



Rome, 23rd June 2011
Parallel Session

Present and future role of forest resources in the socio-economic development of rural areas

Parallel Session 1

Forests, conservation of biodiversity, landscape protection and public services.

Development of a European forest biodiversity status indicator

Bruno Petriccione, Ph.D.



**SEBI
2010**



***Corpo Forestale dello Stato
(National Forest Service)***

U.T.B. L'Aquila (Italy)

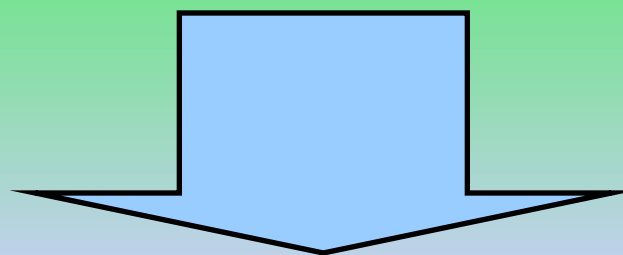
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***UN Convention on
Biological
Diversity***

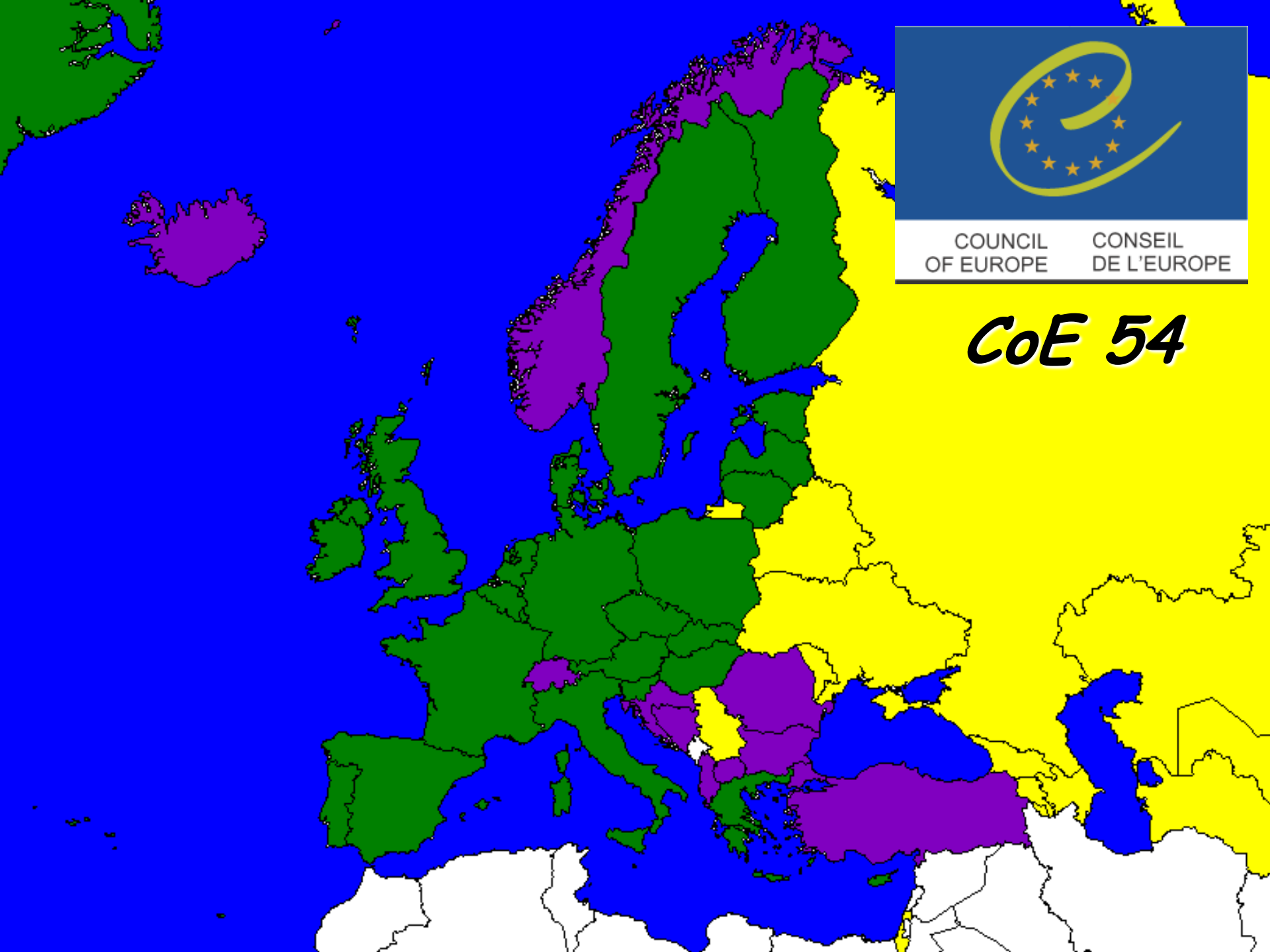
COUNTDOWN
2010

Halt the loss of biodiversity



***EEA/UNEP/ECNC SEBI2010 initiative
(Streamlining European 2010 Biodiversity Indicators)***

ICP Forests represented by the Italian Forest Service



COUNCIL OF EUROPE CONSEIL DE L'EUROPE

CoE 54



Communication from the Commission

COM(2006)216 final

Brussels, 22.05.2006 SEC (2006)216

Biodiversity Headline Indicators (Annex 2)

- Trends in abundance and distribution of selected species
- Change in status of threatened and/or protected species
- **Trends in extent of selected biomes, ecosystems and habitats – SEBI2010 work**
- Trends in genetic diversity of domesticated animals, cultivated plants and fish species of major socio-economic importance
- Coverage of protected areas
- Nitrogen deposition
- Number and costs of invasive alien species
- Water quality in aquatic ecosystems
- Impact of climate change on biodiversity
- Marine trophic index
- Connectivity fragmentation of ecosystems
- Area of forest, agricultural, fishery and aquaculture ecosystems under sustainable development
- Ecological footprint
- Percentage of European patent applications for inventions based on genetic resources
- Funding to biodiversity
- Public awareness and participation

SEBI2010 indicators

CBD focal	EU Headline Indicators	Specific indicator proposed	Category	Delivery of indicator		Delivery of documentation				
			A,B,C	2005	2006	2005	ASAP/2006	2006/7		
Status and trends of the comp	Trends in the abundance and distribution of selected species	Pan-European Common Bird Index	A	Available		Available				
		European Butterflies	A	Grasslands available		Available				
		Freshwater fish and lampreys	C		Develop	Draft		X		
		Seabirds	C		Develop	Draft		X		
		Waterbirds	B		Finalise	Draft	X			
		Marine fish		PARAMETERS (REAL DATA): ✓ Tree condition ✓ Plant species composition and coverage ✓ Deadwood amount and type ✓ Forest structure ✓ Naturalness level ✓ Conservation status of forests in Natura2000 sites						
		Dragonflies								
		Cetaceans, seals								
		Large carnivores								
		Large herbivores								
		Bats								
		Amphibians								
		Plants								
	Change in status of threatened and/or protected species	IUCN Red List Index for E								
		Pan-European Threatened								
		Change in status of species of European interest	C		Develop	Draft		X		
		Endemic species	C		Develop			X		
	Trends in extent of selected biomes, ecosystems and habitats	Trends in extent and composition of selected ecosystems in Europe	B	Available		Draft	X			
		Status and trends of forest ecosystems	C		Develop	Draft				
		Trends in extent of wetlands	C	Draft	Develop			X		
Trends in extent and integrity of peatland		C	Draft	Develop			X			
Trends in extent of tundra habitats (Shrub, freshwater, tree- line)		C	Draft	Develop	Draft		X			
Dynamic of glaciers		C	Draft	Finalise	Draft		X			
Sea-Ice extent in Arctic		C	Available	Finalise	Draft		X			
Change in area of snowbed communities in mountain alpine zone		C	Draft	Finalise	Draft					
							X			
		Position of tree-line	C		Develop			X		

Development of a Forest Status Indicator (status and trend of forest ecosystem)

A pilot project under the responsibility of the
Italian Forest Service,

in collaboration with PCC of ICP Forests,
funded by EEA, in the SEBI2010 framework
final report published (EC CHM web site)





**CORPO FORESTALE DELLO STATO
ITALIAN NATIONAL FOREST SERVICE**

ISPETTORATO GENERALE

Servizio II - Divisione VI - Ufficio CONECOFOR

***SEBI2010* special ad hoc project**

**Development and harmonization of a
*Forest Status Indicator (FSI)***

EEA Contract no. 3603/B2006/EEA.52678 (06/10/2006)

Technical report

prepared by:

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Final version – Roma, 04/06/2007

Final Technical Report

**published on
EC web site
Clearing House
Mechanism**

**[http://biodiversity-
chm.eea.europa.eu](http://biodiversity-chm.eea.europa.eu)**

**Petriccione B., Cindolo C.,
Cocciufa C., Ferlazzo S.,
Parisi G., 2007**

WORK DONE

- Detailed collection of available meta-data and harmonised methods (EU Forest Focus & UN/ECE ICPs, National Forest Inventories, Natura2000 National Reports, MCPFE Reports, etc.);
- Co-ordination of FSI sub-indicators with similar sub-indicators in progressive development by SEBI2010 EG6 (Sustainable use...): naturalness, deadwood, forest health, etc.
- Synthesis and interpretation of the FSI sub-indicators.
- Combination of FSI with headline indicator *Trend in extent and composition of selected ecosystems.*

Development of a Forest Status Indicator

(status and trend of forest ecosystem)

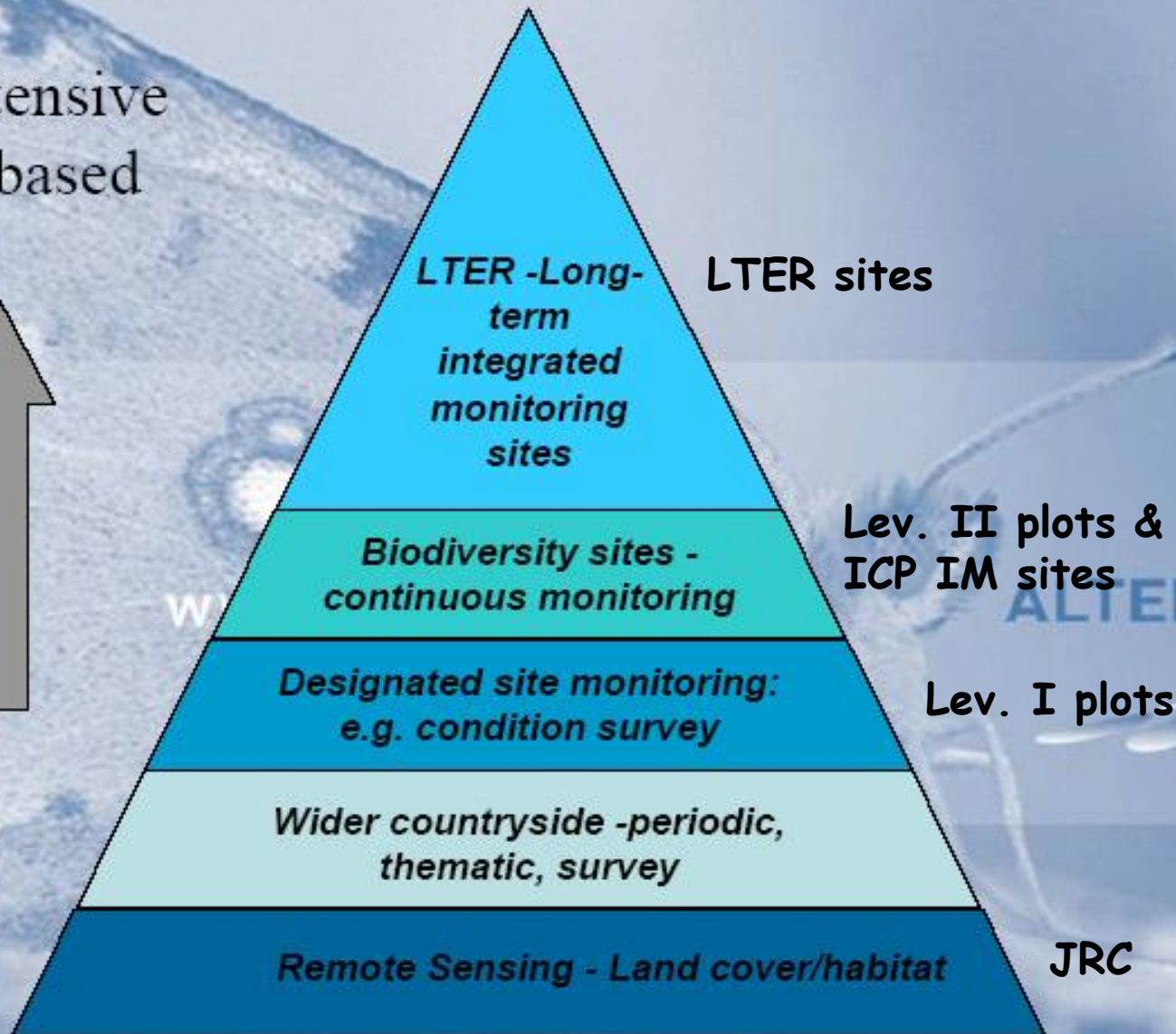
- ✓ Tree condition
- ✓ Plant species composition and coverage
- ✓ Deadwood amount and type
- ✓ Forest structure
- ✓ Naturalness level
- ✓ Protected forests
- ✓ Conservation status of forests in the 2000 sites



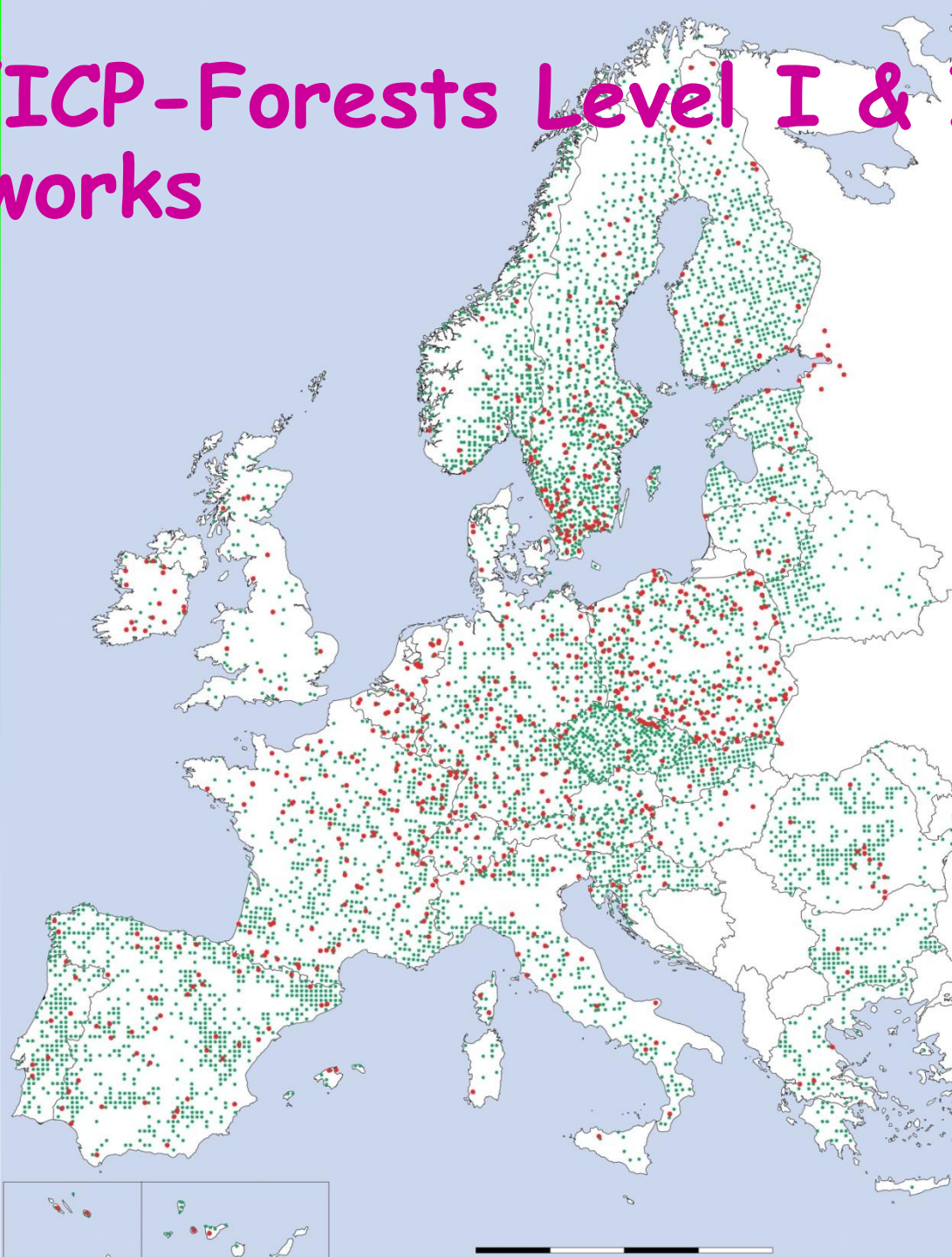
**EU Forest
Focus,
ForestBIOTA &
BioSoil data**

BIODIVERSITY research & monitoring levels

More intensive
Process based



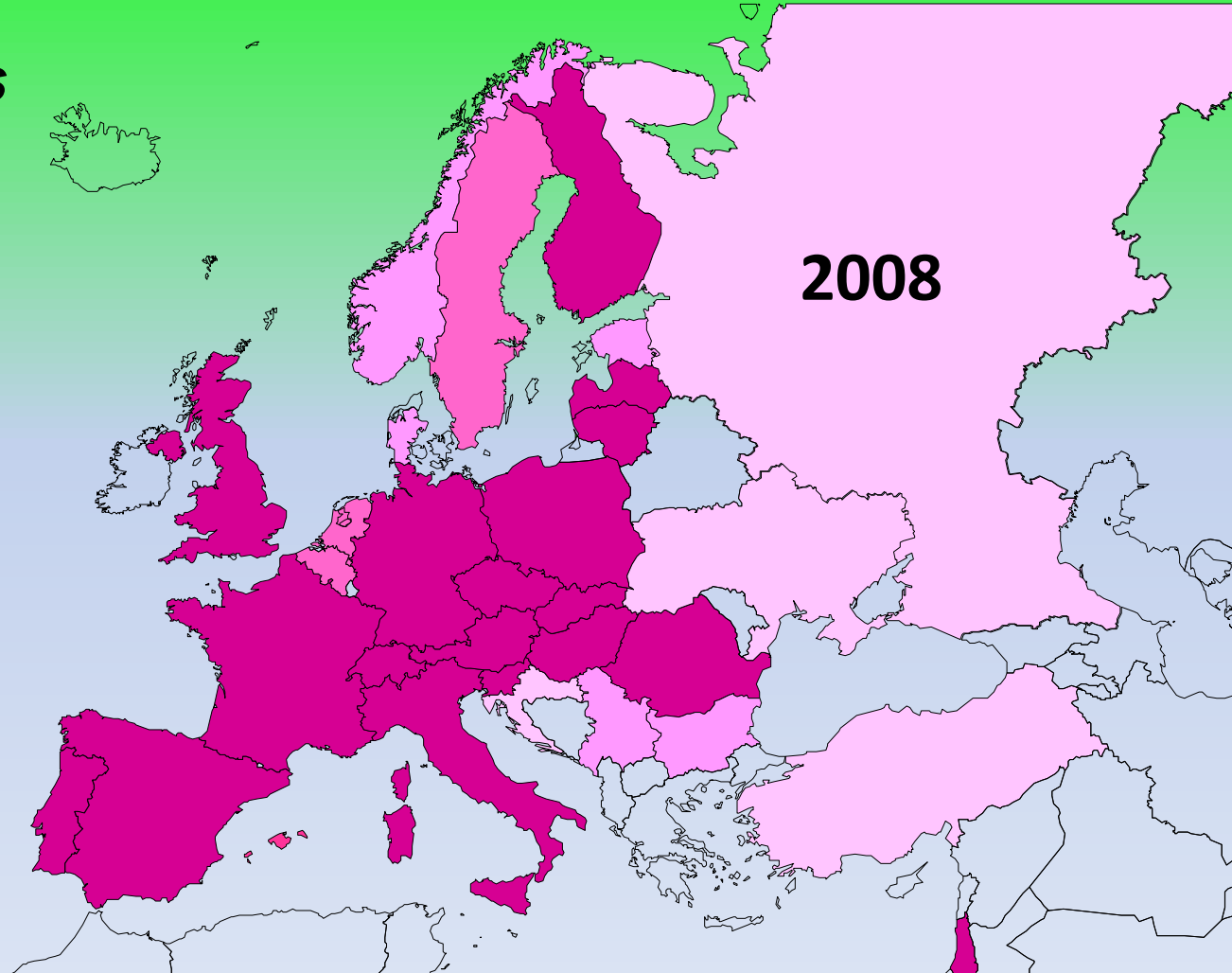
EU/ICP-Forests Level I & II networks



LTER Europe (2008)

18 Member States

<u>Lobbying initiated</u>
<u>Discussion started</u>
First <u>concepts</u>
Network <u>implementation</u>
Formal ILTER <u>member</u>





NATURA 2000 forest sites

A number of sites are included
in Lev. I and Lev. II plots,
up to 20% (Lev. I),
70% (Lev. II)
and 100% (LTER sites),
partly overlapping in some Countries !

MAIN PARAMETERS ASSESSED (1)

- **Tree condition**: % of trees considered as “damaged” (damage classes 2-4).
- **Forest structure**: values of indices of structural diversity (grouped in horizontal, vertical, size and complexity types).
- **Deadwood amount and type**: volume and decay state of dead downed trees, lying coarse and fine wood pieces, stumps and standing deadwood.

MAIN PARAMETERS ASSESSED (2)

- **Vascular plant species composition**: total no. of vascular plant species (community level) and related biodiversity indices.
- **Tree species composition**: total no. of tree species (stand level).

MAIN PARAMETERS ASSESSED (3)

- **Conservation status of forests included into Natura2000 sites:** according to the EU classification system (EEC Directive no. 92/43).
- **Naturalness:** level, as *distance* between current and potential level (reference stand)

Plantations of not-native species: min value

Old-growth forests: max value

Halting the loss of biodiversity by 2010:
proposal for a first set of indicators to monitor progress in Europe

SEBI2010 Technical Report 2007

26 operative indicators



European Environment Agency



http://reports.eea.europa.eu/technical_report_2007_11

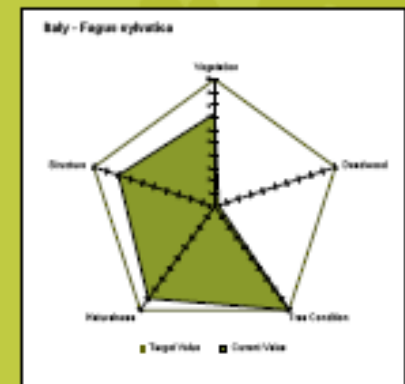
Towards a European Forest Status Indicator

The proposed European 'Forest Status Indicator (FSI)' can provide information to decision makers on forest condition (changes in quality, functionality and integrity of forest ecosystems) including progress towards halting the loss of forest biodiversity.

FSI comprise a number of indicator elements: forest structure, deadwood, crown condition, vegetation and naturalness. The indicator is proposed to be presented as a 'spider diagrams' showing the values at different times of the different elements put in relation to target values.

The data for the indicator can be provided by forest monitoring networks in Europe:

National Forest Inventories, ICP Forests and ICP Integrated Monitoring plot networks, European Long Term Ecological Research plots etc. A planned project 'Future forest biodiversity monitoring in Europe (FuDiv)' will ensure a coordinated European dataflow for the Forest Status Indicator.



Rete Nazionale Integrata

**CON.
ECO.
FOR.**
 Controllo Ecosistemi Forestali

European Forest
ICP Co-ordinating
network

Forest Protection,
National Forest Service, Italy
enrnet@ipf.italia.it

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<http://biodiversity-chm.eea.europa.eu>

TREE CONDITION



VEGETATION



STRUCTURE



NATURALNESS

DEADWOOD



1 – vegetation

15 SIC (Ficuzza) m. 940, 20° NE TQ1 species: 81 (82)

SUBPLOT NO.	11	12	13	14	15	21	22	23	24	25	31	32	33	34	35	41	42	43	44	45	51	52	53	54	55	aver.	pres.	frequ.	REF.
SPECIES NUMBER	36	32	29	30	25	38	29	28	26	30	31	40	34	31	38	24	26	27	36	36	25	36	25	44	35	32		%	48
SHREDSSEN INDEX (%)																										0			100
TREELAYER (%)	70	70	70	80	70	70	75	75	70	70	70	75	70	75	70	70	75	75	70	70	75	70	60	70	71			70	
Quercus cerris (= gussonei)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	25	100	4
SHRUB LAYER (%)	50	40	30	25	60	70	40	60	20	30	30	20	40	60	40	50	30	40	50	40	20	60	50	40	30	41			40
Rubus ulmifolius	2	2	2	1	3	3	2	3	1	2	2	+	2	2	2	3	1	2	2	2	1	2	2	2	1	2	25	100	2
Ruscus aculeatus	2	1	1	1	1	1	2	2	+	+	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	25	100	1
Prunus spinosa			+	+	+	1		+										+		+	+	+	+	1	+	+	12	48	+
Rosa sempervirens	+	+	+		+				1		+					+			1	1		+	+	+	+	+	12	48	+
Acer campestre	+		+	+	1	1																				+	6	24	+
Cytisus villosus				1								1								+	1			+		1	5	20	
Crataegus oxyacantha		+	+																	+	+		+			+	5	20	
Quercus cerris (= gussonei)							+	+	+					+											+	+	5	20	
Fraxinus ornus	+																								+	+	2	8	
LIANOUS LAYER (%)	5	2	2	2	2	2	2	2	2	3	1		2	1	1	2	2	5	2	5	5	3	2		2			5	
Tamus communis	1	1	1	1	+	+	+	1	+	+	+		+	+	+	1	1	+	+	+	1	+	1	+	+	+	23	92	+
Hedera helix	1	+	+	+	+	+	+	+	1	1	+		1	1			1	1	1	1	1	1	1	1		1	21	84	1
Clematis vitalba					+						+											+				+	3	12	
HERB LAYER (%)	70	85	80	80	50	40	60	40	90	70	50	80	70	60	70	60	90	80	60	70	70	90	80	80	80	70			80
Lamium flexuosum	2	3	3	3	2	2	2	2	3	3	+	+	1	1	3	3	1	3	1	+	1	3	3	+	1	2	25	100	2
Paeonia mascula ssp. russii	1	1	1	1	1	1	+	+	1	1	+	+	+	+	1	1	+	1	1	+	+	+	1	+	+	1	25	100	+
Cyclamen hederifolium	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	25	100	+
Cyclamen repandum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	25	100	+
Euphorbia amygdaloides ssp. arbuscu	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1	+	+	+	25	100	+
Smyrnium perfoliatum	+	+	+	1	+	+	+	+	+	+	+	+	+	+	+	1	1	+	+	+	+	+	+	+	+	+	24	96	+
Thalictrum calabricum	+	+	+	+	+	+	+		+	+	1	1	+	+	+	+	+	+	+	1	1	+	1	1	+	+	24	96	+
Geum urbanum	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23	92	+
Polysticum aculeatum	+	+	+	+	+		+	+	+			+	+	+	+	+	+	+	+	+	1	+	+	+	+	+	21	84	+
Asplenium oopteris	+	+		+	+	+	+					+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20	80	+
Hedera helix	+	+		+	+	+	+	+				+	+		+	+	+	+	+	+	+	+	+	+	+	+	20	80	+
Orobanche lavandulacea	+	+	+	+	+	+	+				+	+	+	+				+	+		+	+	+	+	+	+	20	80	+
Silene dioica	1	+	+	+	+	+	+	+	+			+	+	+	+			+	+	+		+		+	+	+	20	80	+
Festuca drymeia	1	+	1	+	+	+	+	+	+	+	+	+	+	+	+						+				+	+	18	72	
Tamus communis			+	+	+		+	+	+			+	+			+	+		+	+	+	+	+	+	+	+	18	72	+
Vicia lutea	+		+	+		+		+	+	+	+	1	1		+					+		+	+	+	1	+	16	64	+
Geranium sanguineum	+	+	+			+	+	1	+	+	1	2	2	2							3	3			+	1	15	60	+

2 – stand structure

PLOT	SPECIES DIVERSITY			HORIZONTAL DIVERSITY		SIZE DIVERSITY		VERTICAL DIVERSITY		COMPLEXITY
	<i>no.</i>	<i>H</i>	<i>Si</i>	<i>Cox</i>	<i>Pielou</i>	<i>SD</i>	<i>CV</i>	<i>VE</i>	<i>A</i>	<i>HC</i>
ABR1	1	0,00	0,00	2,28	0,84	12,2	59,9	0,92	1,08	8,87
CAL1	2	0,17	0,05	1,01	0,90	19,3	56,8	0,99	1,06	7,59
FRI2	2	0,21	0,06	0,41	0,84	9,5	27,6	0,96	0,61	18,34
LOM1	9	2,01	0,66			13,6	77,8	0,98	2,33	98,56
TRE1	2	0,08	0,02	0,41	0,56	14,5	36,9	0,94	0,78	12,91
SIC1	3	0,22	0,06	1,09	0,86	3,9	20,4	0,80	0,73	39,75
SAR1	5	1,13	0,37			9,4	64,1	0,98	1,68	57,88
TOS1	13	2,15	0,70			7,3	71,3	0,77	2,21	124,88

Cox = var. / average

$A = \sum_s \sum_h (\pi_i \cdot \ln \pi_i)$

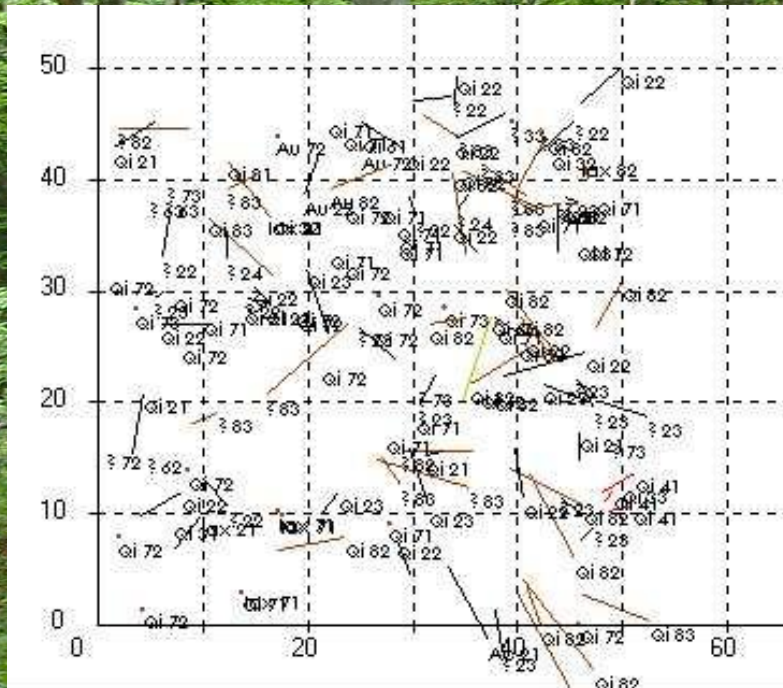
$Pielou = \pi \cdot (N/A \cdot 1/K) \cdot \sum r_i^2$

$HC = H \cdot BA \cdot n \cdot N$

$VE = \sum ((-\log_2 Ni) \cdot Ni / \log 3)$

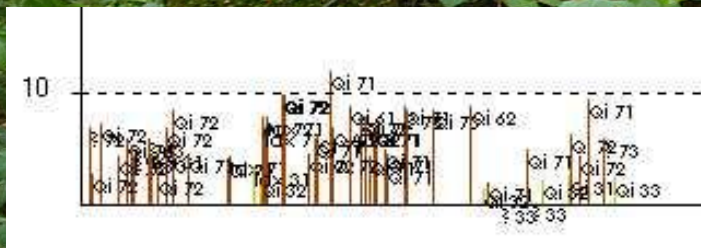
Amorini & Fabbio (Istituto Sperimentale per la Selvicoltura)

3 – deadwood



- **Localisation**
- **Volume calculation**
- **Decay assessment**

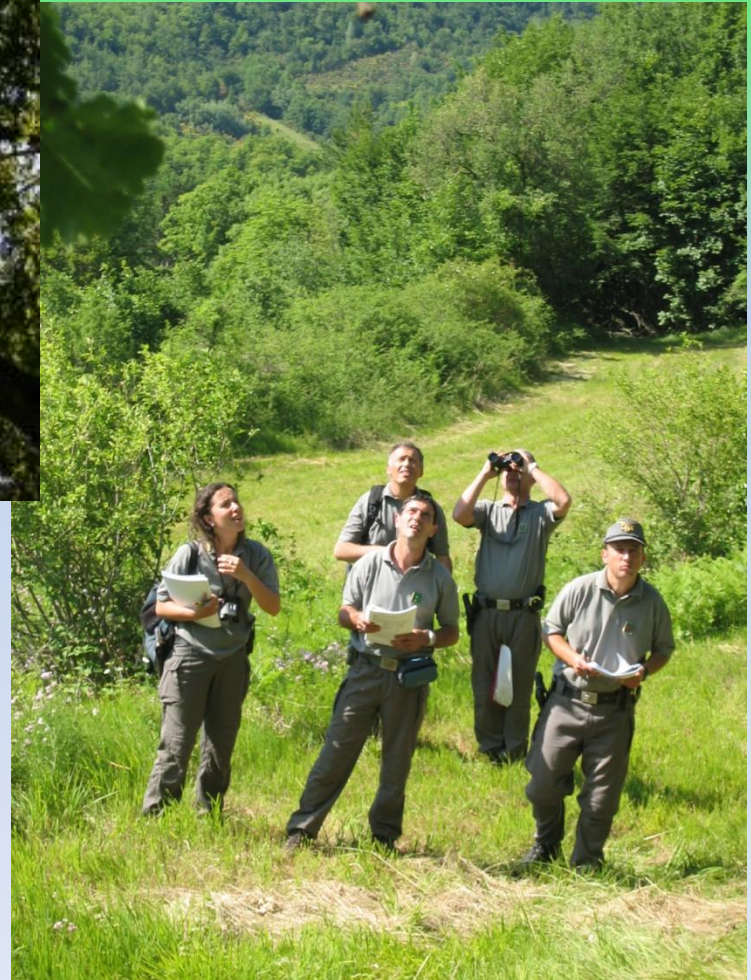
- ✓ **Dead downed trees**
- ✓ **Lying coarse wood pieces**
- ✓ **Lying fine wood pieces**
- ✓ **Stumps**
- ✓ **Standing deadwood**
- ✓ **Accumulation**



4 – tree condition



**Key indicator:
Defoliation/
transparency %**





30%

46

Defogliazione (%)



55%

47

Defogliazione (%)



0%

36

Defogliazione (%)



60%

37

Defogliazione (%)

5 – naturalness

A new methodology for a fast assessment at stand level:

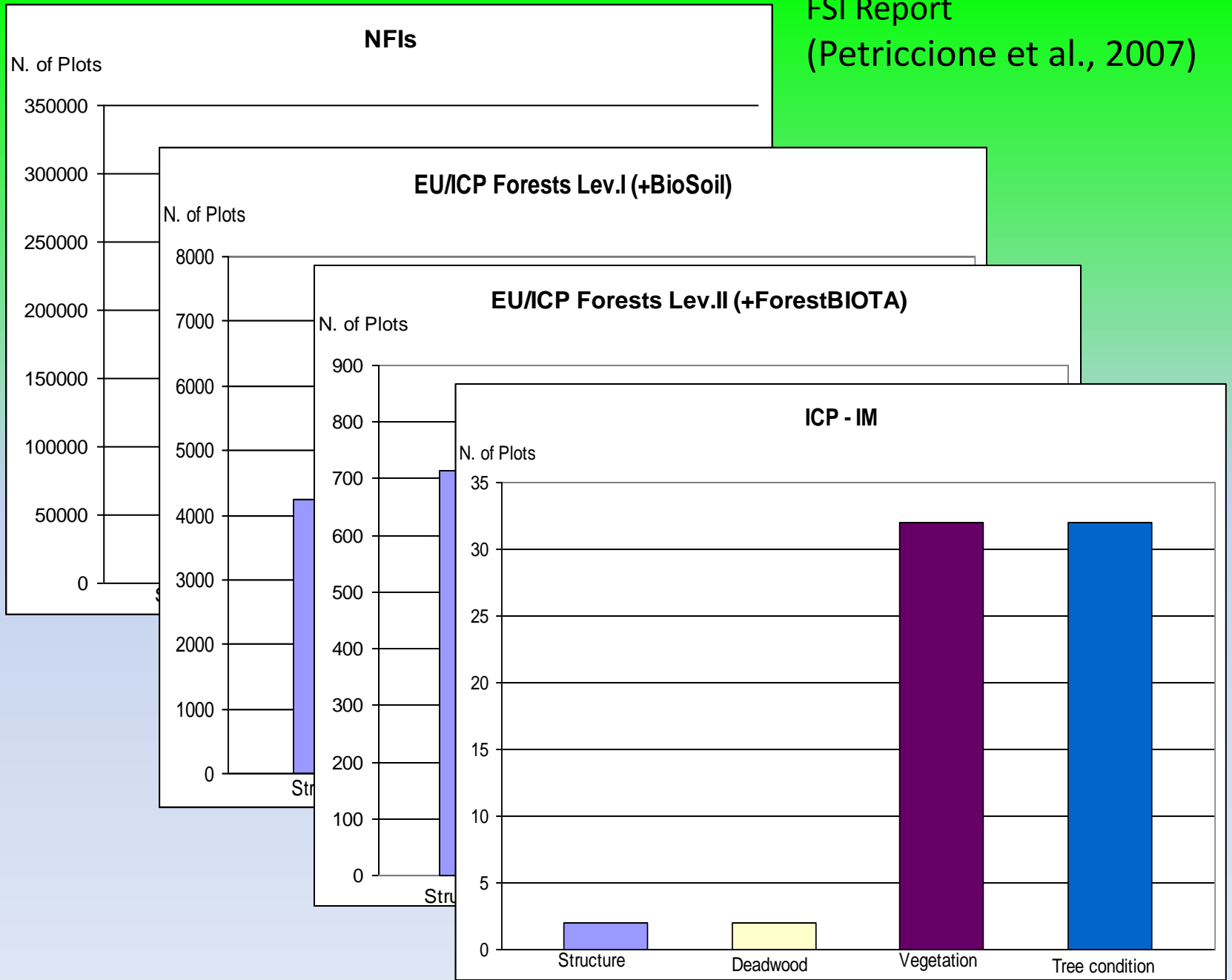
- ✓ *comparison of real and potential vegetation type;*
- ✓ *species composition: native from the stand or not*
- ✓ *comparison with comparable nearest stand undisturbed;*
- ✓ *naturalness indexes survey in the field*

Vegetation naturalness %

Species diversity ($H, H/H_{max}$)

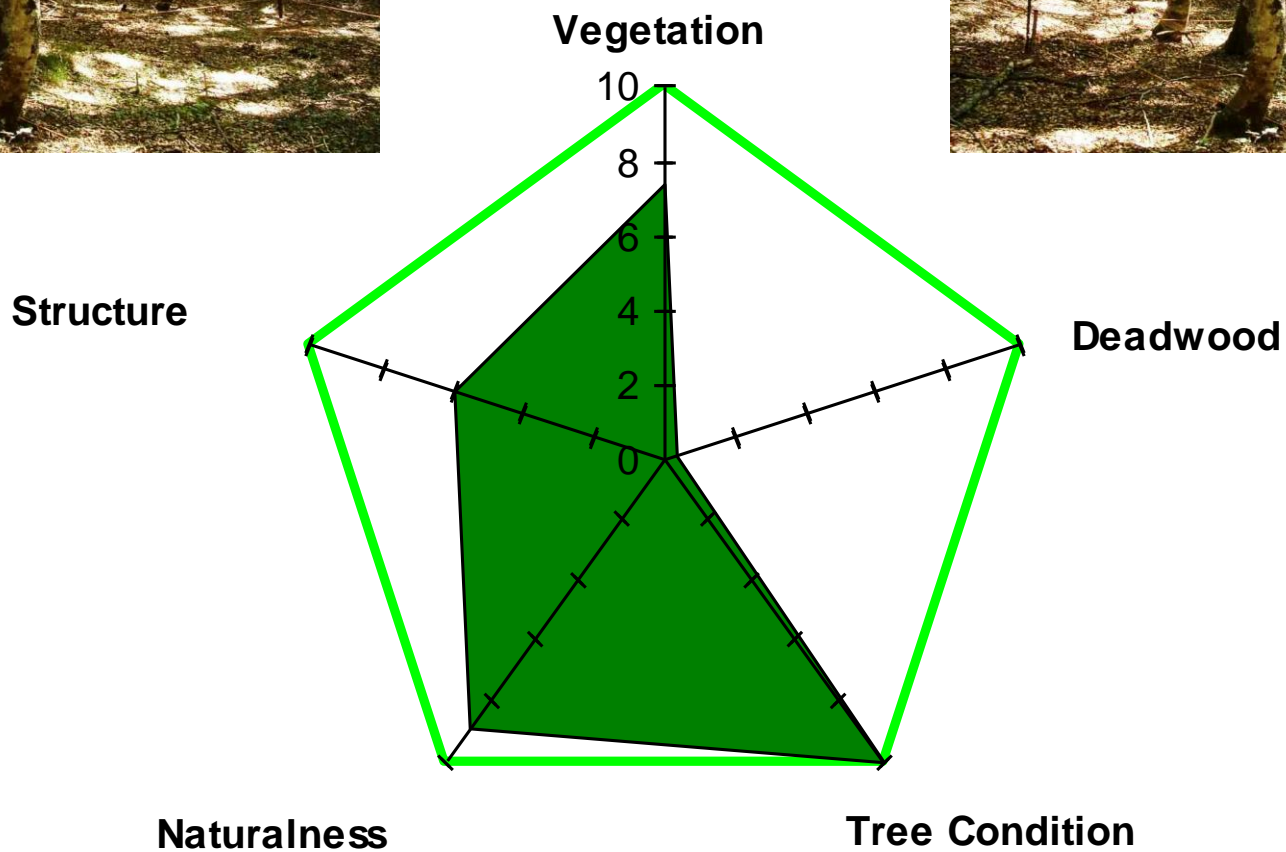
Chorotypes choerence

Native species %





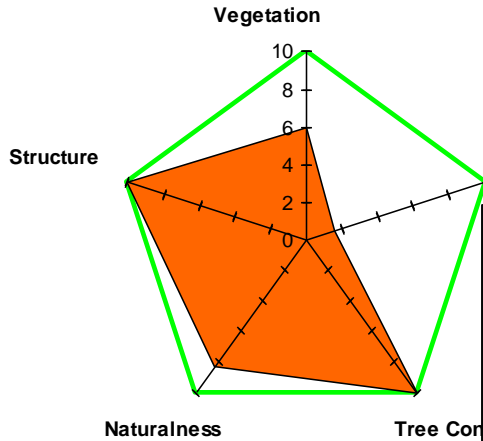
Italy - *Fagus sylvatica*



■ Target Value ■ Current Value

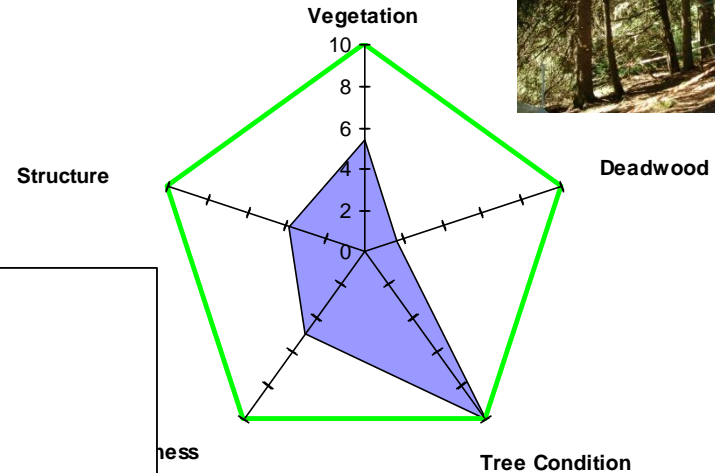
An example of the output..

Italy - *Quercus ilex*



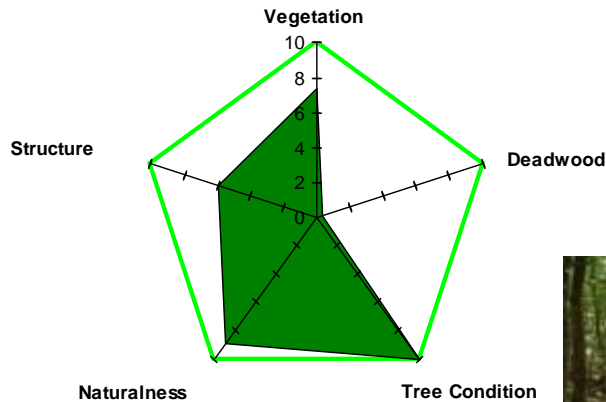
Deadwood

Italy - *Picea abies*



Deadwood

Italy - *Fagus sylvatica*



Deadwood

Tree Condition

Target Value Current Value



Current value Target value

An other example of the output...

