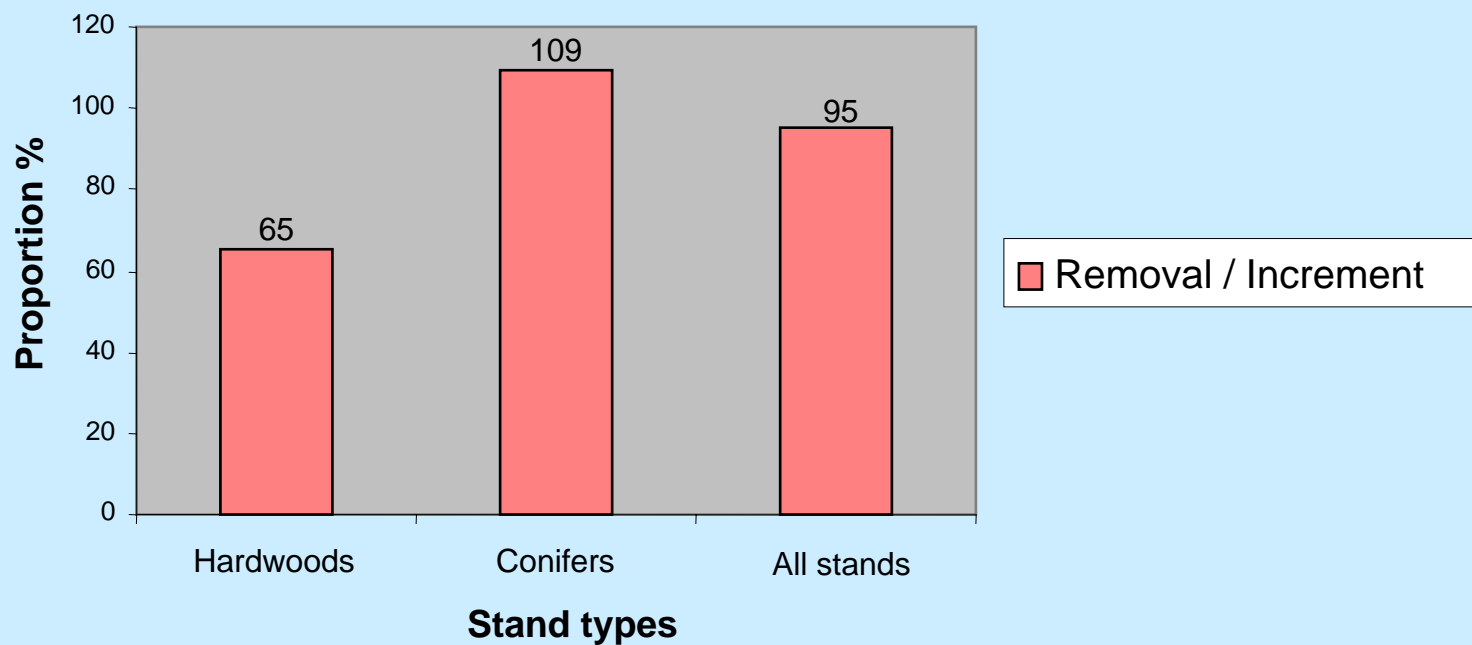
Multiple use concept

- clarification of the setting-up of the multiple-use management concept
- ranking the demanding objectives, some of them becoming excessive and a source of conflicts
- reinforcing the communication and participation of stakerholders
- enhancing the concept of « adaptative management »

Monitoring /assistance

- optimal use of the permanent forest inventory

Annual removal / increment by stand types



Example of use of the permanent forest inventory in the monitoring of biodiversity

Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems

(Helsinki : Criterion 4)

Which data ?

Ground vegetation description

Study of ecotones

Sampling point typology (habitat)

Standing and laying dead wood assessment

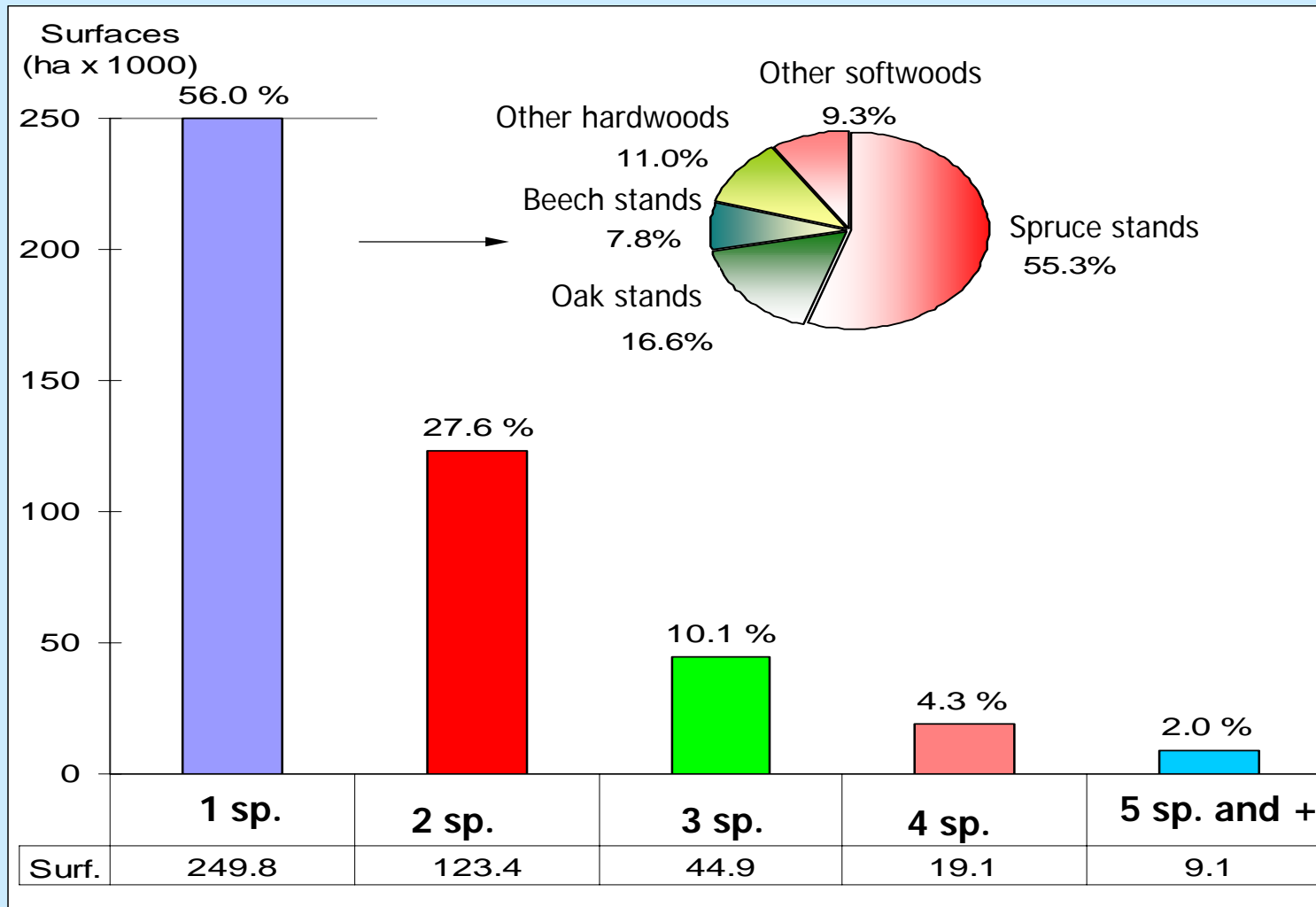
Edges description

Vertical and horizontal structure of stands

Which results ?

Various occupied areas

Volume



Surfaces

- stand composition (%)
- ligneous species occurrence (ha)

5 – Ecosystem service losses – What measures ?

At the moment : more a change of the « hierarchy of services » due to the diversity of demands than a loss of ecosystem services

Multiple use concept

- clarification of the setting-up of the multiple-use management concept
- ranking the demanding objectives, some of them becoming excessive and a source of conflicts
- reinforcing the communication and participation of stakerholders
- enhancing the concept of « adaptative management »

Monitoring /assistance

- optimal use of the permanent forest inventory
- usefulness of a CRPF to better assist private forest owners and better implement a regional forest policy

5 – Ecosystem service losses – What measures ?

At the moment : more a change of the « hierarchy of services » due to the diversity of demands than a loss of ecosystem services

Silviculture / forest management

- more efficient use of growing space and site conditions
- drastic reduction of game's population and analysis of forest capacity
- analysis of the place of the recreation service and implementation of a inter-sectorial policy

It should be useful...

**to focus more research in the field of « environmental economics »
and « non-marked forest values appraisal »**

5 – Ecosystem service losses – What measures ?

Special attention must be paid to :

Economic assessment of forest « functions » (non-wood forest products)

Example of Natura 2000

indirect indicators based on « *loss of revenue* »

bare land = loss of soil use (land expectation value) due to a modification of initial affectation (spruce, mixed stands,..)

wooded land = loss of soil use + loss of expected stumpage value

ecological value equals *at least* a compensation for a loss

« *the owner is entitled to compensation* »

5 – Ecosystem service losses – What measures ?

Special attention must be paid to :

Economic assessment of forest « functions » (non-wood forest products)

Example of recreation

- using indirect indicators based on « *willingness to pay* »
(very different issues unless organized activities)
- using the substitution of a « *correlated market* » (case of a visited site)
(how fare have you come to get there and what mode of transport ?)
= time and money that users spend in accessing the site

6 – « MEA » , an appropriate approach to evaluate ecosystem change ?

Constraints and traps

- existence and availability of pertinent data (+ definitions ! ..)
- risk of using data collected for specific objectives and/or issued from different non compatible ways
- use of global models based upon exploratory approach leading to complexity of interpretation

Need of pertinent indicators

- a set of C/I has to be used to cover the full range of diverse forest goods and services
- they have to relate changes in land use and management in a way appropriate for the scale of assessment (space and temporal dimension)

6 – « MEA » , an appropriate approach to evaluate ecosystem change ?

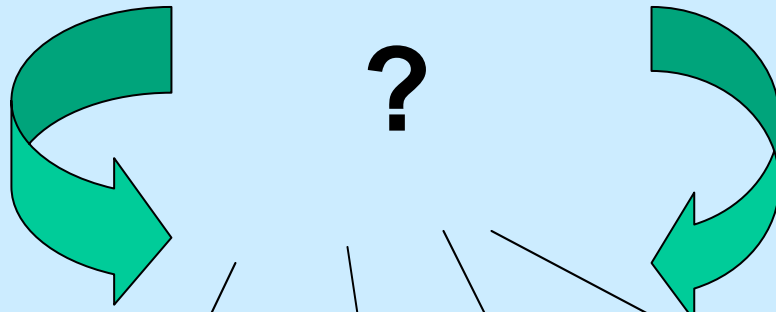
Usefulness of MCA (why and how ?)

- decision-making must require consensual agreement among the various interest groups which may be difficult to achieve
- analysis must be interactive and participants should be informed
- a performance matrix can help the decision-makers (from scores given by experts to assess the occurrence of potential consequences to be observed)

END WORD ...

- it really takes a (very) long time before forestry options have effects
- the complexity of the forest ecosystem makes all previsions difficult
- the future of our forest seems to lie in a « return » to the logic of organising the supply of goods and services on a global scale
- resource renewal and human well-being will no longer be left to Nature but directed by man

Increase in information needs about forest « services »



Recreation..

Ecosystems,
Biodiversity,
Non-Wood
Forest
Products

Ecosystems,
Biodiversity,
Non-Wood
**Forest
Products**

**Global
Warming**

Global
Warming

Global
Warming

Biomass

Biomass

Biomass

Biomass

Multiple
Resources

Multiple
Resources

Multiple
Resources

Multiple
Resources

Multiple
Resources

Timber

Timber

Timber

Timber

Timber

Timber

1950s

1960s

1970s

1980s

1990s

2000+

Thanks for your attention

rondeux.j@fsagx.ac.be

<http://www.fsagx.ac.be/gf>