

Protecting Mountain Biodiversity

Biodiversity in the Mediterranean mountains

1) Biodiversity & mountain forests

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Research interests:

- **Silviculture and ecology of mountain forests (protective role)**
- **Upper forest limits (tree-line and forest-line), land-use and climate change**
- **Forest-wildlife (ungulates) relationships**
- **Long-term silvicultural and ecological studies (LTER) in permanent plots**
- **Old-growth forests**



2010 Anno Internazionale della Biodiversità



2010 International Year of Biodiversity

General Outline

- 1. Rationale: biodiversity & Mediterranean mountain forests**
- 2. Forest of the Italian Alps: type, role, history**
- 3. Sustainable forest management**
- 4. Close-to-nature silviculture**
- 5. Further developments (stakeholders' expectations, current dynamics, climate change)**

What is biodiversity?

“Biological diversity: the variability among living organism from all sources, including terrestrial, marine another aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”.

Walter G. Rosen 1985, term “biodiversity”

“National forum on Biodiversity” Washington DC Settembre 1986

“Convention of Rio de Janeiro 1992”

Biodiversity is the variation of life forms within a given ecosystem, biome, or on the entire Earth. Biodiversity is often used as a measure of the health of biological systems. The biodiversity found on Earth today consists of many millions of distinct biological species.

Three Levels of Biodiversity

- **Genetic Diversity**
- **Species Diversity**
- **Ecosystem Diversity**

Researchers generally accept three levels of biodiversity: genetic, species, and ecosystem.

These levels are all interrelated yet distinct enough that they can be studied as three separate components.

Most studies, either theoretical or experimental, focus on the species level, as it is the easiest to work on both conceptually and in practice.

Species Biodiversity studies typically focus on species.

- They do so not because species diversity is more important than the other two types, but because species diversity is easier to work with.
- Species are relatively easy to identify by eye in the field, whereas genetic diversity requires laboratories, time and resources to identify and ecosystem diversity needs many complex measurements to be taken over a long period of time.
- Species are well known and are distinct units of diversity. Each species can be considered to have a particular "role" in the ecosystem, so the addition or loss of single species may have consequences for the system as a whole.
- Conservation efforts often begin with the recognition that a species is endangered in some way, and a change in the number of species in an ecosystem is a readily obtainable and easily comprehensible measure of how healthy the ecosystem is.

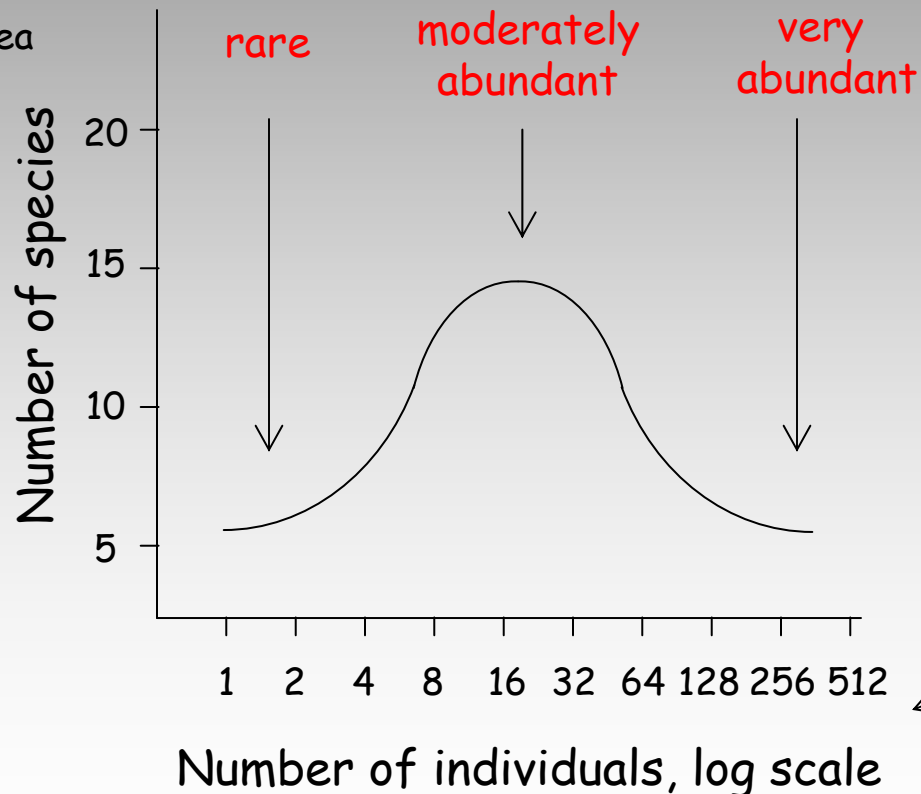
Ecosystem-level biodiversity deals with species distributions and community patterns, the role and function of key species, and combines species functions and interactions.

- The term "ecosystem" here represents all levels greater than species: associations, communities, ecosystems, and the like.
- This is the least-understood level of the three described here due to the complexity of the interactions.
- Examples of these characteristics include the levels of the food chain and the species at each of those levels, guilds (species in a community that are functionally similar), and other interactions.

Abundance: Most species are moderately abundant; few are very abundant or extremely rare

More quantitatively, most species follow the log-normal distribution

This is n° of
species in an area

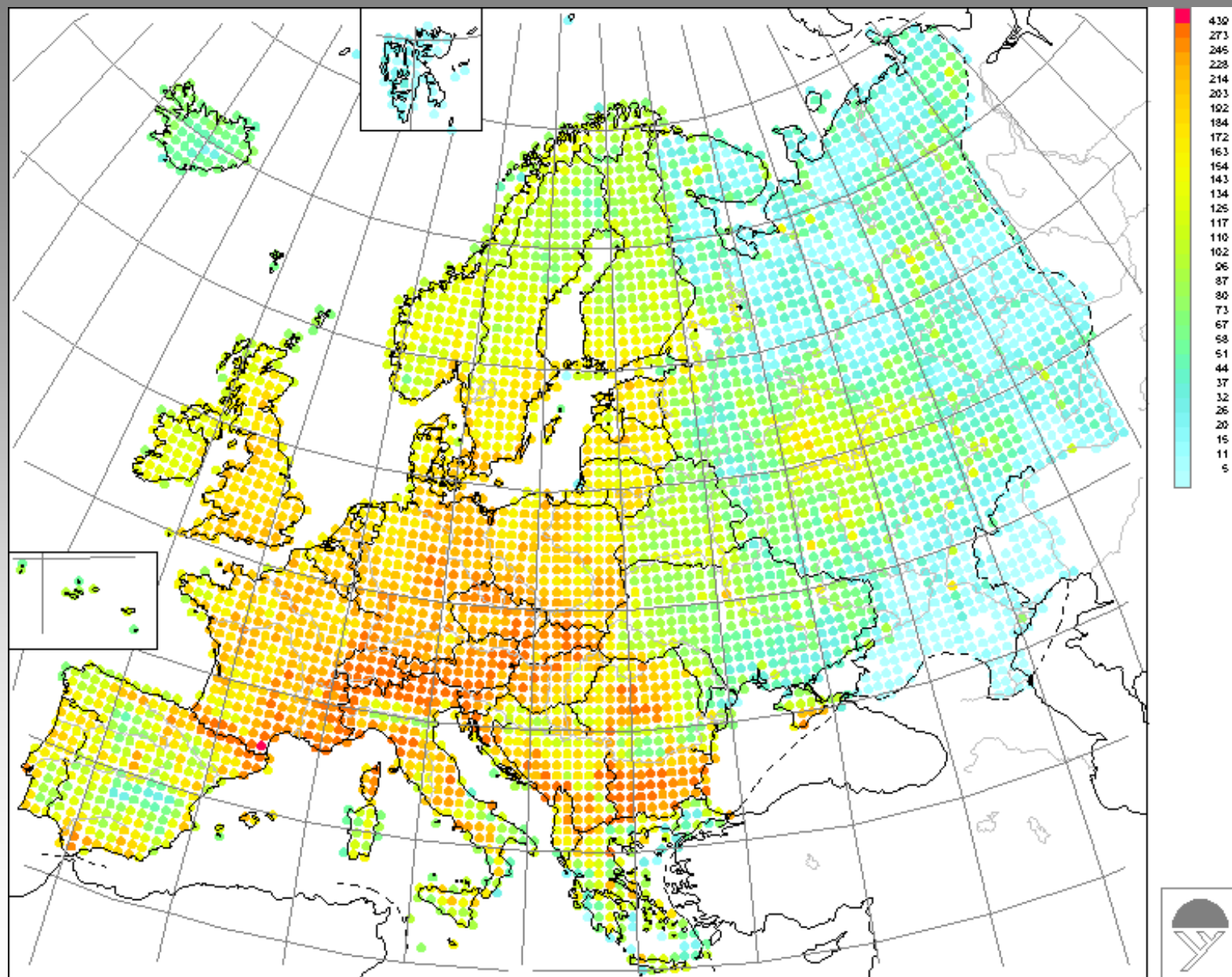


This is n° of individuals
of a given species

Keystone & Umbrella Species

- **Keystone species:** species whose presence or resource requirements affect ecosystem functions.
- **Umbrella species :** health of an umbrella species is a way to monitor the health of an ecosystem.
- **Flagship species:** species chosen to represent an environmental cause





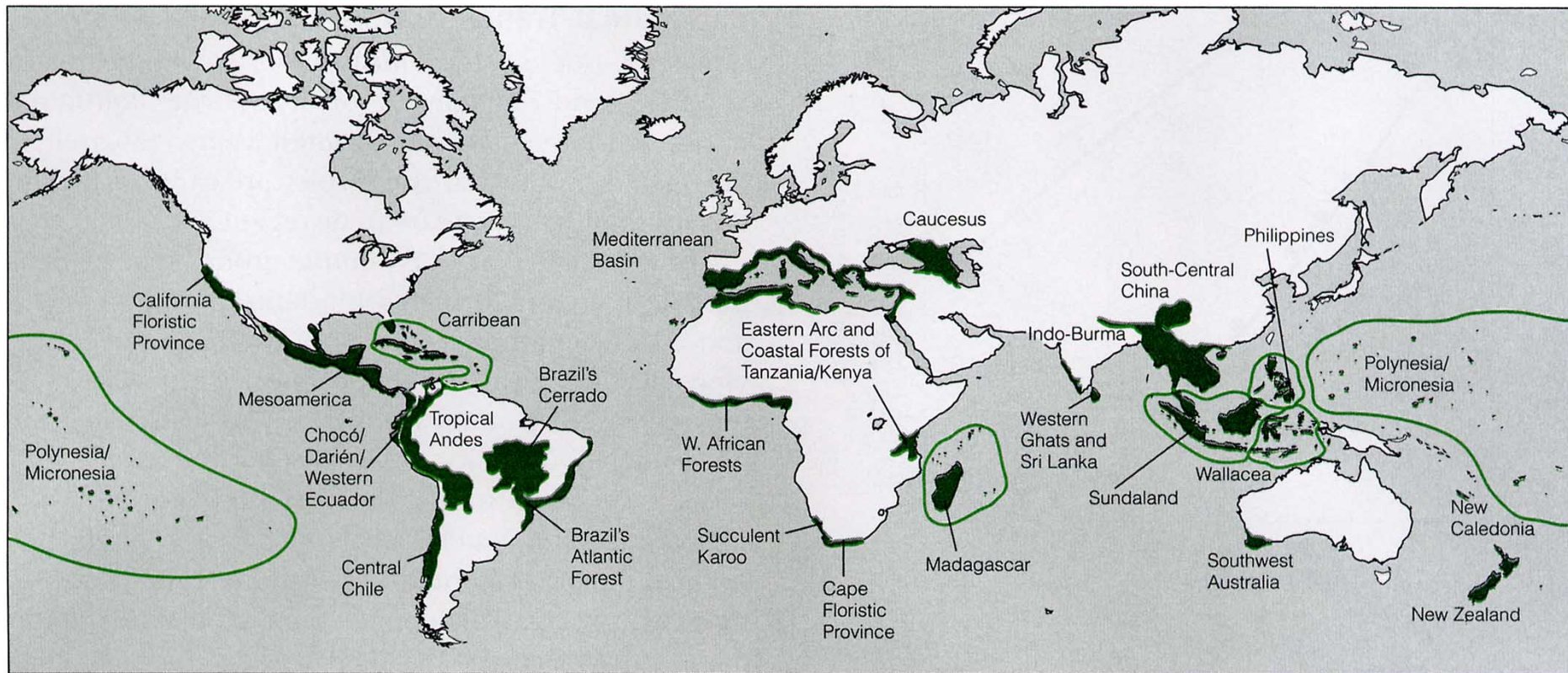


FIGURE 12.6 Twenty-five “hot spots” of species diversity—regions of exceptional concentration of endemic species and exceptional loss of habitat. The regions are important foci for conservation efforts. (From Norman *et al.* 2000).

What is Mountain Biodiversity?

- Many mountain ecosystems are host to higher species richness and levels of endemism than adjacent lowlands. Mountains at lower altitudes can support exceptional biodiversity, due to compression of a wide range of ecosystems into a relatively short distance.
- Mountains also often provide islands of suitable habitat, isolated from unfavourable surrounding lowlands. Endemism levels are often high, particularly on mountains at medium elevations in the tropics and warmer temperate zones.
- Mountain species with narrow habitat tolerance, particularly higher elevation forms and those with low dispersal capacity, are at high risk from the environmental effects of climate change.
- Slope dynamics and livestock grazing are significant drivers of diversity in many alpine regions. Flower-rich alpine meadows are an important cultural heritage that is increasingly threatened as traditional grazing practices decline.

Why is it Important?

- Mountain environments cover some 27% of the world's land surface, and directly support the 22% of the world's people who live within mountain regions.
- Lowland people also depend on mountain environments for a wide range of goods and services, including water, energy, timber, biodiversity maintenance, and opportunities for recreation and spiritual renewal.
- Mountains provide for the freshwater needs of more than half of humanity, and are, in effect, the water towers of the world. The world's mountains encompass some of the most spectacular landscapes, a great diversity of species and habitat types, and distinctive human communities.

Mountain biodiversity plays a key role in the support of global environmental, economic, social and cultural sectors.

The main problems for the mountain biodiversity currently are: invasive species, air pollution, climate change, mining, hydropower, tourism, forests, agriculture.

Therefore the challenge is to sustainably manage mountain regions to avoid degradation and avoid subsequent increases in poverty and hunger.

Mountain Biodiversity

A Global Assessment



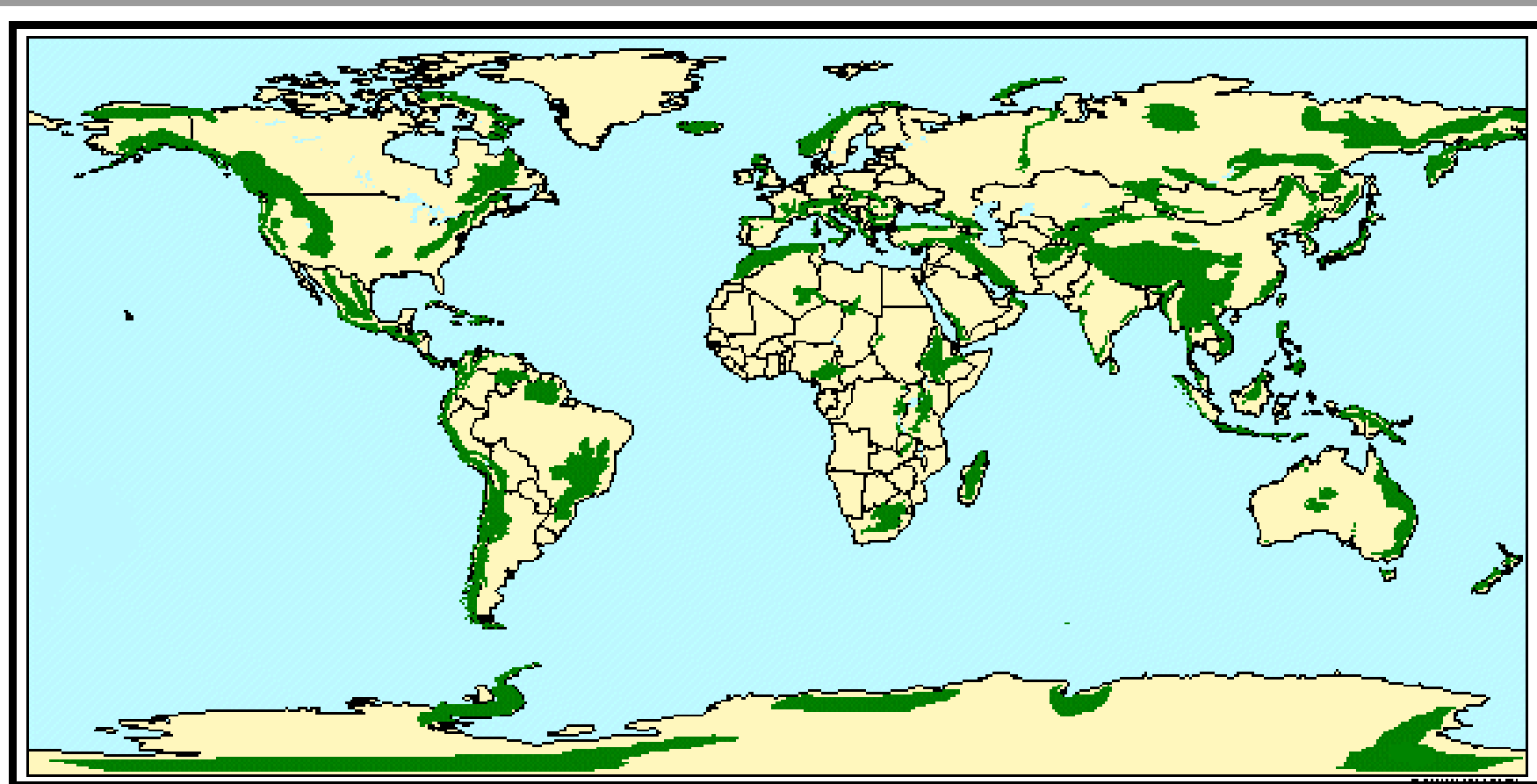
Edited by Ch. Körner and E.M. Spehn

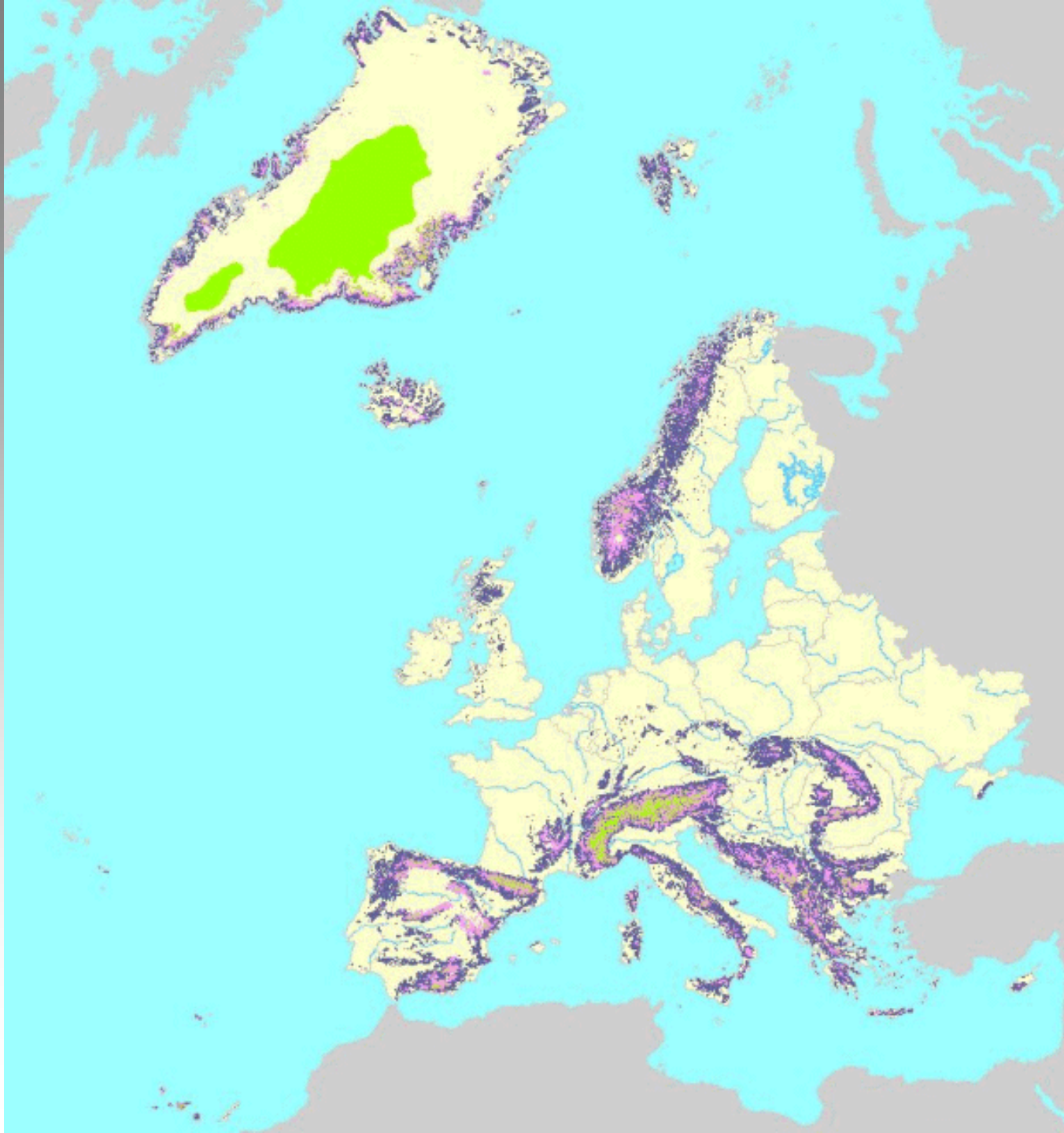


Mountain Biodiversity

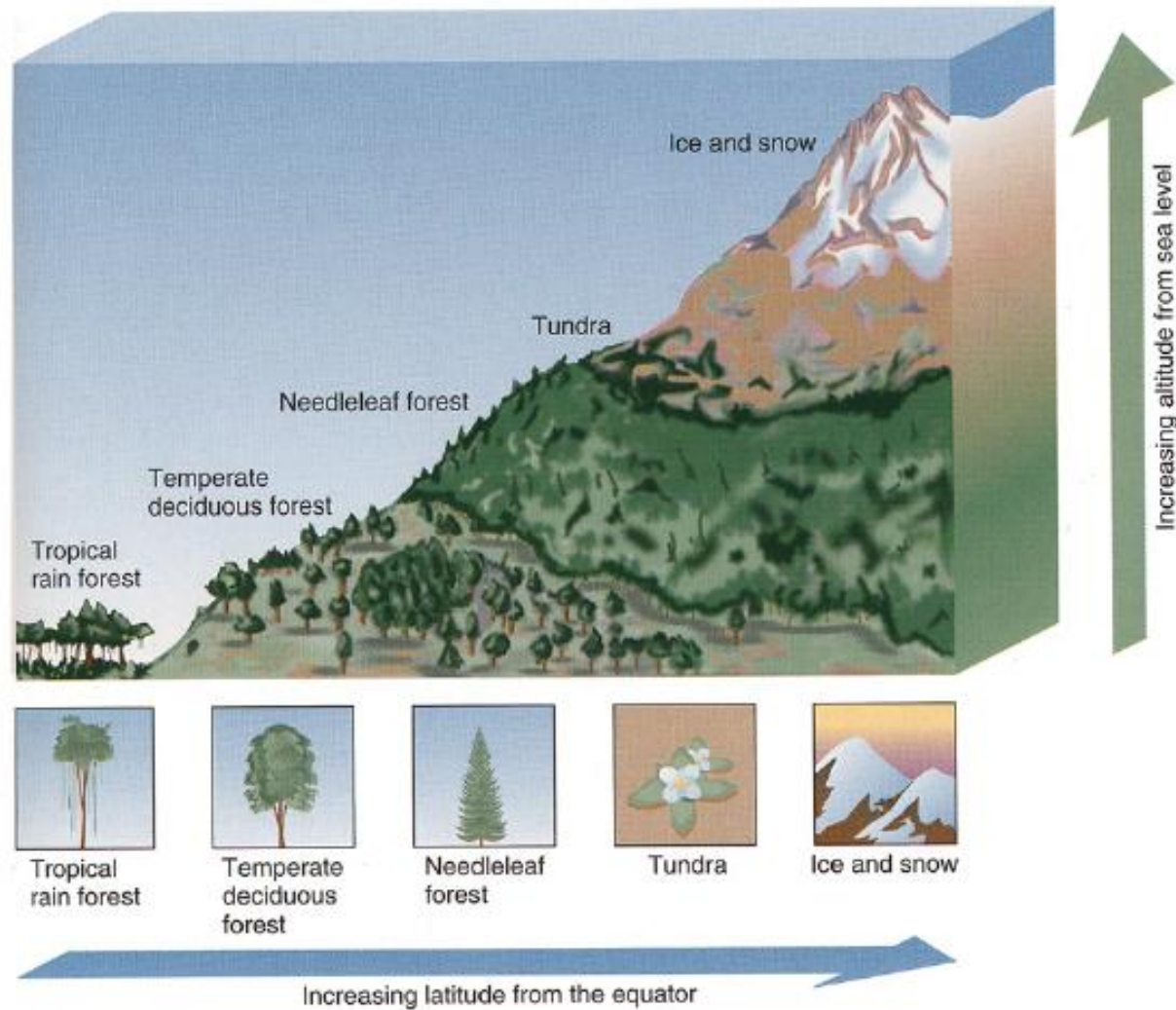
a global assessment

1. Catchment slopes depend on soil stability
2. Soil stability depends on near continuous plant cover
3. Plant species diversity ensures a sustained plant cover and hence soil stability
4. Biodiversity therefore provides insurance – intact systems provide insurance against system failure (Körner 2002)
5. Ecosystem functioning (plants, animals, micro-organisms co-existing and functioning together)
6. Cultural heritage argument – diverse, man-made ecosystems are historical treasures of our society
7. Ethical aspects (the right of all species to exist)
8. Aesthetic values (the beauty of alpine plants)





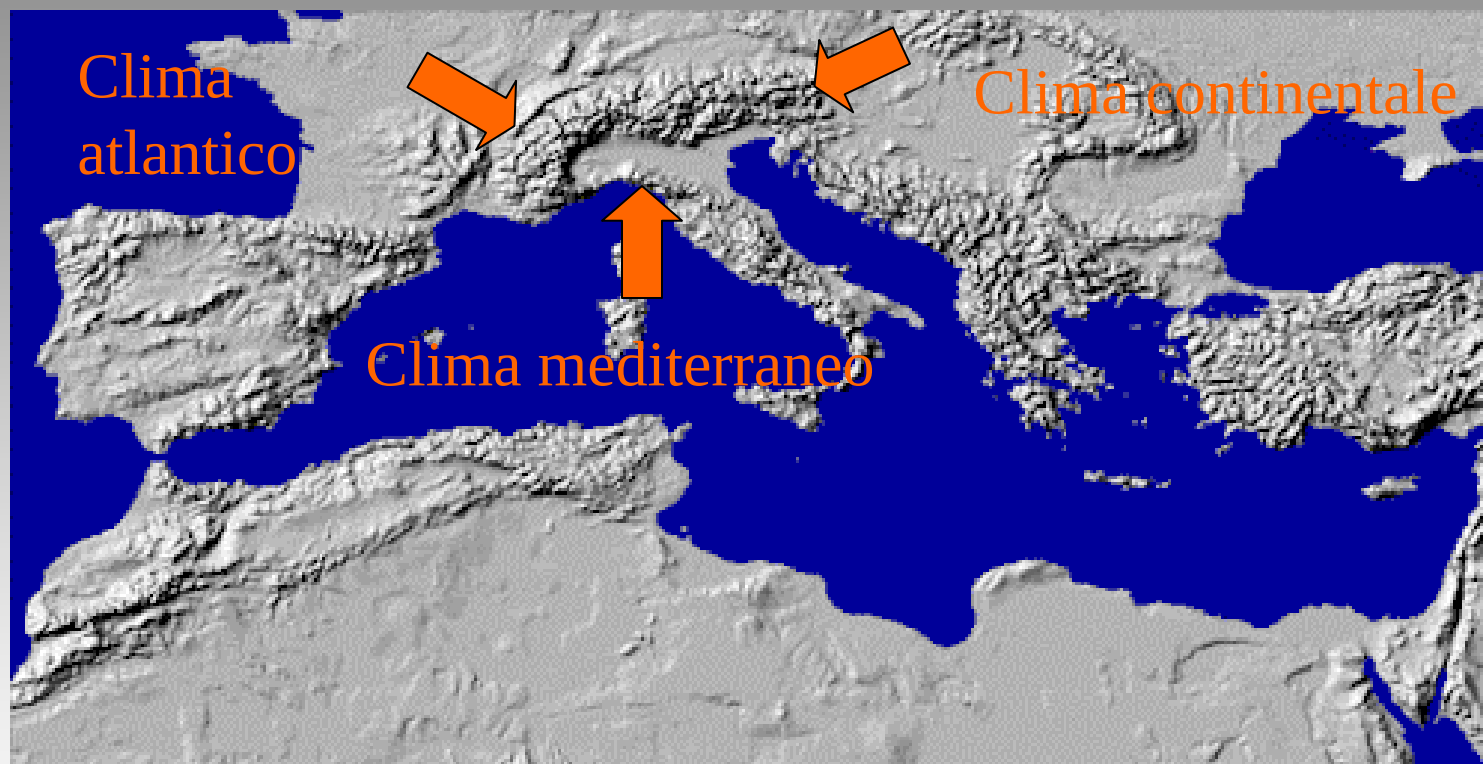
Similar patterns in community structure are observed with increasing latitude and increasing altitude



European Alps

- Climatic cross-road
- Steep aspects (gradient)
- Different rocks and soils
- Anthropogenic impact
- Role of the glaciations (particularly the last glacial period that reached the maximum about 18000 years ago)





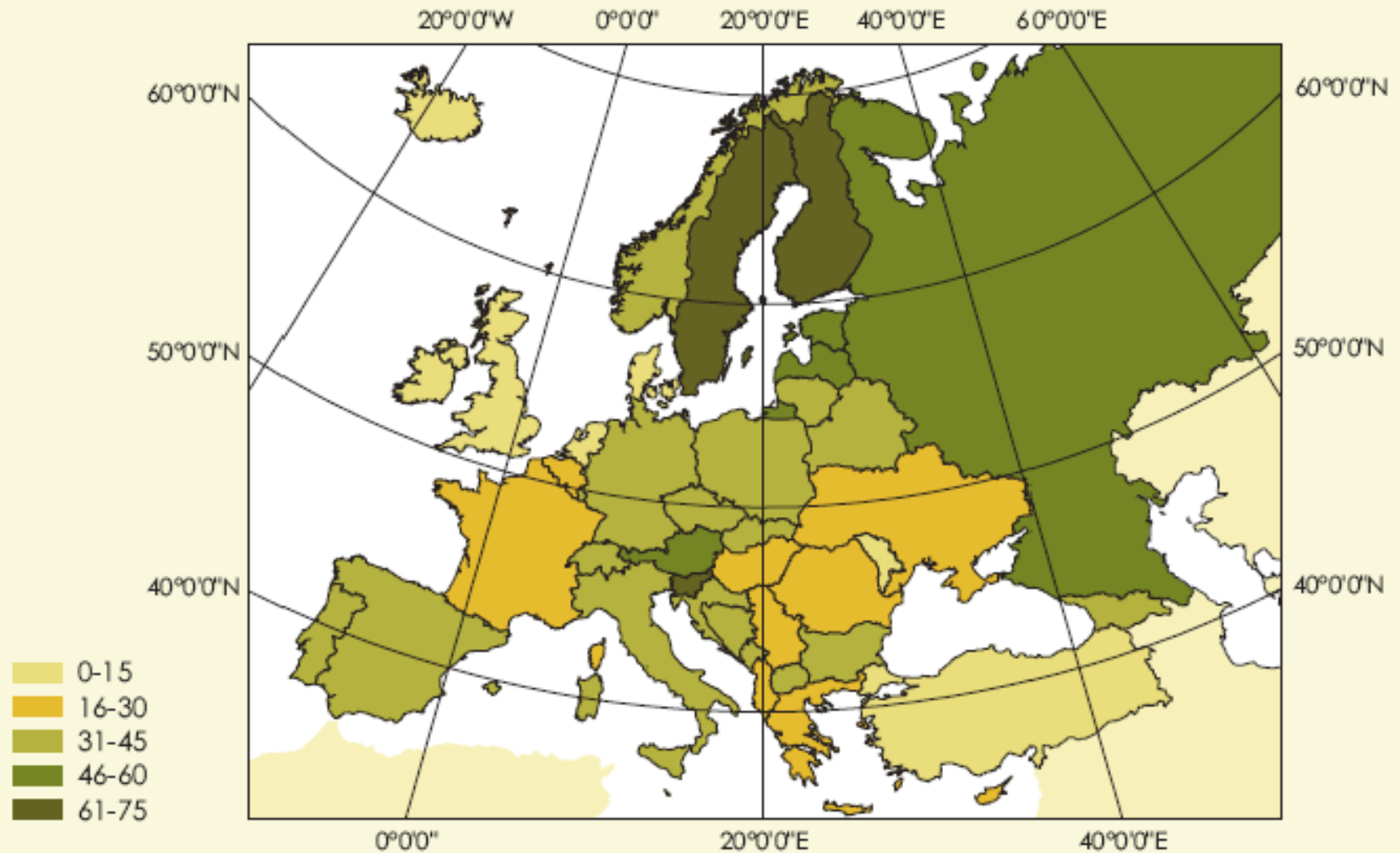


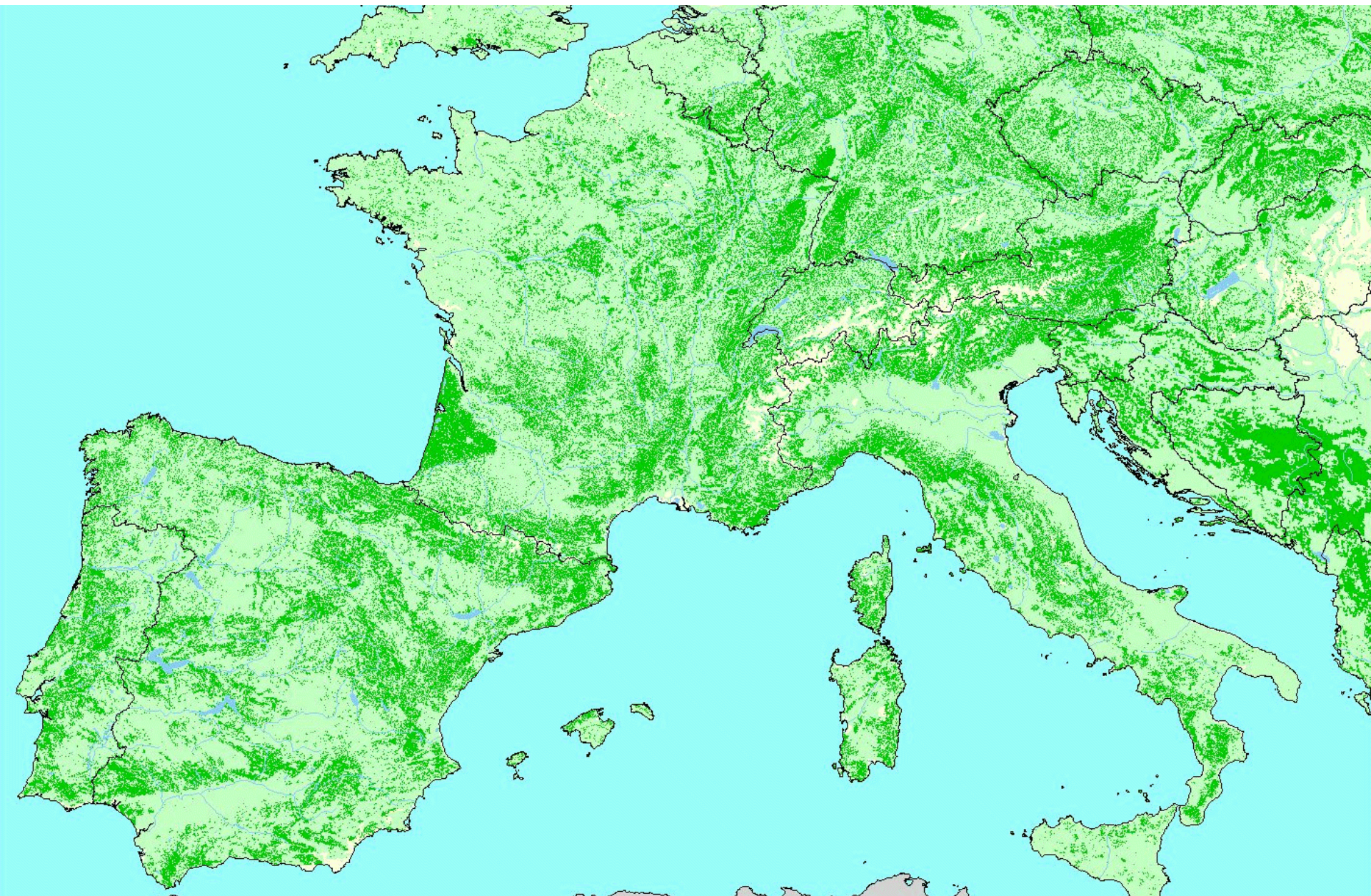


Forest

- Definitions (law, technical or administrative requirements, ecology)

Dizionario della Crusca del 1612: “loco pien di piante selvatiche come di querce, cerri, castagni e simili “





Forestland ownership:

-60% private

-40% public (Municipalities, local communities, Regions, State)

-Local interest are prevailing on Federal interests (National rules and regional rules)

- Strong public control and severe regime of authorization (LF1923)

-Think globally and act locally???

La risorsa forestale italiana

<http://www.sian.it/inventarioforestale/jsp/home.jsp>



Superficie forestale
totale

10.467.533
ES (%) 0,3

34.7% della sup. tot.

Bosco

8.759.200 ES (%) 0,4

Boschi alti	8.582.968
Impianti di arboricoltura da legno	122.252
Aree temporaneamente prive di soprassuolo	53.981

(83,7%)

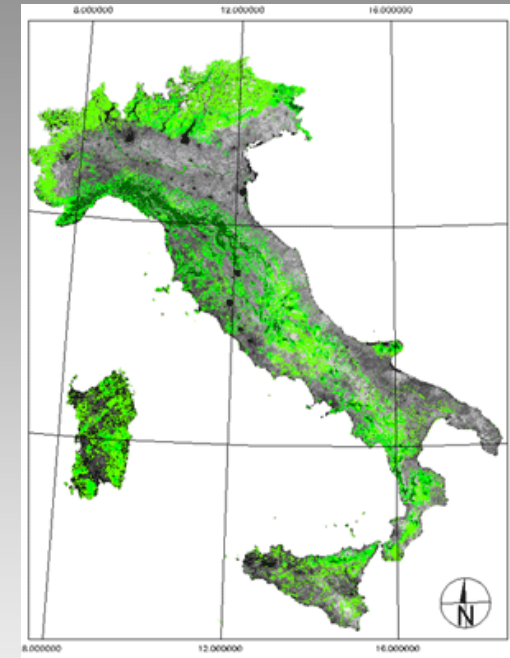
Altre terre boscate

1.708.333 ES (%) 1,3

Boschi bassi	124.229
Boschi radi	146.415
Boscaglie	48.678
Arbusteti	990.916
Aree boscate inaccessibili o non classificate	398.095

(16,3%)

	Superficie [ha]	Copertura forestale [ha]	Indice di boscosità□ [%]
Piemonte	940116	2539983	37,0
Valle d'Aosta	105928	326322	32,5
Lombardia ,	665703	2386285	27,9
Alto Adige	372174	739997	50,3
Trentino	407531	620690	65,7
Veneto	446856	1839122	24,3
Friuli V.G.	357224	785648	45,5
Liguria	375134	542024	69,2
Emilia Romagna	608818	2212309	27,5
Toscana	1151539	2299018	50,1
Umbria	390255	845604	46,2
Marche	308076	969406	31,8
Lazio	605859	1720768	35,2
Abruzzo	438590	1079512	40,6
Molise	148641	443765	33,5
Campania	445274	1359025	32,8
Puglia	179040	1936580	9,2
Basilicata	356426	999461	35,7
Calabria	612931	1508055	40,6
Sicilia	338171	2570282	13,2
Sardegna	1213250	2408989	50,4
Italia	10467533	30132845	34,7



Italy: 95% of forests are in mountains and hills

area where production is not the main purpose

less developed area (agriculture)

tourism

high importance of the watershed management

Multi functional forests

**2-3 million hectares
under natural
conversion to forests**
(mainly in mountain
areas)

1950 = 5.5 M hectares

2000 = 10.4 M hectares

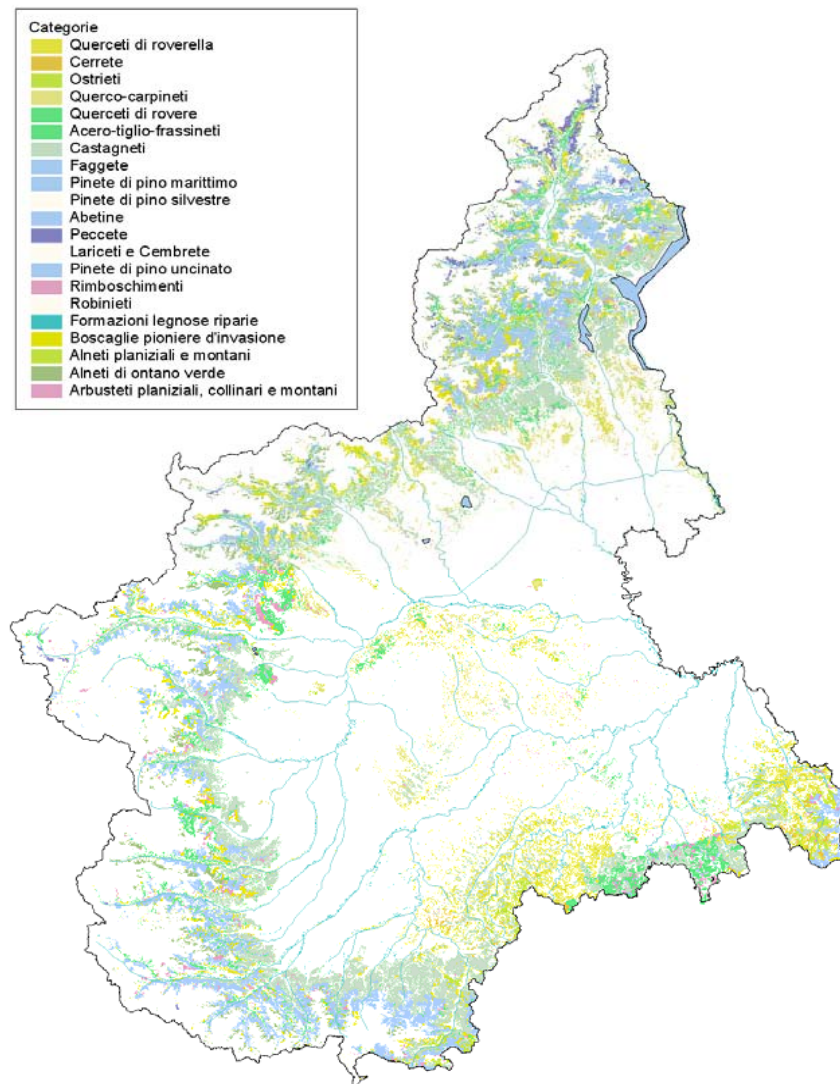




National Annual Increment (Forest Inventory): 35.8 million cubic meters

Wood production (statistics, largely underestimated): 6 million cubic meters of which 60% of fuelwood

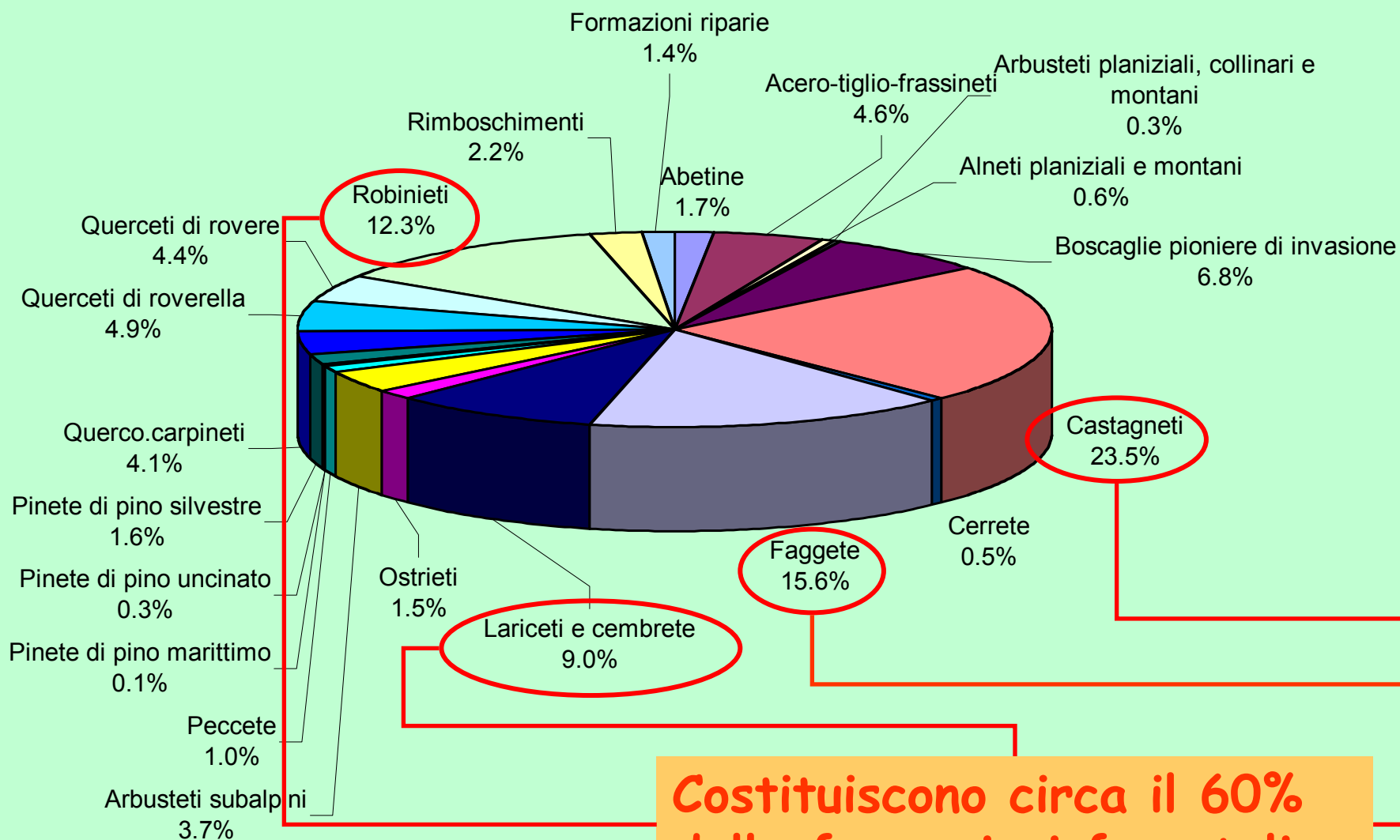
The rate removals/increment is the lowest in Europe



La superficie forestale della Regione Piemonte

Fonte	Anno	Ettari
Carta forestale IPLA	1981	718.000
IFNI	1985	743.000
ISTAT	1994	665.000
Piani Forestali Territoriali	2000 - 2004	925.000
INFC	2005 (1ª fase)	956.000

Ripartizione della superficie forestale



**Costituiscono circa il 60%
delle formazioni forestali**

Regione Piemonte - Sito Ufficiale

Sezione Montagna, Foreste e Tutela del Paesaggio

Foreste in Piemonte



Le foreste in Piemonte ricoprono una importante [porzione del territorio](#) e svolgono un ruolo fondamentale nella protezione del territorio.

Anche se dal punto di vista strettamente economico esse hanno un "peso" decisamente inferiore a quello di altri comparti, è comunque forte la consapevolezza della loro importanza per gli aspetti paesaggistici, naturalistici ed ambientali e per il ruolo culturale e sociale che svolgono ed il cui "valore" non è sempre facilmente monetizzabile.



Le azioni intraprese in questi anni, quali lo sviluppo della [filiera legno-energia](#), la promozione dell'associazionismo ed il finanziamento di azioni di miglioramento forestale, sono state concepite come tra loro sinergiche nel più ampio quadro delle politiche di sviluppo del settore forestale e della montagna, che oggi fa sempre più riferimento ai concetti di multifunzionalità e di sostenibilità.

http://www.regione.piemonte.it/montagna/foreste/pian_gest/for_piem.htm

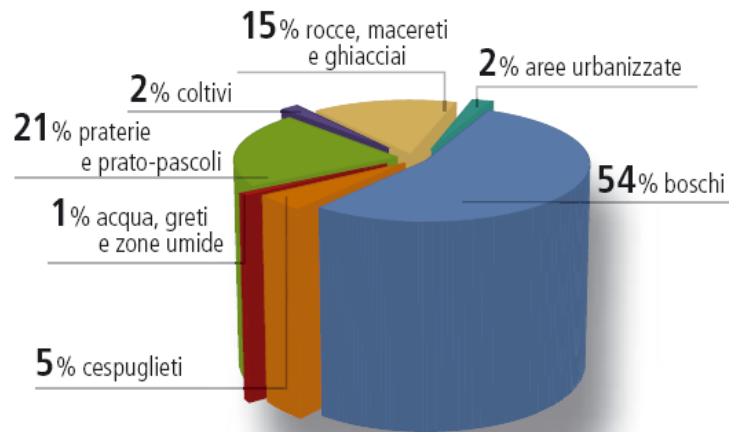


Grafico 5.5

Piemonte: ripartizione della superficie montana (627.259 ha) nelle principali categorie d'uso del suolo

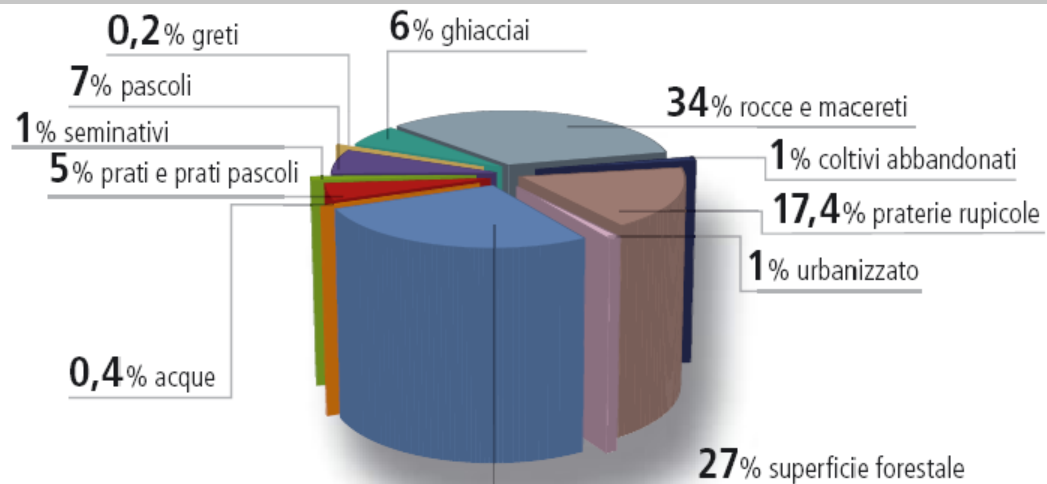


Grafico 5.1

Valle d'Aosta: ripartizione della superficie totale (326.400 ha) nelle principali categorie d'uso del suolo

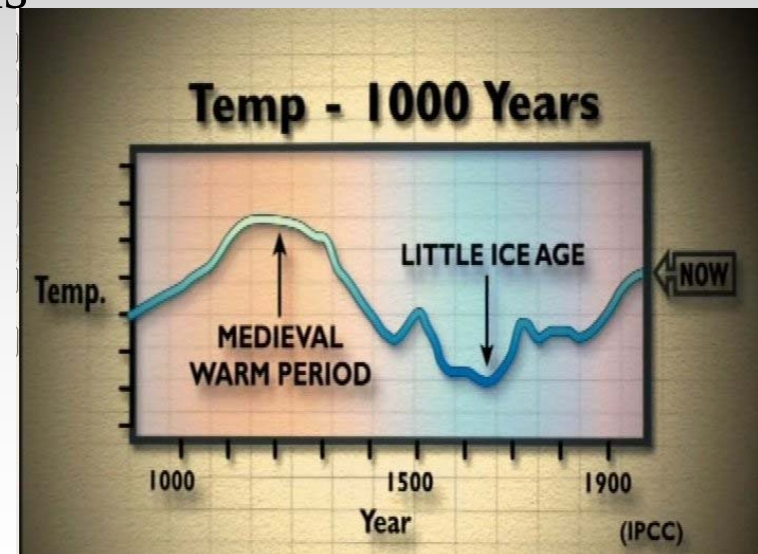
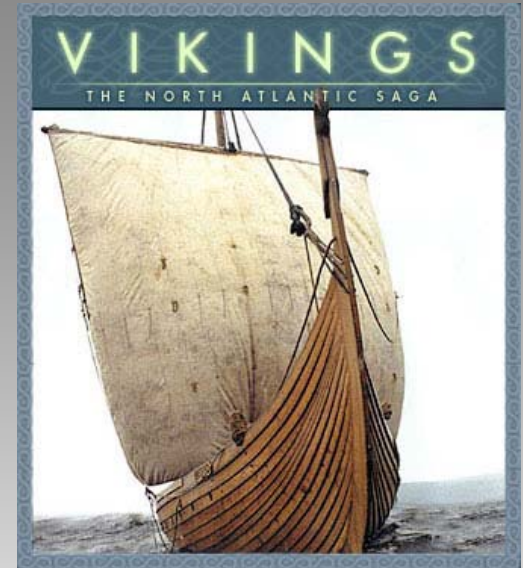
The men and the forest in the Alps (1)

- about 11000-5000 bp beginning of the colonisation of the Alps (better climate, seasonal hunters, human fires....)
- 5000-2000 bp migrations, stable settlements, development of agriculture
- Roman period road network, development of the mines and of the forest harvesting. New colonisations (slavic and germans mainly)



The men and the forest in the Alps (2)

- middle age: mines, wood production and development of the farms; migrations e.g. walser and “Valdesi”
- 1400 dc: maximum development of the agriculture (optimum medioeval period)
- 1600-1800: little ice age, the climate is not as favourable as in the past. Development of the trade activities, road system in the Alps and crossing the Alps, development of large settlements and towns, highest human density



The men and the forest in the Alps (3)

- 1800 and first half of 1900:
decline and collapse of the rural
economy, migration,
- second half of 1900:
development of the tourism,
strong increment of the request
for recreation, landscape and
nature protection; development of
policies devoted to restore the
montane agriculture



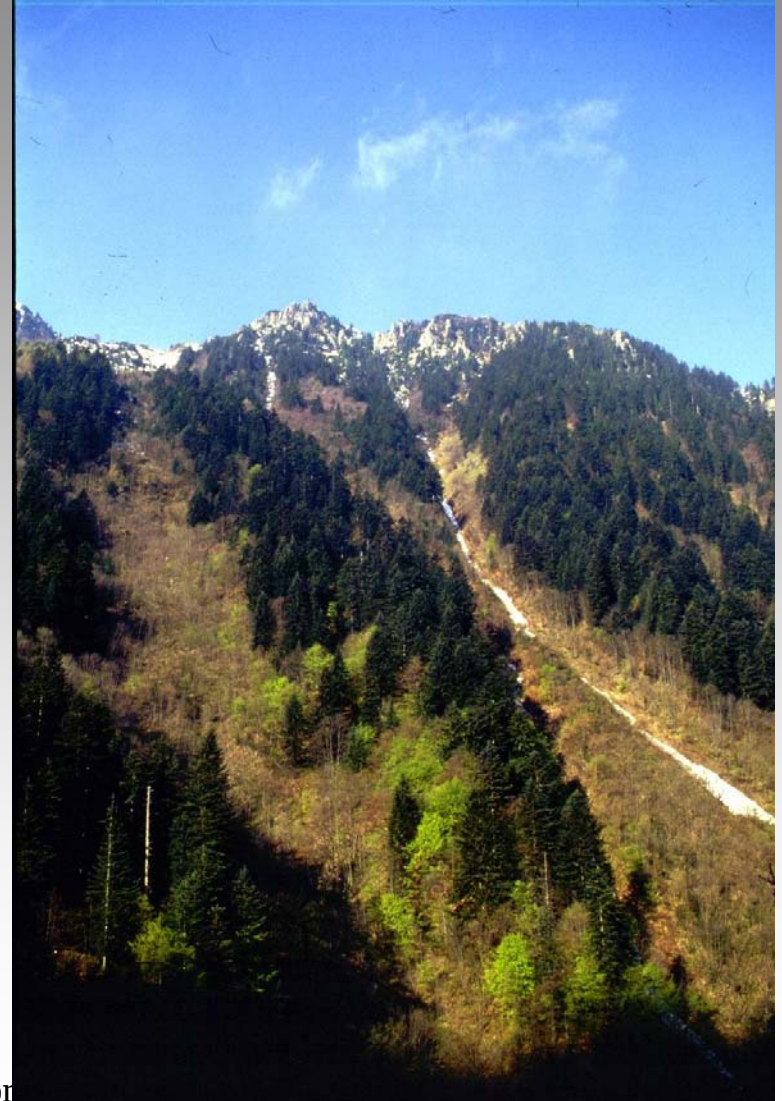
Wood products (at the beginning....)

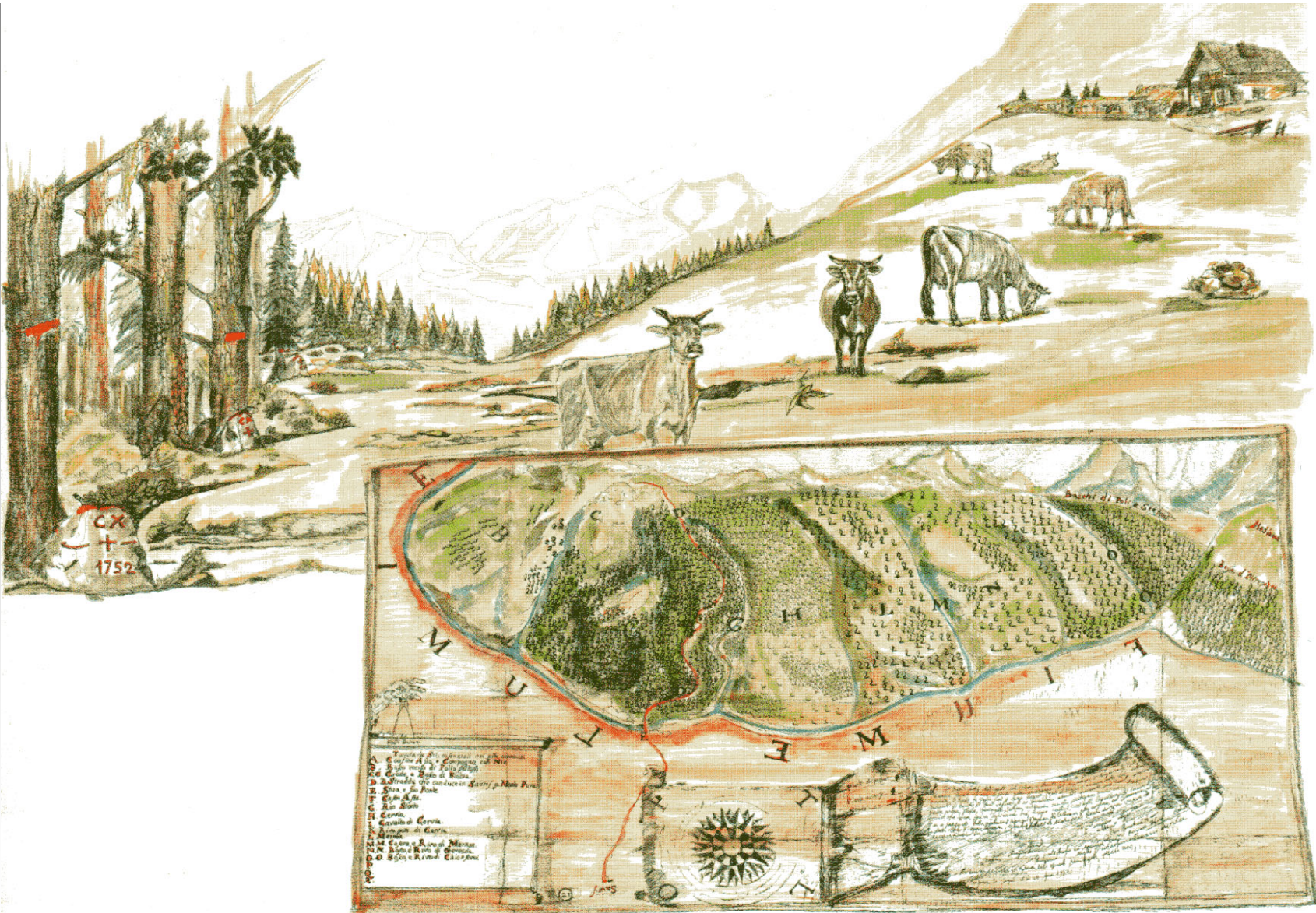
Oetzi (5000 years bp)

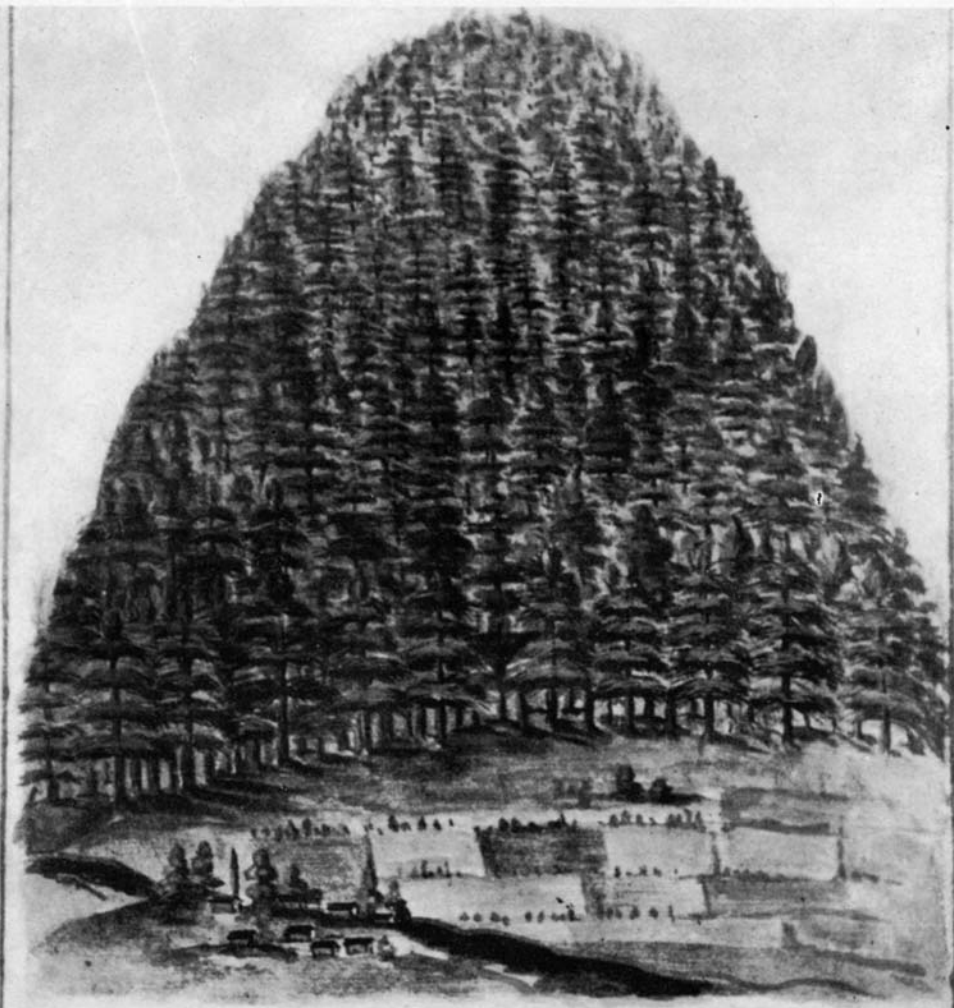
His equipment included:

- a longbow made of yew (*Taxus baccata*)
- a flint knife with an ash handle (*Fraxinus excelsior*)
- 14 bone-tipped arrows with *Viburnum* and dogwood shafts (*Cornus* spp)
- a larch wood frame and cords of a backpack (*Larix decidua*)
- two birch-bark (*Betula pendula*)
- a copper axe with a yew handle (*Taxus baccata*)



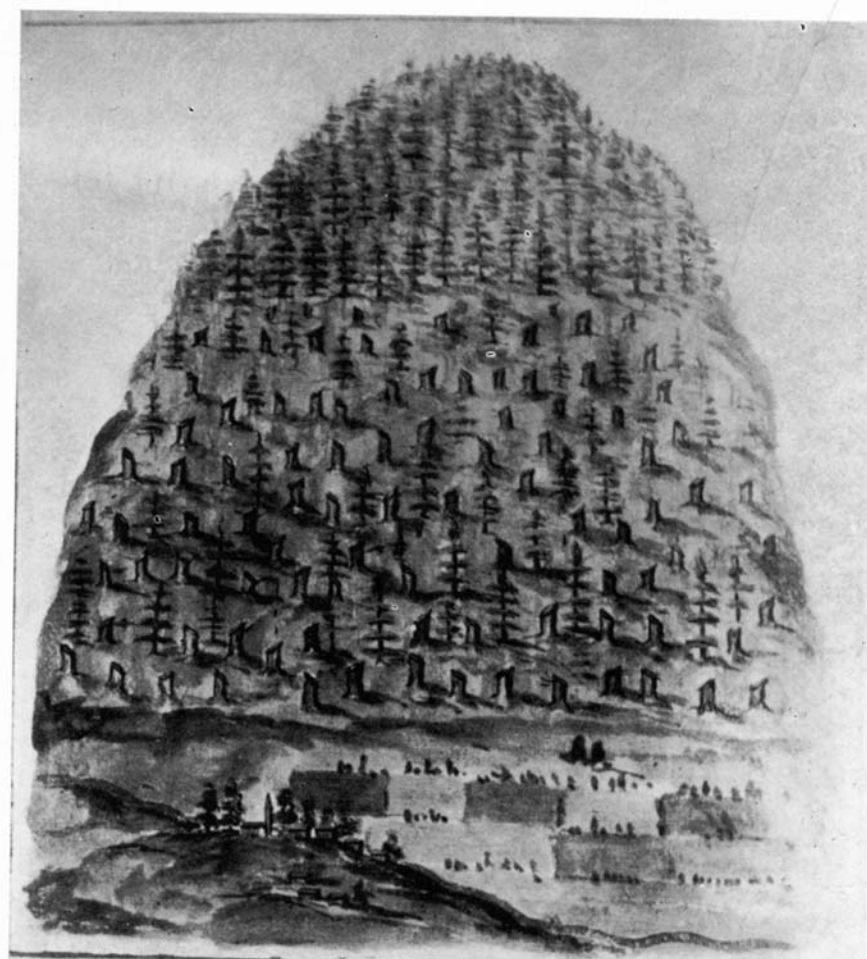






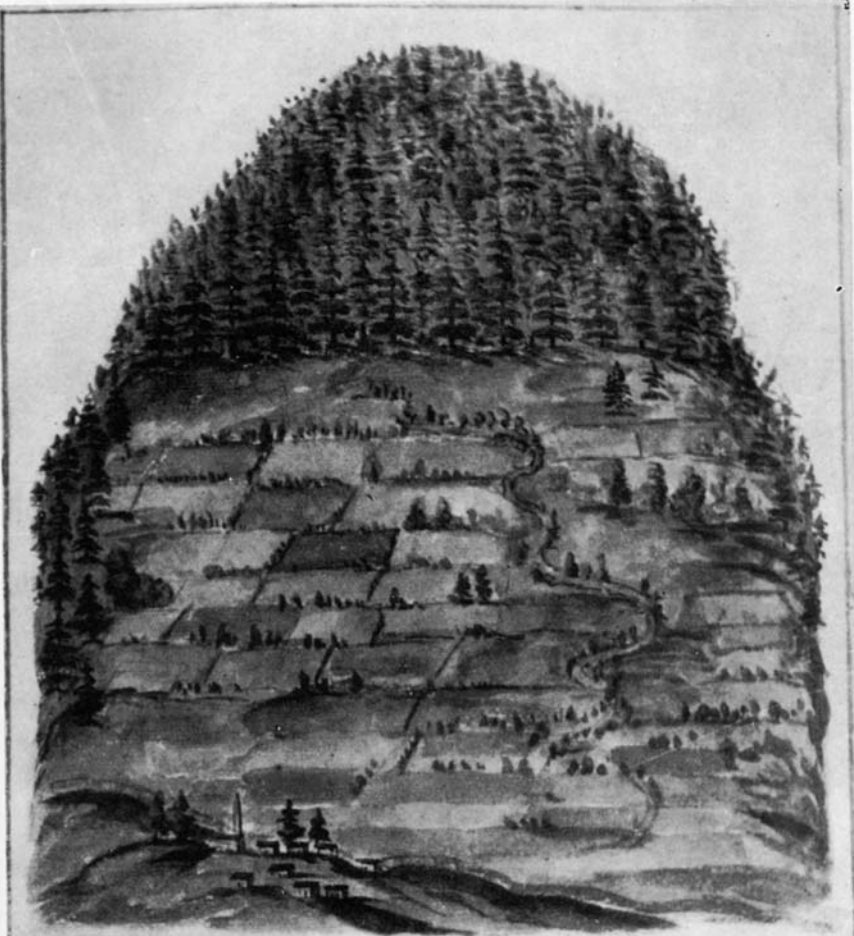
Questa è la faccia d'una Montagna boschiva così verdeggiente e folta, che poca pioggia e neve può discendere al basso trattenute da gli Arbori, che il sole va pian piano rasciugando col consumare anco si può dire insensibilmente quasi tutte le Nevi, e se cala al basso qualche poco d'humore, vien tosto assorbito dalle spesse radici, tronchi e foglie secche degli Arbori.

13.1 - « Questa è la faccia d'una Montagna boschiva così verdeggiente e folta, che poca pioggia e neve può discendere al basso trattenute da gli Arbori, che il sole va pian piano rasciugando col consumare anco si può dire insensibilmente quasi tutte le Nevi, e se cala al basso qualche poco d'humore, vien tosto assorbito dalle spesse radici, tronchi e foglie secche degli Arbori ».



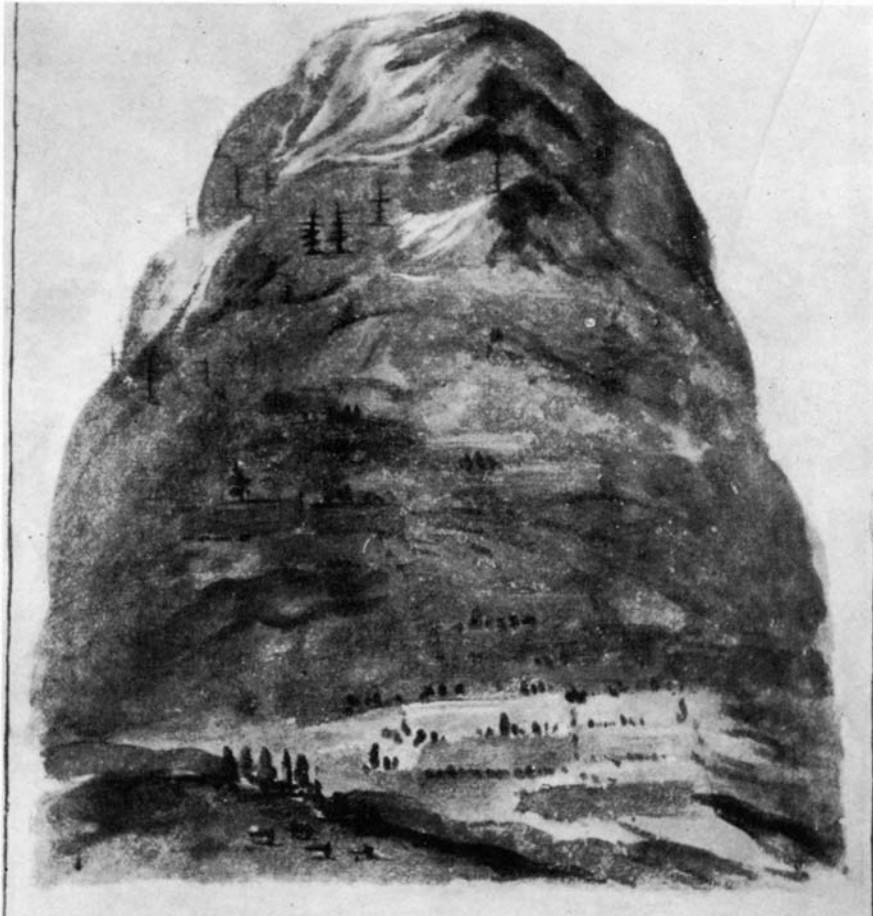
E se ben il Bosco montuoso al suo tempo si taglia, non ne segue però l'effetto pernicioso, perchè la sommità delli Monti Boschivi si lasciano con gli Arbori verdi che difendono per il suo quasi all'istesso modo, essendo massime de' nani inutili e di difficile condotta: oiera che tagliando in la mano gli Arboricelli, le fratte, le radici, e tronconi dalle quali in breve tempo pullulano altri novi Arbori, e il bosco presto si rinovella.

13.2 - « E se ben il Bosco montuoso al suo tempo si taglia, non ne segue però l'effetto pernicioso; perchè la sommità delli Monti Boschivi si lasciano con gli Arbori verdi che difendono per il suo quasi all'istesso modo, essendo di massime legnami inutili e di difficile condotta, oltre che tagliando si lasciano gli Arboricelli, le fratte, le radici, e tronconi dalle quali in breve tempo pullulano altri novi Arbori, e il bosco presto si rinovella ». Come doveva essere tagliato il bosco in montagna: lasciando in alto tutti gli alberi vegeti e togliendo solo quelli secchi; diradando saltuariamente il soprassuolo delle pendici inferiori, senza estirpare le ceppaie e conservando erbe, arbusti e novellame. L'attuale taglio saltuario è ugualmente caratterizzato: da interventi moderati e distribuiti sulla superficie a scopo di utilizzazione (alberi più grossi) e di cura del bosco (eliminazione di alberi difettosi, piccoli e grossi); dal rispetto del novellame e del sottobosco. Il bosco raffigurato dai Paulini, di abeti, larice e pini si riferisce all'alto Bellunese e al Cadore, ma è comune a tutto il territorio alpino.



Conoscevano gli Antichi, che potevano dove le serviva, il terreno coltivare, et far campi negli Monti purché nella sommità d'essi vi fosse bosco ben folto, perché, come si vede dalla presente prospettiva non calavano tante acque al basso, e gl'istessi zappati, e pascoli si mantenevano in bonissimo stato come fanno al presente le Montagne d'Imperiali, se ben zappate, in molti luoghi senza però che s'accrescano soverchio i loro Torrenti. Assetto della montagna coltivata, attribuito dai Paulini agli antichi (i quali anche allora facevano meglio dei successori!): pendici superiori con bosco denso e continuo, pendici inferiori coltivate. Tale assetto assicurava secondo i Paulini, un equilibrio soddisfacente anche riguardo alla tutela idrogeologica.

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S'abbrugiano i boschi da Contadini per ridurre i Monti nell'essere che si vede dando fuoco alle Cespugli et all'erbe secche per allarghar li pascoli, et haver più presta, e più morbida l'erba novella, di modo che ogni Anno sono più volte abbrugiate le Montagne di questo Ser.mo Dominio. Quel fuoco trasportato dal vento, da per tutto va serpando, et allargandosi penetrando sino nelli Valloni, et alti dirupi che sono inaccessibili consuma ogni pianta novella, che dalla Natura vien prodotta, Et quindi nasce che le gran piogge e nevi liquefatte sendo esposte al sole, et a i sirocchi, non traendo alcun ritegno discendono con tanta furia, che portan seco il terreno e scuoprono in molti luoghi il sasso, come qui si vede. L'abuso dell'uomo, che incendia il bosco per allargare campi e pascoli (quelli già coltivati essendo divenuti sterili o insufficienti), riduce la montagna in questo stato. Lo stesso quadro è oggi purtroppo comune a gran parte delle nostre montagne: magre praterie al posto di fecondi boschi, alberi sparuti e dispersi, roccia affiorante. Il capitale più prezioso, la terra fertile prodotta dal bosco durante millenni, è finito disperso nel mare.

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Modern silviculture (1)

Colbert's (1669) "French Forest Ordinance"

Colbert established the principle of public interest in the forest management



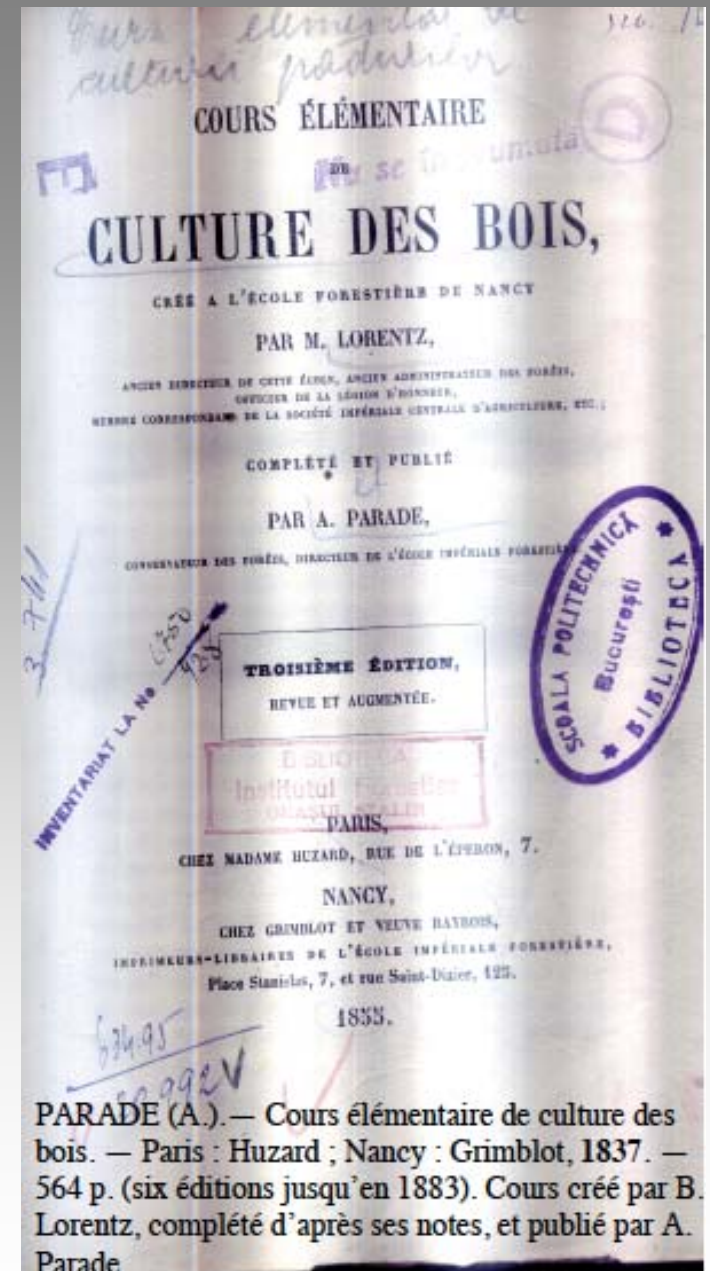
Forestry school of Tharandt (Germany).

- Agronomy
- Clear cut
- Artificial afforestations (exotic species)
- Mono-specific
- Mono-layered
- Even-aged stands
- Conifers (Norway spruce and Scots pine)



School of Nancy.

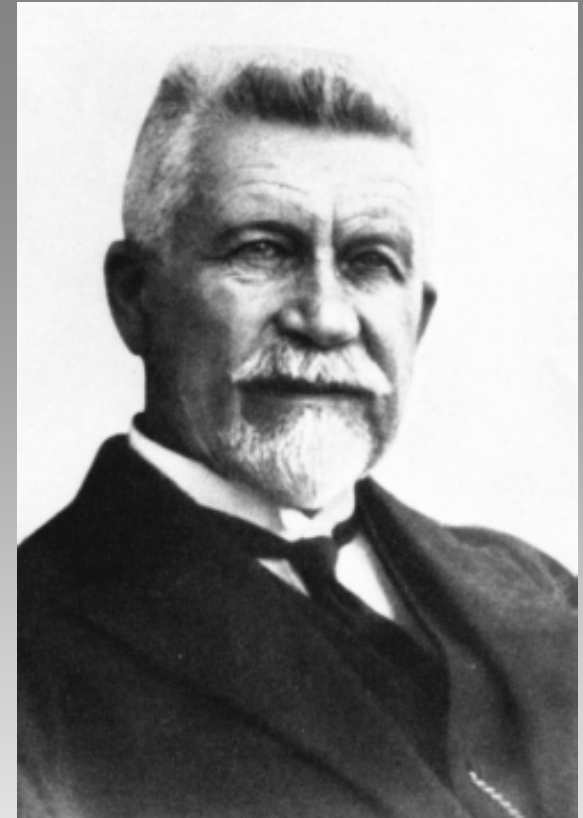
- Even-aged stands
- Natural regeneration
- Broadleaves
- Shelterwood system





Gurnaud and Biolley: uneven-aged stands.

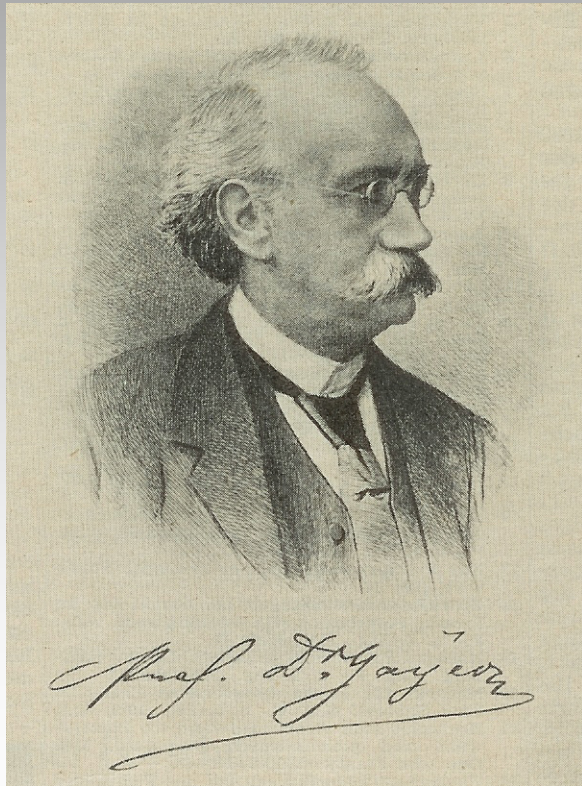
- Mixed stands
- Uneven-aged stands
- Natural regeneration



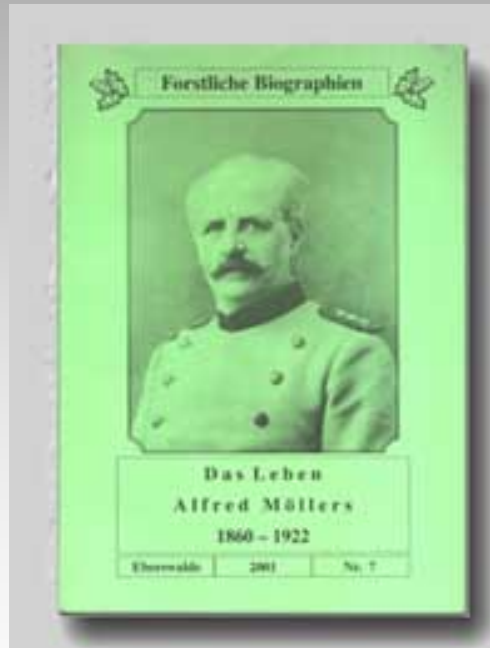


Gaier, Möller and the “Dauerwald”

Ecology, philosophy and politics
The Nazism and the silviculture



06/10/2010



Selvicoltura



Edited by Franz-Josef Brüggemeier, Mark Cioc, and Thomas Zeller

How Green Were the Nazis?

*Nature, Environment, and Nation
in the Third Reich*





In the past: virgin forest



In Middle age



1870

Industrial timber production

European forestry

*Adapted from
Schütz 2007*

The research on the European virgin forests (1950-1980)

- Leibundgut
- Mlisnsek
- Korpel
- Susmel



Wien 1982
Dušan Mlinšek





Pro Silva Europe



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DECLARATION OF APELDOORN May 29-31 1997

Declaration

I.Sustainability

II.Combining or separation forest functions

III.Ecological forest management

IV.Promotion of close-to-nature forestry

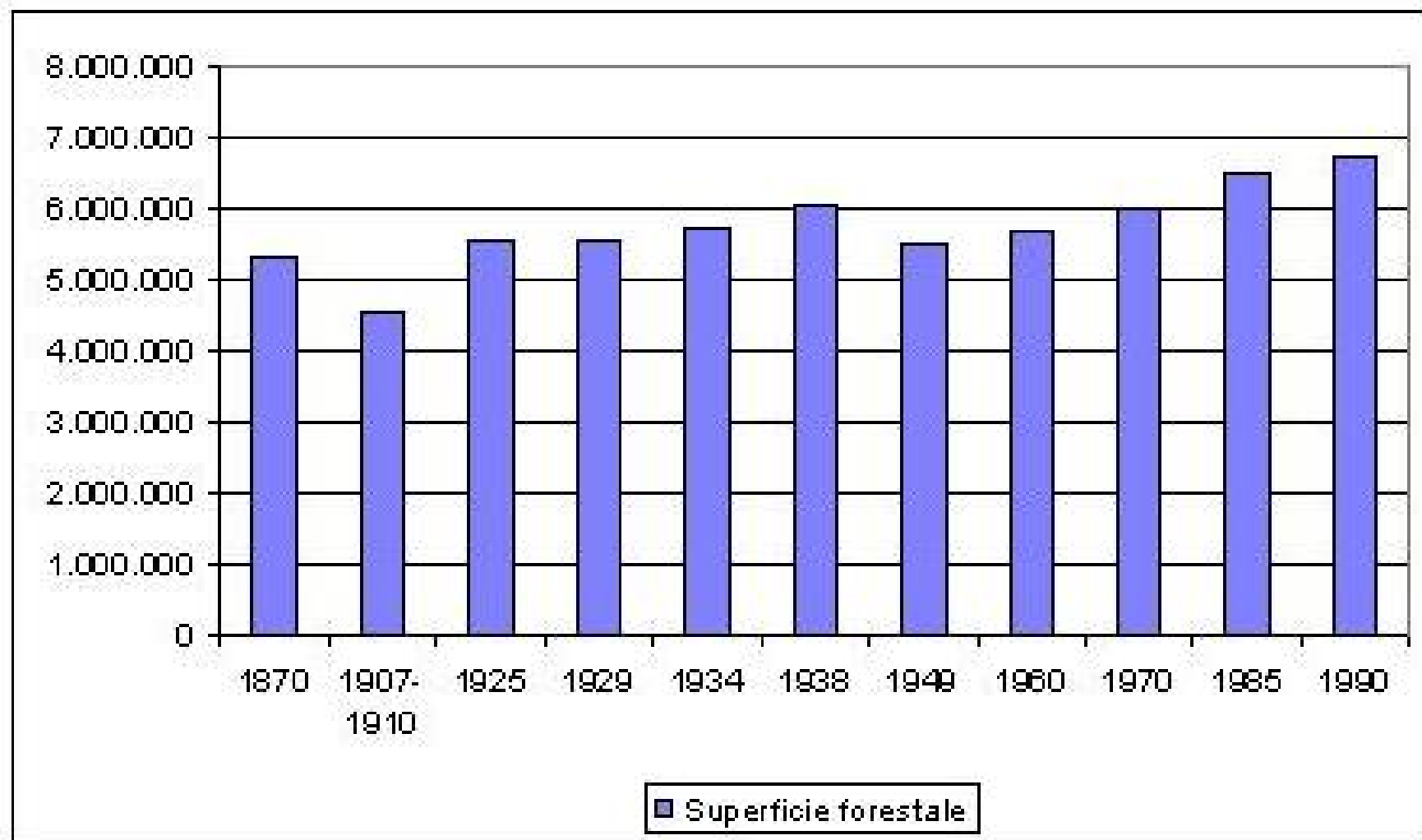


Management options

Foresters can make use of the following approaches as a means of preserving and developing natural biodiversity:

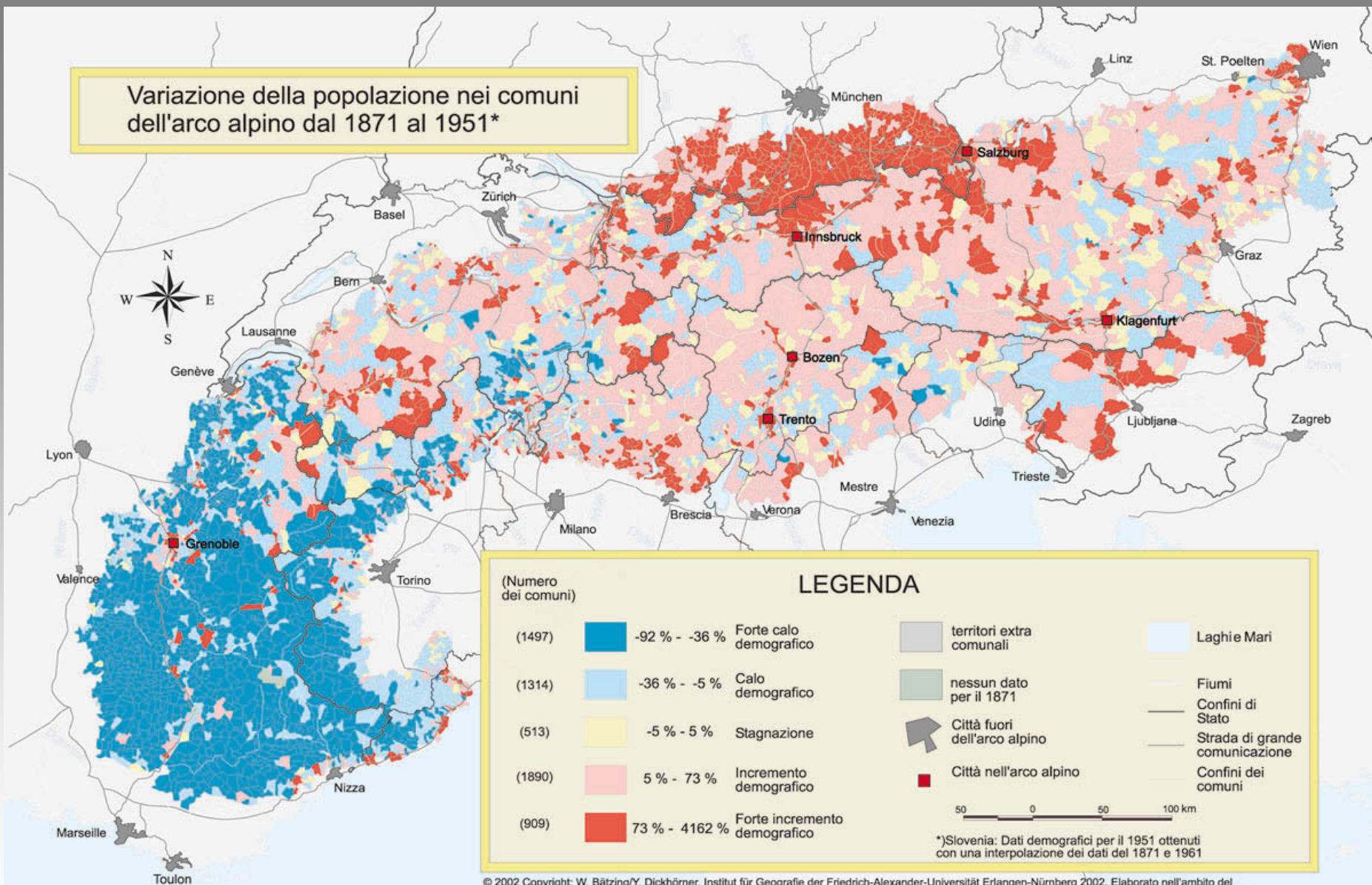
- Use of indigenous tree species: because numerous animal and plant species are connected to the indigenous trees in their co-evolutionary development;
- Enhancement of diversity in forest structure through forest regeneration, tending and exploitation as a means of obtaining appropriate occurrence of niches in space and time;
- Acceptance of standing and fallen dead trees, hollow trees, old groves, etc. in sufficient quantities and distribution;
- Protection of special biotopes in the forest (wetlands, rocky outcrops, dunes, etc.);
- Regulation of unnaturally high game densities, and other populations of herbivores which over-use the forest over large areas.

Evoluzione della superficie forestale italiana (1870-1990; dati in ettari)



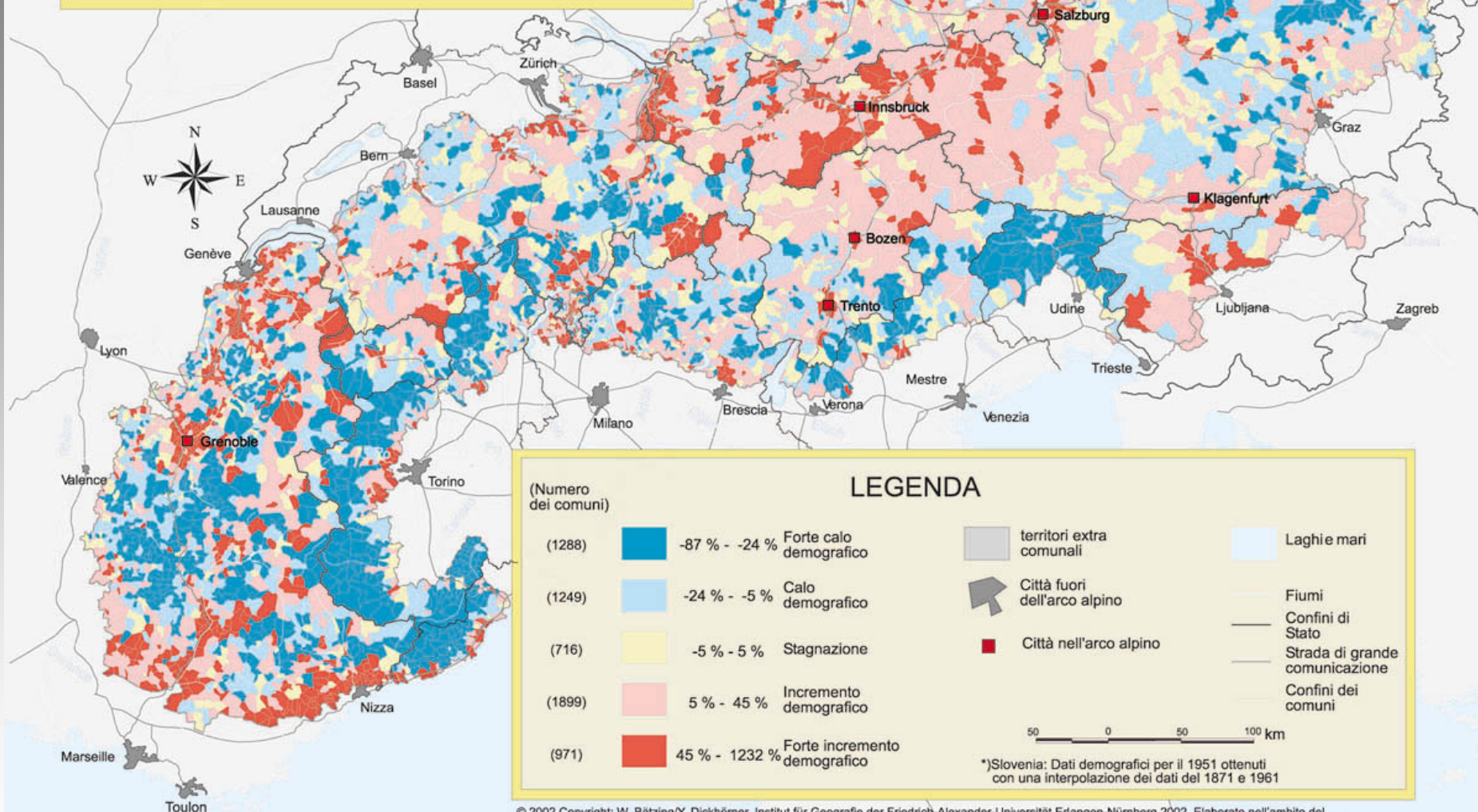
Fonte: dati ISTAT e altre fonti storiche

Variazione della popolazione nei comuni
dell'arco alpino dal 1871 al 1951*



© 2002 Copyright: W. Bätzing/Y. Dickhörner, Institut für Geografie der Friedrich-Alexander-Universität Erlangen-Nürnberg 2002. Elaborato nell'ambito del progetto 200 11 226 "Attuazione degli aspetti socioeconomici ed ecologici del principio di sostenibilità nello sviluppo del tema chiave della Convenzione delle Alpi "Popolazione e cultura", su incarico dell'Ufficio federale per l'ambiente della città di Berlino.

Variazione della popolazione nei comuni
dell'arco alpino dal 1951 al 1981 *



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Individuazione dei paesaggi a vista

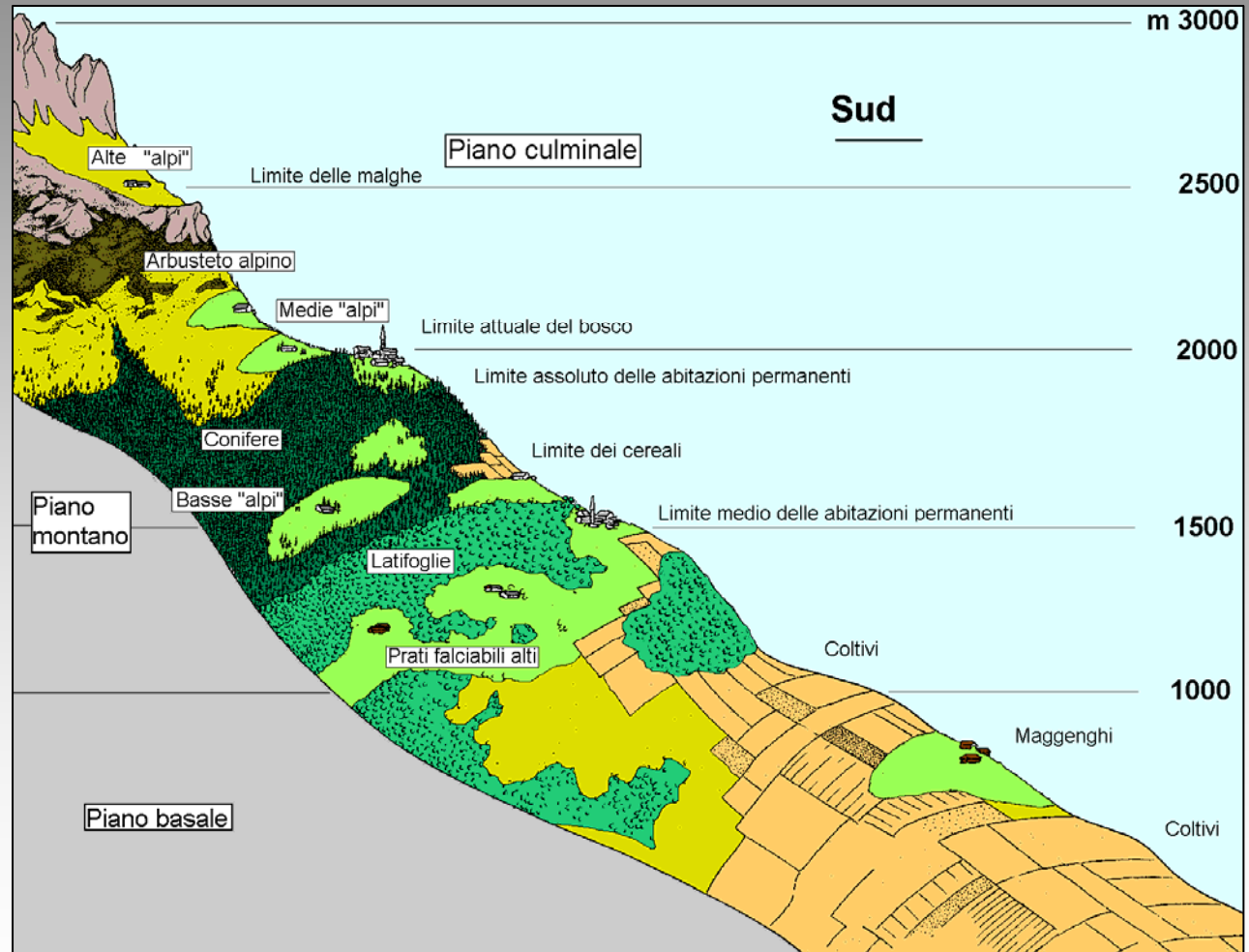
Percorrere un paesaggio di versante

Geomorfologia:
versante
crinale

Vegetazione:
di sostituzione
seminativi
prati
boschi
di latifoglie
di conifere
arbusteti
praterie
veg. rupicola

Antropizzazione:
agricoltura
alpicoltura

Limiti altitudinali



Negli ultimi 15 anni le foreste del Piemonte sono aumentate mediamente di circa 137000 ha

Circa 9133 ha anno⁻¹

Circa 25 ha giorno⁻¹

Circa 1.04 ha ora⁻¹

Circa 173 m² minuto⁻¹

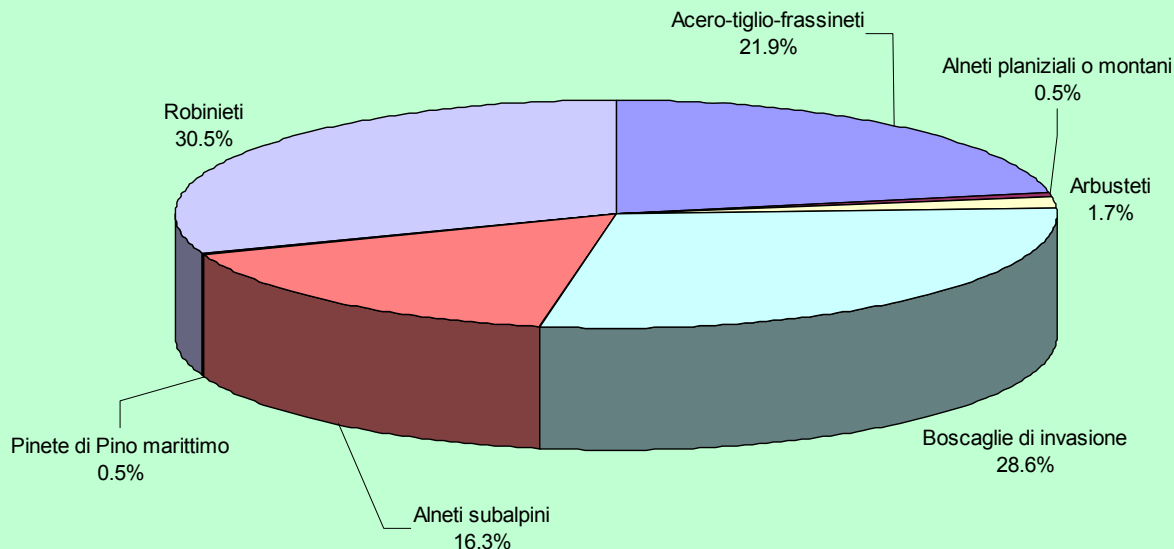
Nel corso della nostra lezione la superficie boscata del Piemonte è aumentata di più di 2 ha (3-4 campi di calcio)





Paesaggio: dinamismo dei boschi

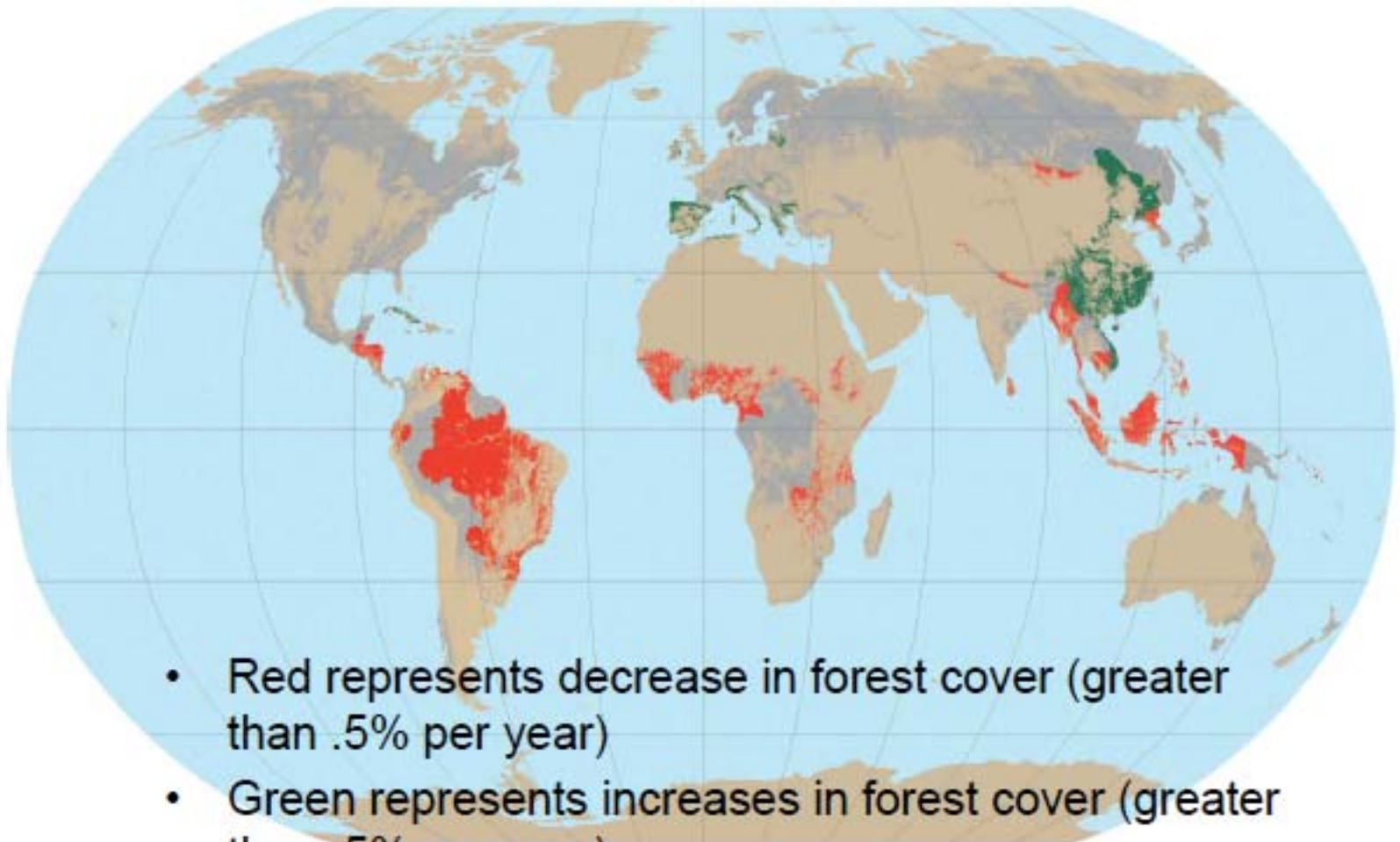
I boschi di neoformazione: ~ 137.000 ha in 15 anni



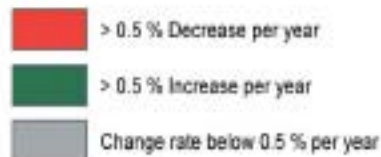
16%
dell'intera
superficie
forestale

Montagna	72%
Collina	16%
Pianura	12%





- Red represents decrease in forest cover (greater than .5% per year)
- Green represents increases in forest cover (greater than .5% per year)



Human land use has been an important driving force in shaping the landscape in the European Alps, and any understanding of the present vegetation in this region requires careful study of the impact and ongoing effects of human activities.



Forests have traditionally been exploited in multiple ways to maximize economic and social benefits: timber production has been combined with other functions such as protection (Motta and Haudemand 2001) and, most importantly, grazable forest land. Timber production and grazeable forestland have existed side by side for centuries, and only in recent decades have grazing areas been separated from forests where grazing is forbidden (Piussi and Farrell 2000).



In recent years, socioeconomic organization in the valleys and public attitudes towards the forest and forestry have changed dramatically, and the goals of forest management now extend far beyond those of the past to embrace the demand for new ecological and recreational functions (Dotta and Motta 2000).



At the same time, the need for a close-to-nature silviculture has arisen, with the aim of developing forest stands that are comparable to natural ones in so far as structure, composition, and regeneration processes are concerned (Wolinsky 1988; Çolak et al. 2003)



Human population in mountains

	Population ($\times 10^3$)	Percent of total	Density (per km^2)
Asia	597,714	49%	65.2
Former USSR	34,851	3%	6.4
South America	173,549	14%	37.7
North Africa	141,113	12%	52.3
Central Africa	119,559	10%	18.3
Europe	152,613	13%	43.1
Total	1,219,399	100%	38.2

World population 6 billion, so **global mountain population** (1.2 billion) is about **20%** of total global population.

Active management is decreasing:

Positive consequences:

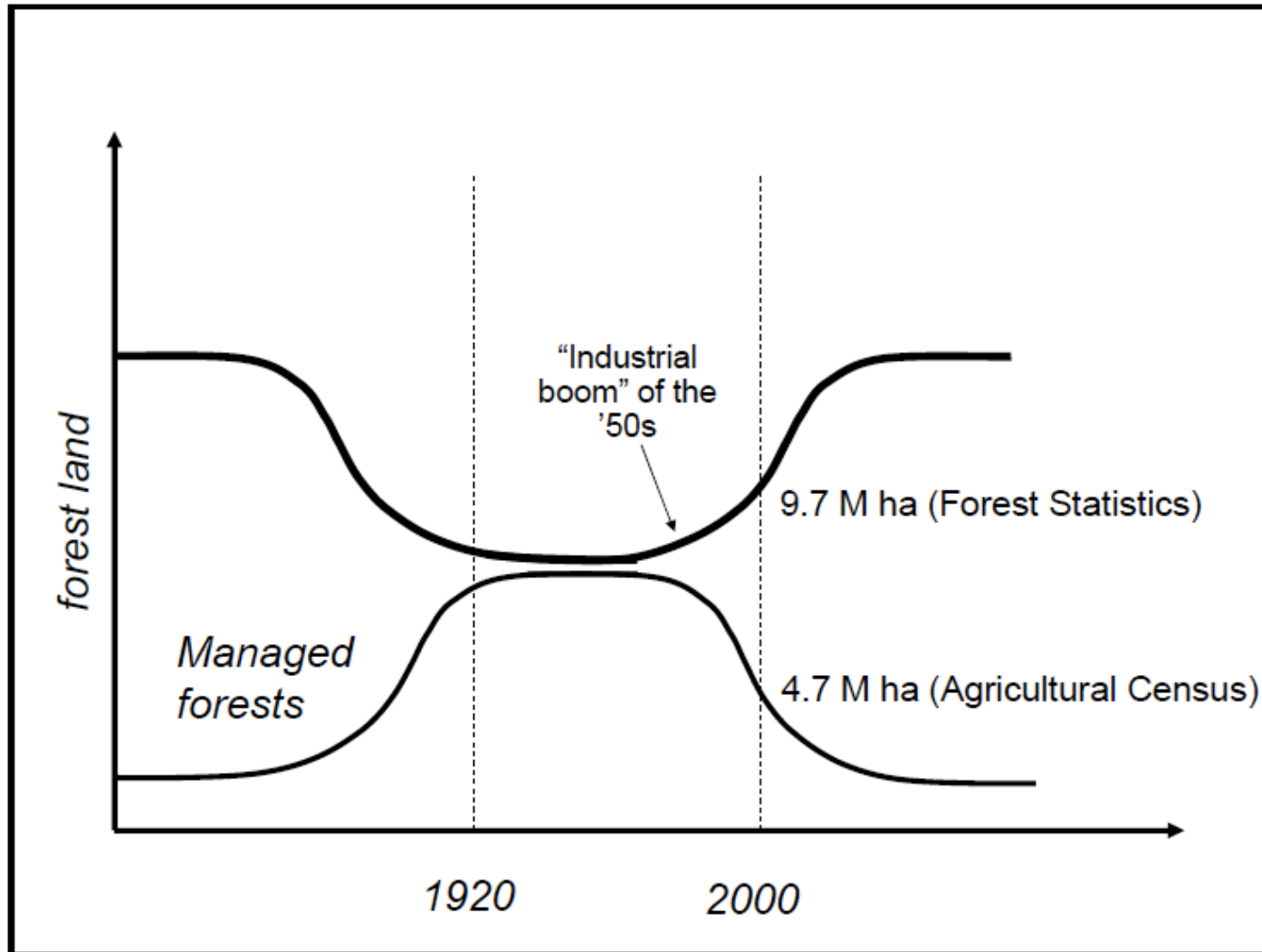
- increment of stocks
- Biodiversity and naturalness (CWD)
- Protective role of the forest cover (erosion but not FDP)

Negative consequences:

- increment of the forest fires (mainly not natural)

Homogeneous landscape (loss of cultural legacies and of cultural landscape)

- loss of potential wood production (renewable resource)



Pettenella,
2008

Cultural Landscapes have been defined by the World Heritage Committee as distinct geographical areas or properties uniquely "...represent[ing] the combined work of nature and of man.."

This concept has been adapted and developed within international heritage arenas as part of an international effort to reconcile "...one of the most pervasive dualisms in Western thought - that of nature and culture"

Pasture (natural)

Afforestation

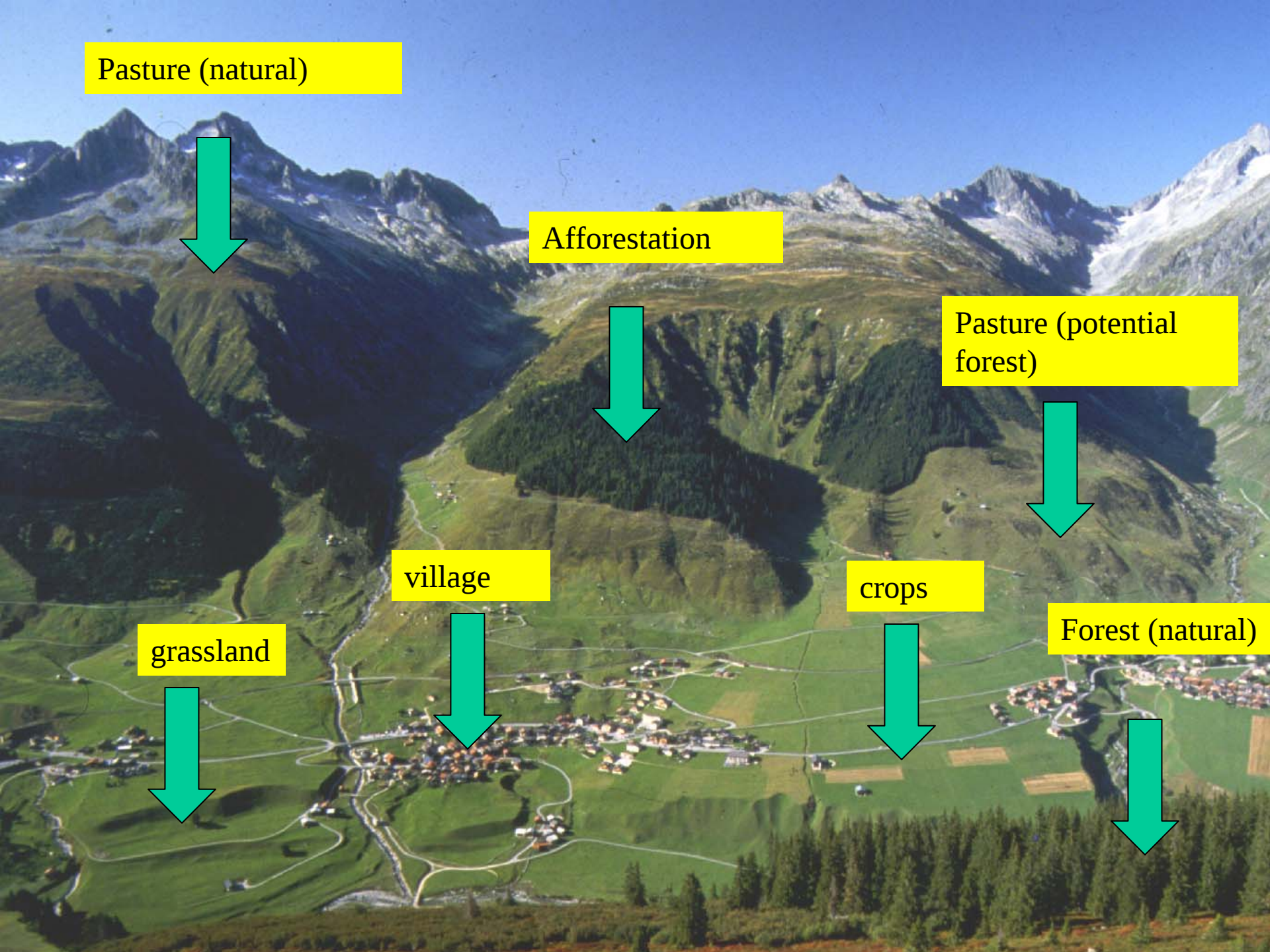
Pasture (potential forest)

village

crops

Forest (natural)

grassland





- The cultural landscape is dialectic between the natural landscape setting and human modification, constantly evolving over time.
- Virtually all landscapes have cultural associations, because virtually all landscapes have been affected in some way by human action or perception. The "cultural landscape" is a way of seeing landscapes that emphasizes the interaction between human beings and nature over.

Biodiversity and human disturbances

Biodiversità

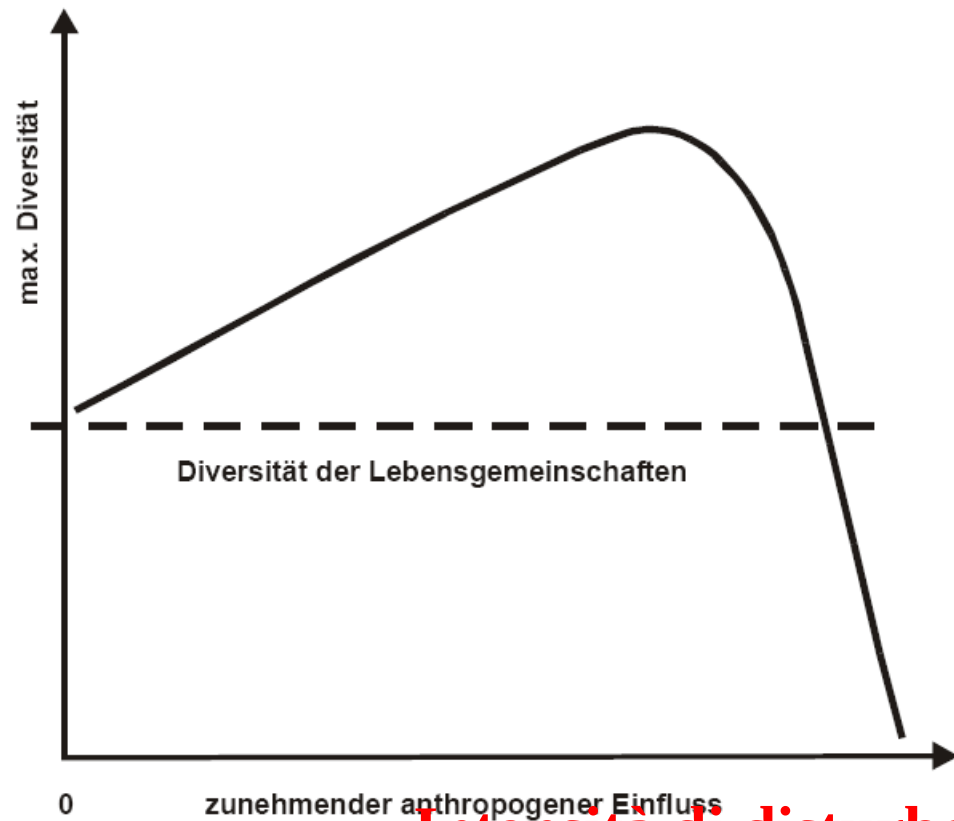


Abb. 2.12: Zusammenhang zwischen Bewirtschaftungsintensität im Wald und der Biodiversität

Nach Waldenspuhl (1991). In: Scherzinger (1996)

Intensità di disturbo antropico









Grazable forestland vs old-growth: > N° species



ECOSCIENCE

3154-Nascimbene

Proofs

15 (4): 1-xxxx (2008) Preprint web release / Parution Internet préimpression 2008-XX-XX

Influences of tree age and tree structure on the macrolichen *Letharia vulpina*: A case study in the Italian Alps¹

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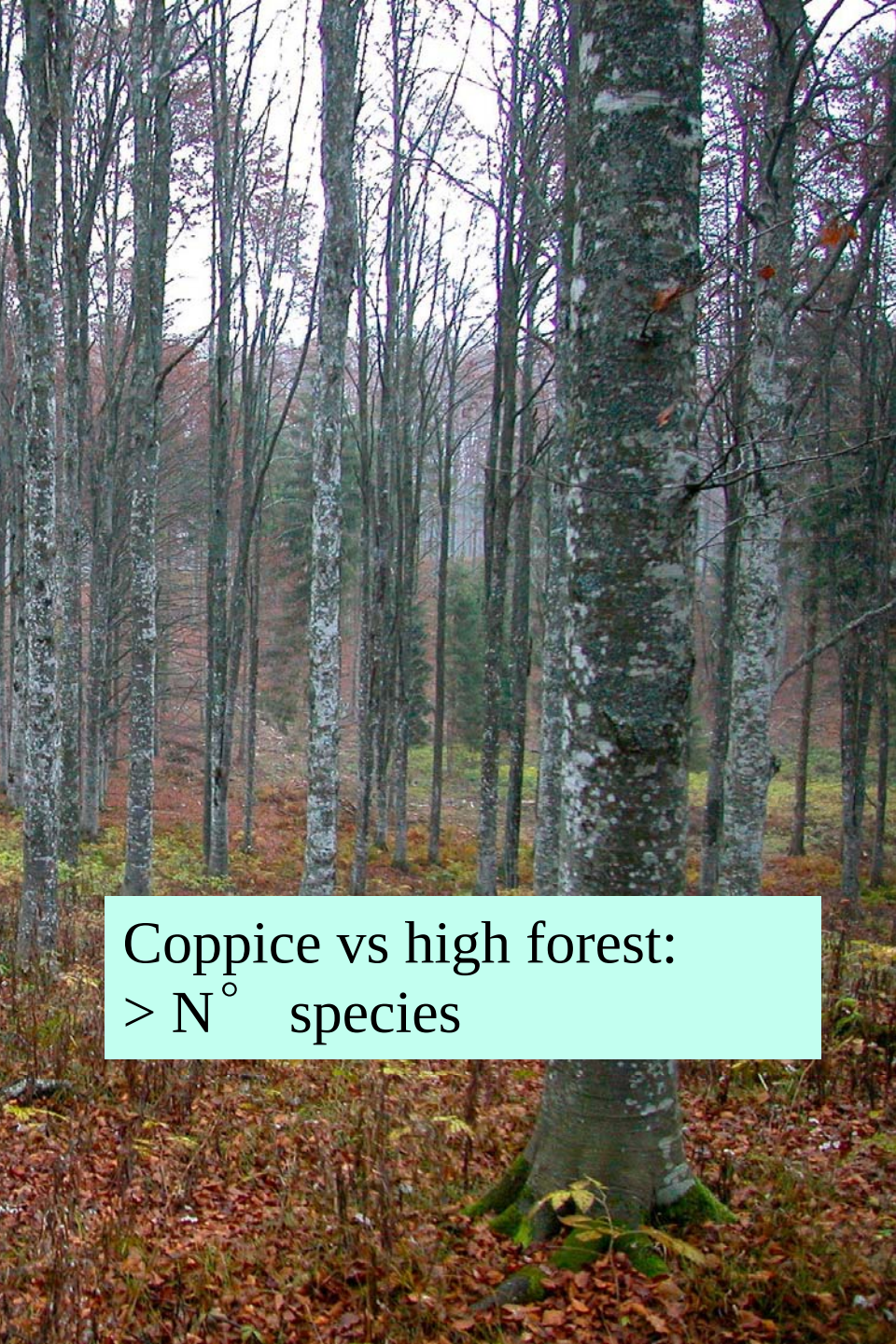
Renzo MOTTA, Department AGROSELVITER, University of Torino, Via Leonardo Da Vinci
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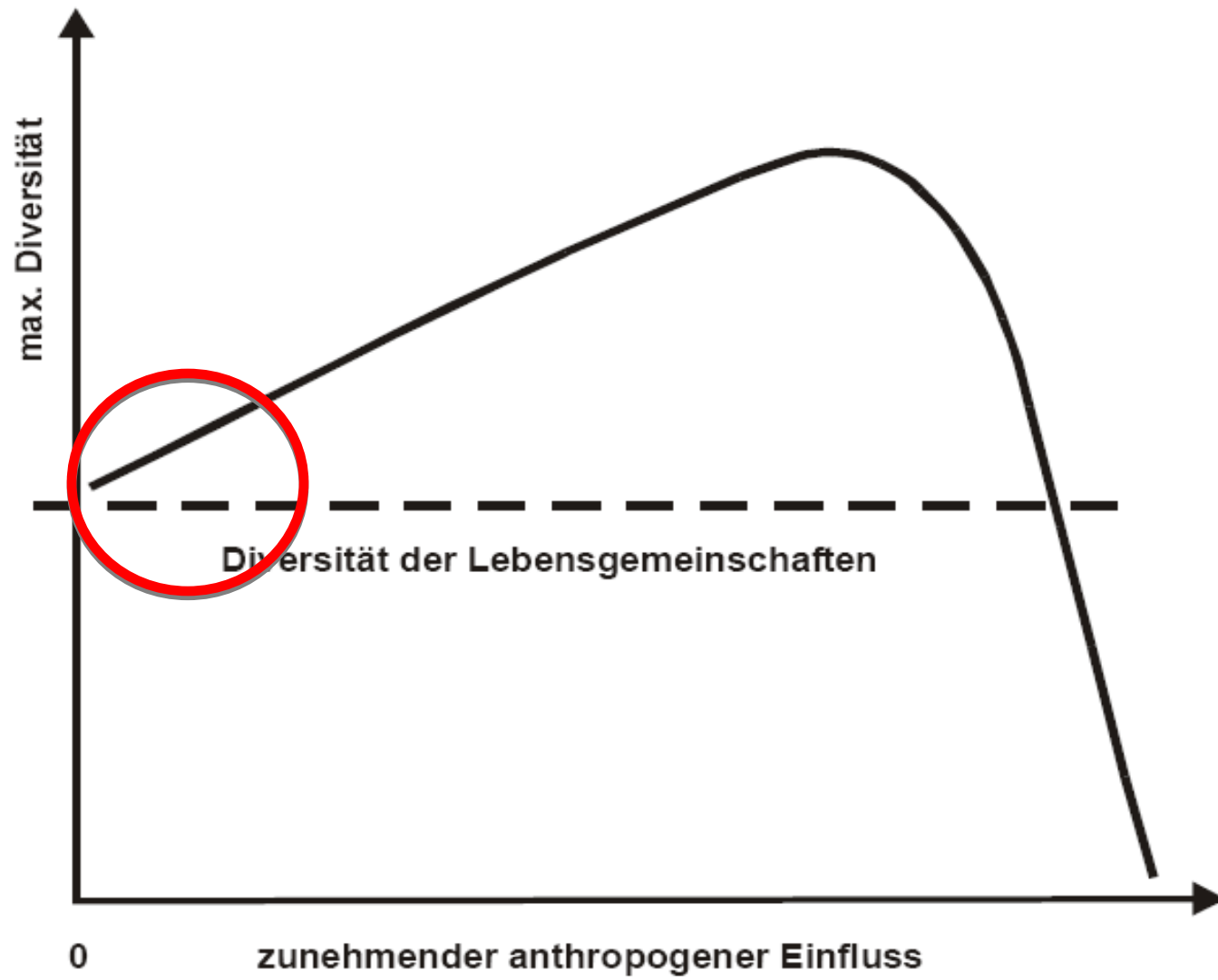
Shelterwood managed
forest vs old-growth:
> N° species



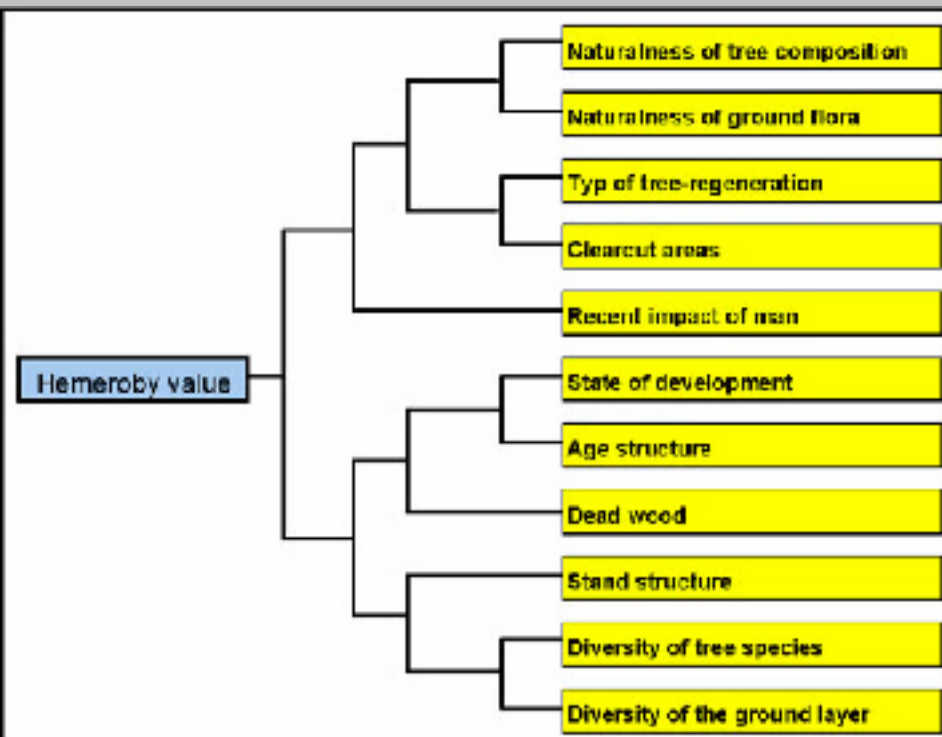


Coppice vs high forest:
> N° species





Hemeroby is "a measure for man's cultivation influence on ecosystems, whereas assessment of hemeroby level is carried out based on the extent of effects of those anthropogenic influences which affect the system's development towards a final state".



Flächenanteil der Naturnähestufen des österreichischen Waldes (Bezugsfläche 3,88 Mio. Hektar)

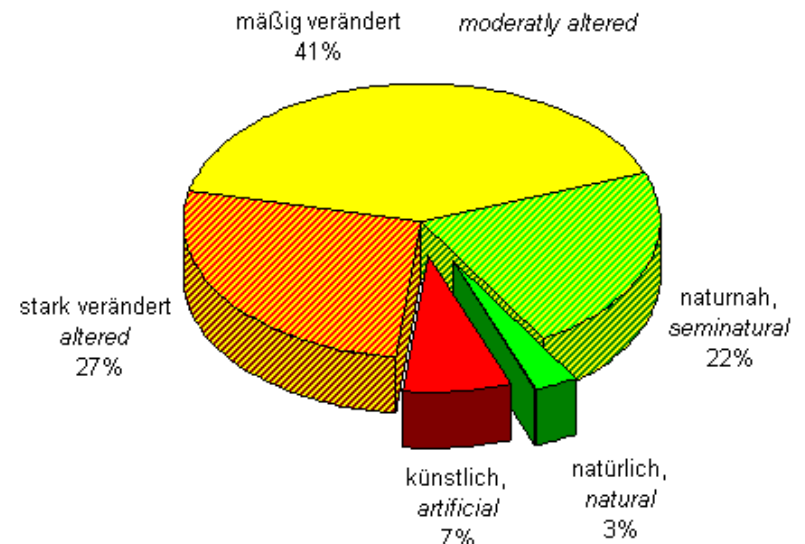


Table 1: Grades of hemeroby or naturalness (after GRABHERR et al. 1998, modified)

GRABHERR et al. 1997, 1998	HORNSTEIN 1950	DIERSCHKE 1984	ELLENBERG 1963	Examples from forests (following GRABHERR et al. 1998, modified)
9 (ahemerob)	Natural forest community	Natural	Virgin	Forests untouched by man, inaccessible sites; or previous impact completely historic; e.g., spruce forests and Pinus mugo-“Krummholz” on steep slopes in the Alps
8 (γ-oligohemerob)			Natural	
7 (β-oligohemerob)			Near-natural	
6 (α- oligohemerob)	Seminatural managed forest	Near-natural	(“naturnah”)	Forests with irregular, weak, selective use ; near-natural tree species composition; only minor modifications of ground vegetation and stand structures; absence of old stand phases (“decaying stage”); e.g., some spruce forests in the Alps.
5 (β-mesohemerob)			Relatively near-natural	
4 (α-mesohemerob)			Relatively unnatural	
3 (β-euhemerob)	Relatively unna- tural managed forest	Relatively un- natural (“Naturfern”)	(“naturfern”)	Moderately modified forests. Dominant and sub-dominant tree species of the potential natural vegetation occur, but with shifted proportions due to management (harvesting of trees, wood pasture). E.g., beech-fir-forests with >50 % spruce in the Alps
2 (α-euhemerob)	(“naturferne Waldbautypen”)		Relatively unnatural (“na- turfern”)	
1 (polyhemerob)	Artificial forest	Artificial („künstlich”)	Not natural	Strongly modified, intensively used forests with simple stand structure (evenaged forests); tree species of pnV only minor canopy component. In the ground vegetation, many species from openland (ruderals, weeds) can be found, or even complete absence of ground vegetation due to lack of light. Example: stand with canopy formed by spruce or even exotic species (only few deciduous native species) in beech climate.
			Artificial (“künstlich”)	

Hemerobiekarte

Der Hemerobiewert eines Stratums ergibt sich aus dem Median aller Probeflächen in diesem Stratum.

- künstlich (alpha-euhemerob)
- stark verändert (beta-euhemerob)
- stark verändert (alpha-mesohemerob)
- mäßig verändert (beta-mesohemerob)
- mäßig verändert (alpha-oligohemerob)
- naturnah (beta-oligohemerob)
- naturnah (gamma-oligohemerob)
- natürlich (ahemerob)

- Stratum ohne WI-Trakt
- waldfrei

