Biodiversità negli ecosistemi forestali: dalla valutazione al ruolo della gestione attiva

Pian Cansiglio , 25.06.2019

Emanuele Lingua
Claudio Betetto
TESAF

Biodiversità

Gestione selvicolturale

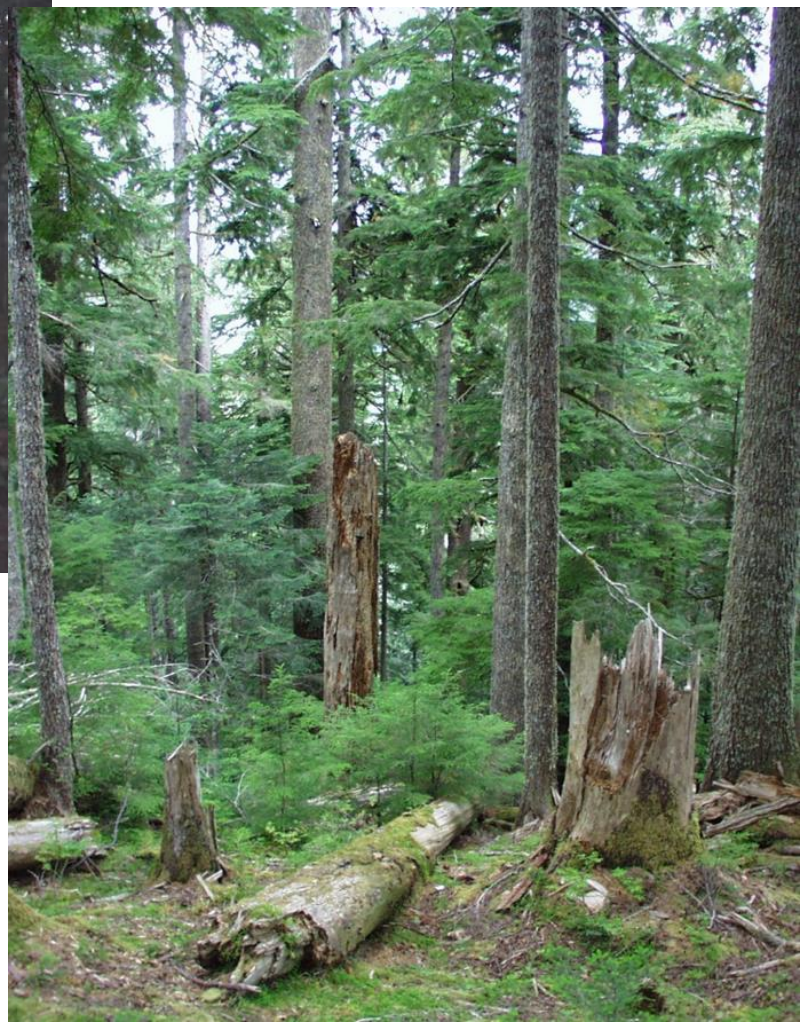
Valutazione

Obiettivo

Individuare indicatori **semplici** che descrivano il livello di biodiversità dei popolamenti forestali.

Proporre **interventi selvicolturali** idonei a **massimizzare e/o mantenere** i valori di biodiversità nelle foreste gestite.

Diversità strutturale



Con il termine **biodiversità** si intendeva descrivere principalmente la diversità a livello di geni, specie ed ecosistema; tale concetto è poi stato esteso ad includere la **diversità strutturale** e di **processi** (Franklin 1988, Franklin et al. 1989).

Diversità strutturale

Distribuzione spaziale

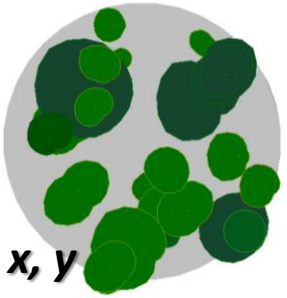
Diversità specifica

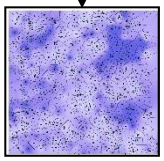
Variazioni dimensioni

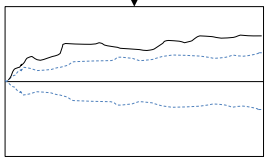
STRUTTURA FORESTALE

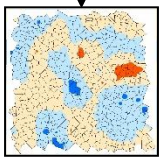
Indici *distance-independent*
Descrivono la struttura a livello di popolamento

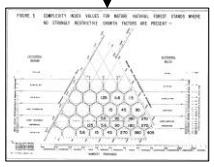
Indici *distance-dependent*
Descrivono la struttura a livello di singolo albero

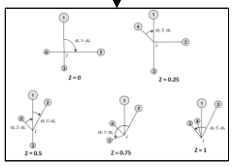












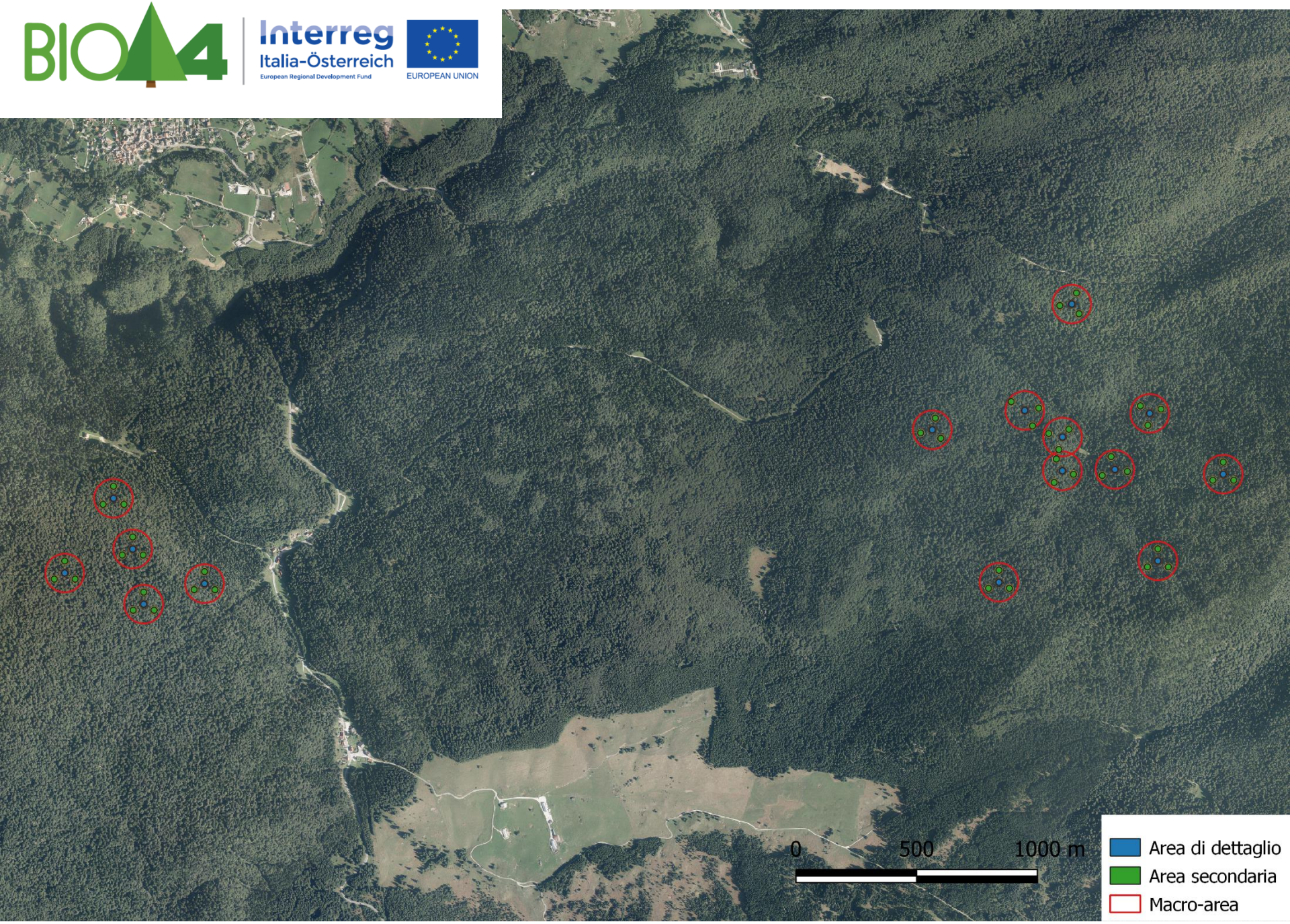
Casi studio

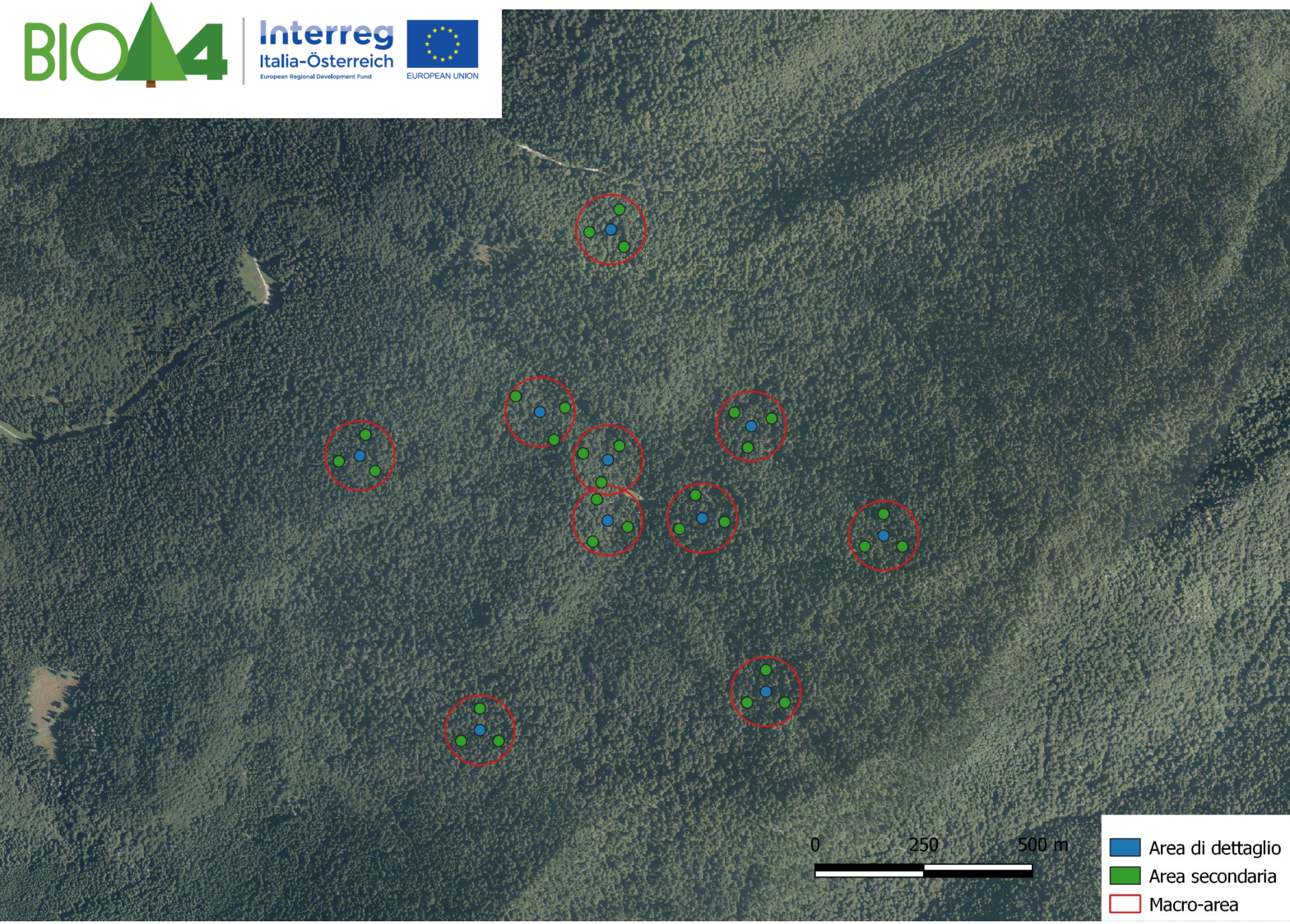
C **Cansiglio**

A **Ampezzo**

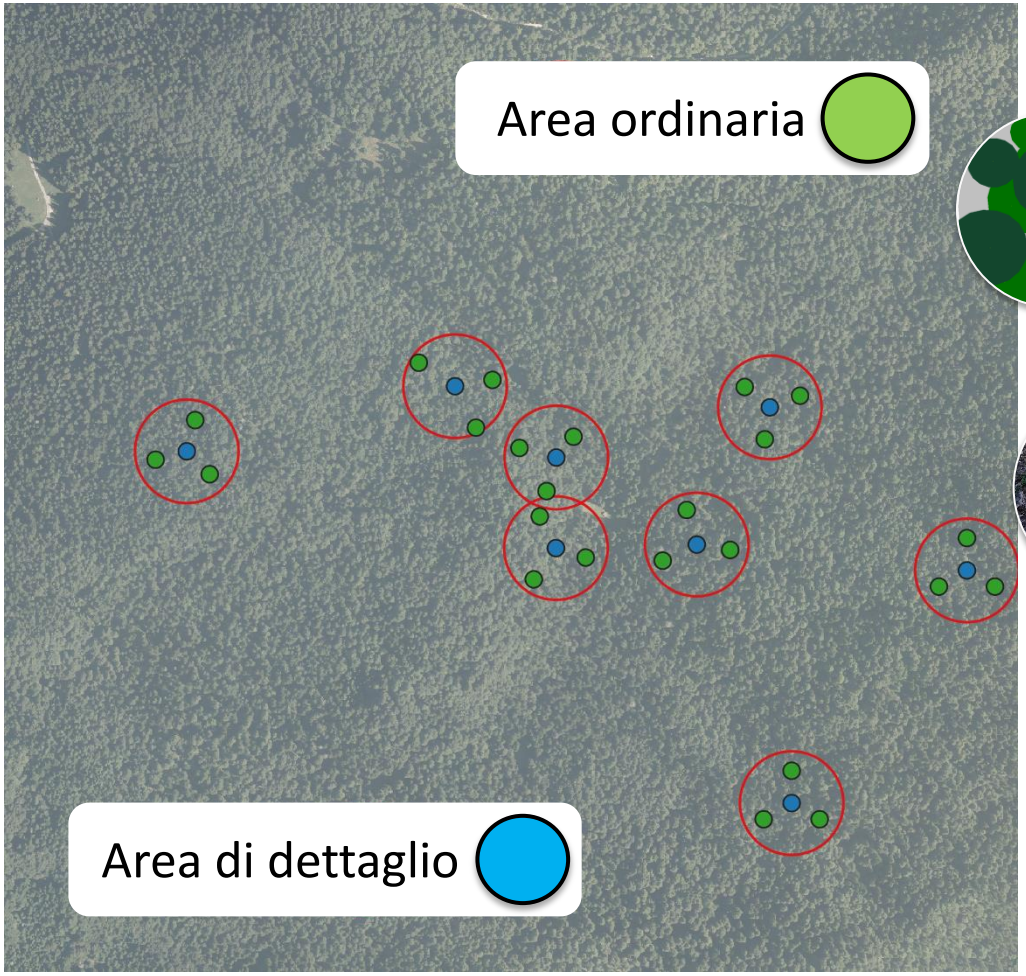
T **Tirolo**

Foreste pilota


0
500
1000 m
Area di dettaglio
Area secondaria
Macro-area


0
250
500 m
Area di dettaglio
Area secondaria
Macro-area

Rilievi strutturali



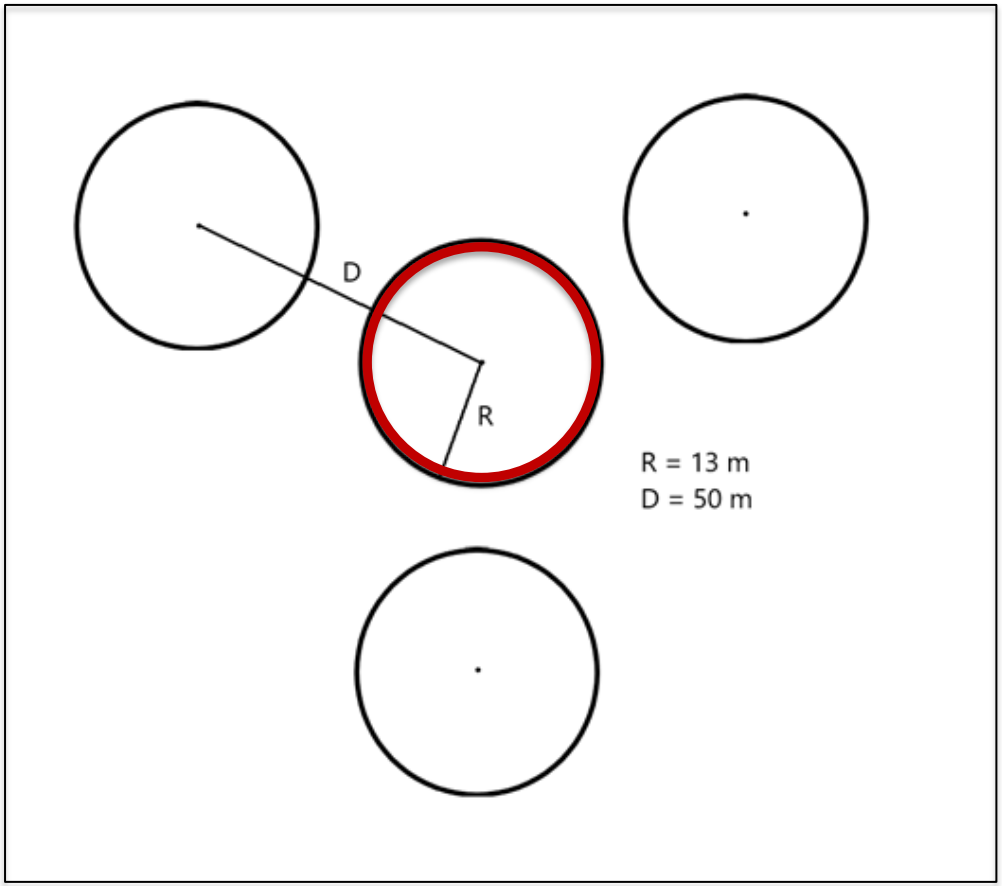
Descrizione dell'area

Parametri dendrometrici

Rinnovazione

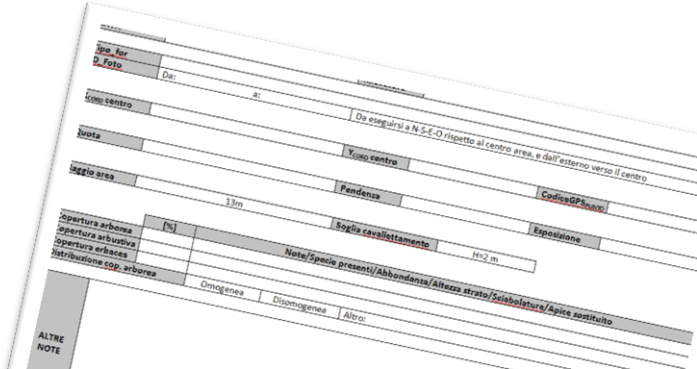
Necromassa

Rilievi dendrometrici

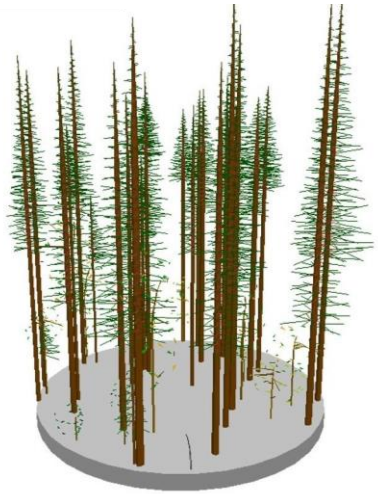


Area di dettaglio

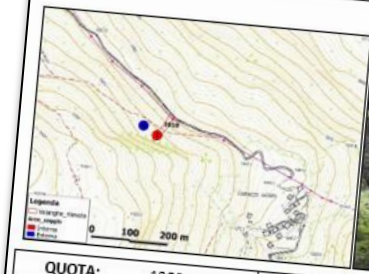
Area ordinaria



Rilievi dendrometrici



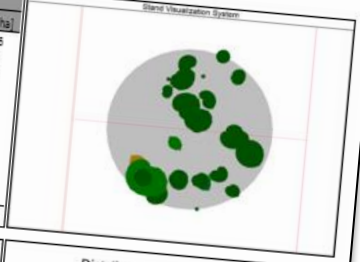
NOME:	Caracoi Agoin	**ID MOD7:**	1018	**AREA:**	DISTACCO

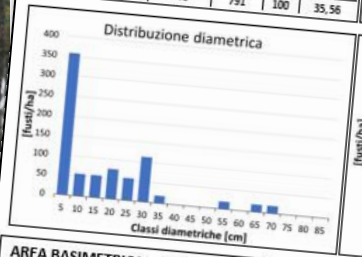


QUOTA:	1366 m s.l.m.	**PENDENZA:**	39,0°	**ESPOSIZIONE:**	46,0 °N
ANNO:	2006	**H_{NEVE}:**	100 cm	**$TIPO_{FOR\ (PREV)}$:**	pecceta
SUPERFICIE:	530,9 m²	**ACCIDENTALITÀ:**	> 50%	**$COPERTURA_{TOT}$:**	45%
				$COPERTURA_{INV}$:	44%

COMPOSIZIONE SPECIFICA

Specie	Presenza %	Fusti/ha	G %	G [m²/ha]
Picea abies	76	603	97,5	34,66
Corylus avellana	10	75	0,4	0,15
Fagus sylvatica	10	75	1,8	0,64
Salix caprea	2	19	0,2	0,07
Sorbus aucuparia	2	19	0,1	0,04
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
Totale	100	791	100	35,56



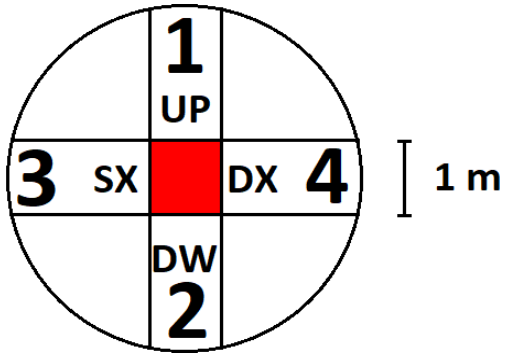


AREA BASIMETRICA:	35,56 m²/ha	**$DIAMETRO_{MEDIO}$:**	17,6 cm	**$RINN_{TOT}$:**	5686 piante/ha

NOTE: Presenza di substrato abbondantemente pietroso coperto da folto strato erbaceo. Salto di roccia a monte della zona di distacco. Diffuse galle da *Sacchiphantes viridis* su *Picea abies*.

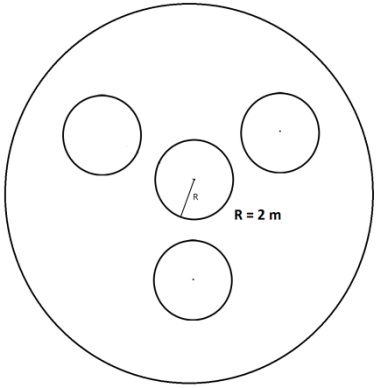
Rinnovazione

Aree di dettaglio:



Quadrante	Specie	Abbondanza (N°elem.)	Distribuzione	Note
1				
2				
3				
4				
CENTRO				

Aree ordinarie:



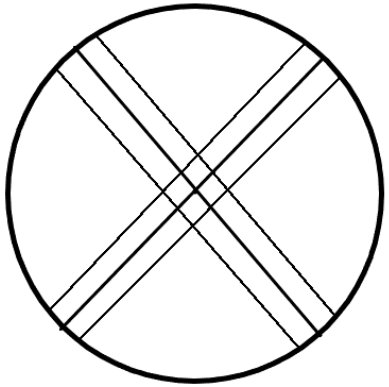
Necromassa

Alberi morti in piedi (Snag)

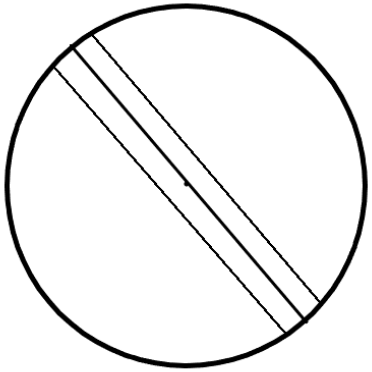
Ceppaie (stump)

Tronchi a terra (log)

Aree di dettaglio

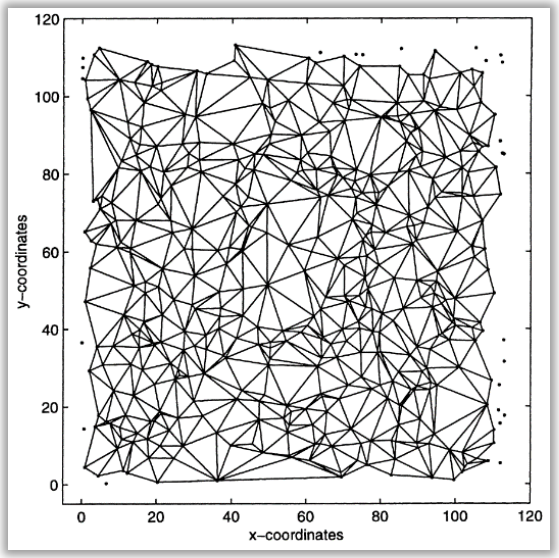


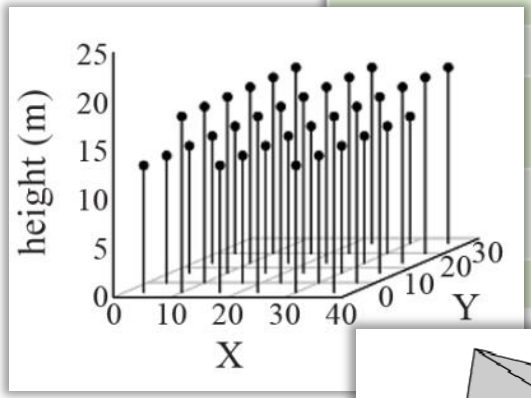
Aree ordinarie

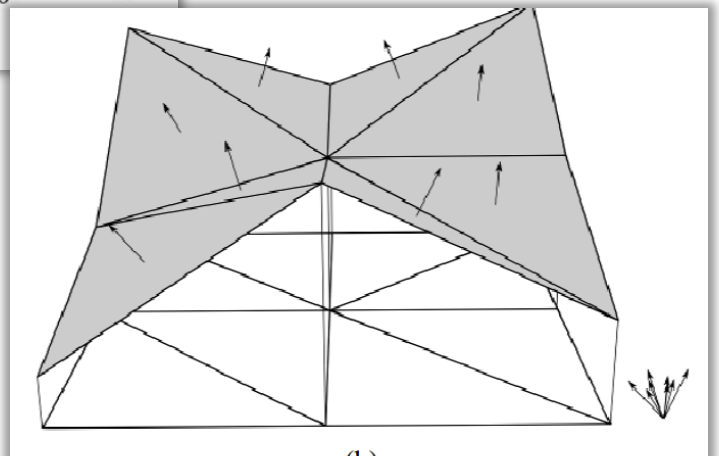


Indici di biodiversità strutturale

Indice	Formulazione	Parametri richiesti	Riferimento spaziale
TDD – THD Tree Diameter or Height Differentiation	$-\sum_{i=1}^{n}(p_i \times ln(p_i))$	Diametro (cm) – Altezza (m)	×
VE Vertical Eveness	$\sum_{i}^{4}(-log\,\pi_i) \times \frac{\pi_i}{log\,4}$	Raggi di chioma e altezza (m)	×
CE Aggregazione di Clarck and Evans	$\frac{1}{n} \times \sum_{i}^{n} n_i 2\sqrt{\rho}$	Distanze, area e numero individui	✓
DIST Distanza dal più vicino	$\sqrt{(x_j - x_i)^2 + (y_j - y_i)^2}$	Distanze	✓
UAI Uniform Angle Index	$\frac{1}{k}\sum_{j=1}^{k} zj$	Angoli e distanze	✓
MDI Mean Directional Index	$\sqrt{\left(\sum_{j=1}^{n}\cos\alpha_{ij}\right)^2 + \left(\sum_{j=1}^{n}\sin\alpha_{ij}\right)^2}$	Angoli	✓
TD – TH Diameter or Height Differentiation	$1 - \frac{min(xi;xj)}{max(xi;xj)}$	Angoli, distanze, diametro (cm) e altezza (m)	✓
	$\frac{1}{K} \times \sum_{j=1}^{k} v_j$	Diametro (cm) – Altezza (m), distanze	✓
	$\frac{1}{n}\sum_{j=1}^{n} mj$	Specie e distanze	✓
	$\frac{\mathbf{hbds}}{\mathbf{1000}}$	Altezza, area basimetrica, densità alberi e numero di specie	×



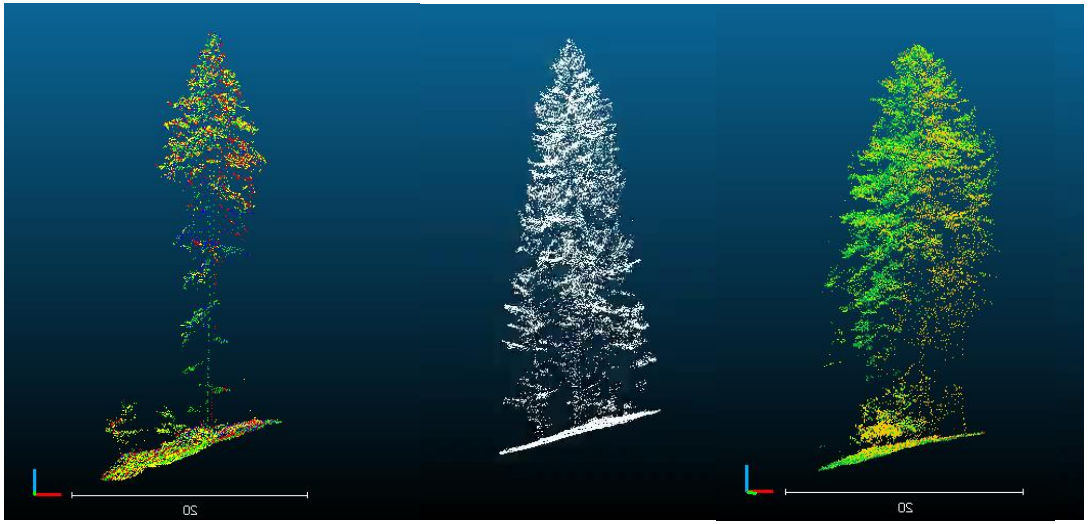


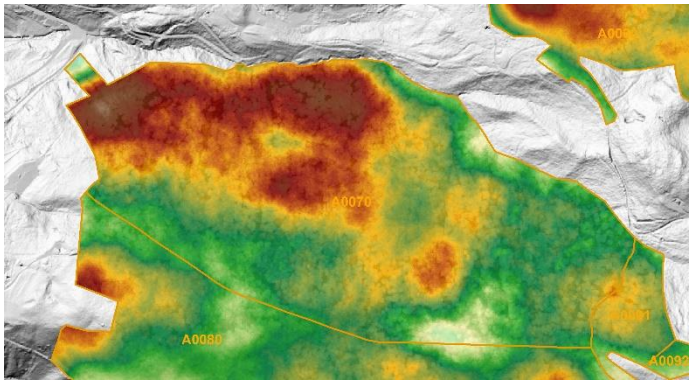


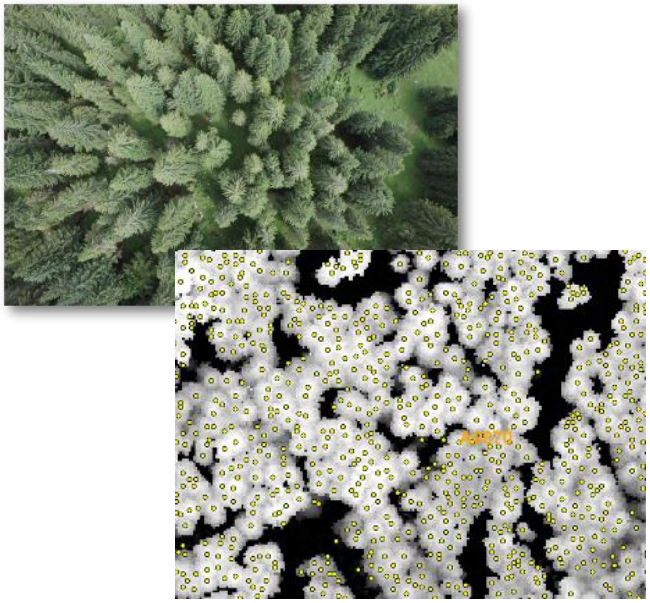
“Indici 3D”

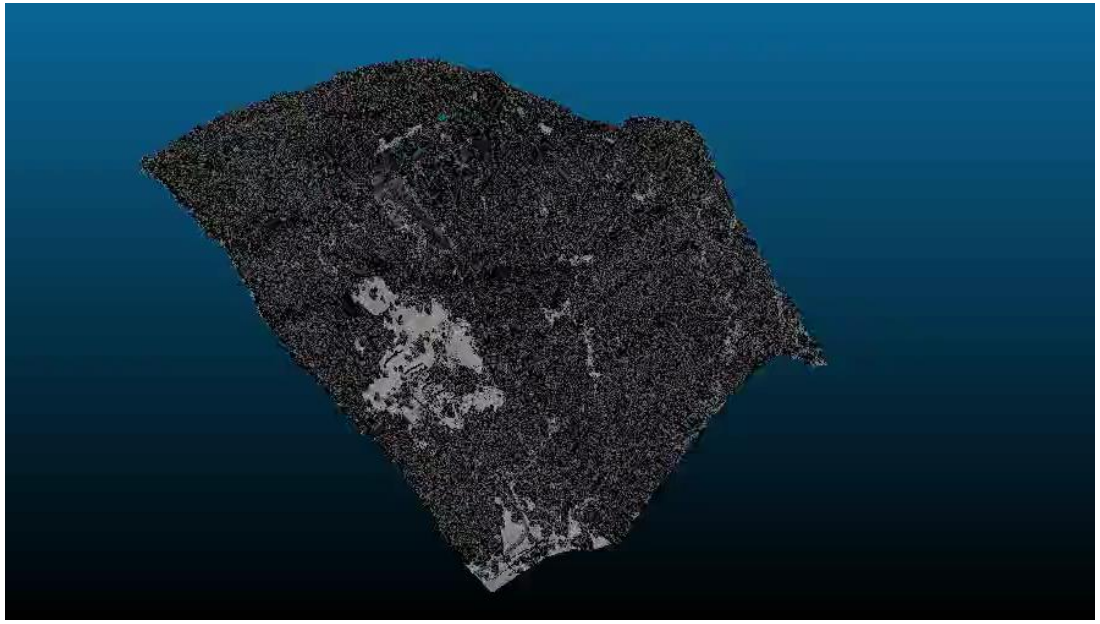
Dati telerilevati

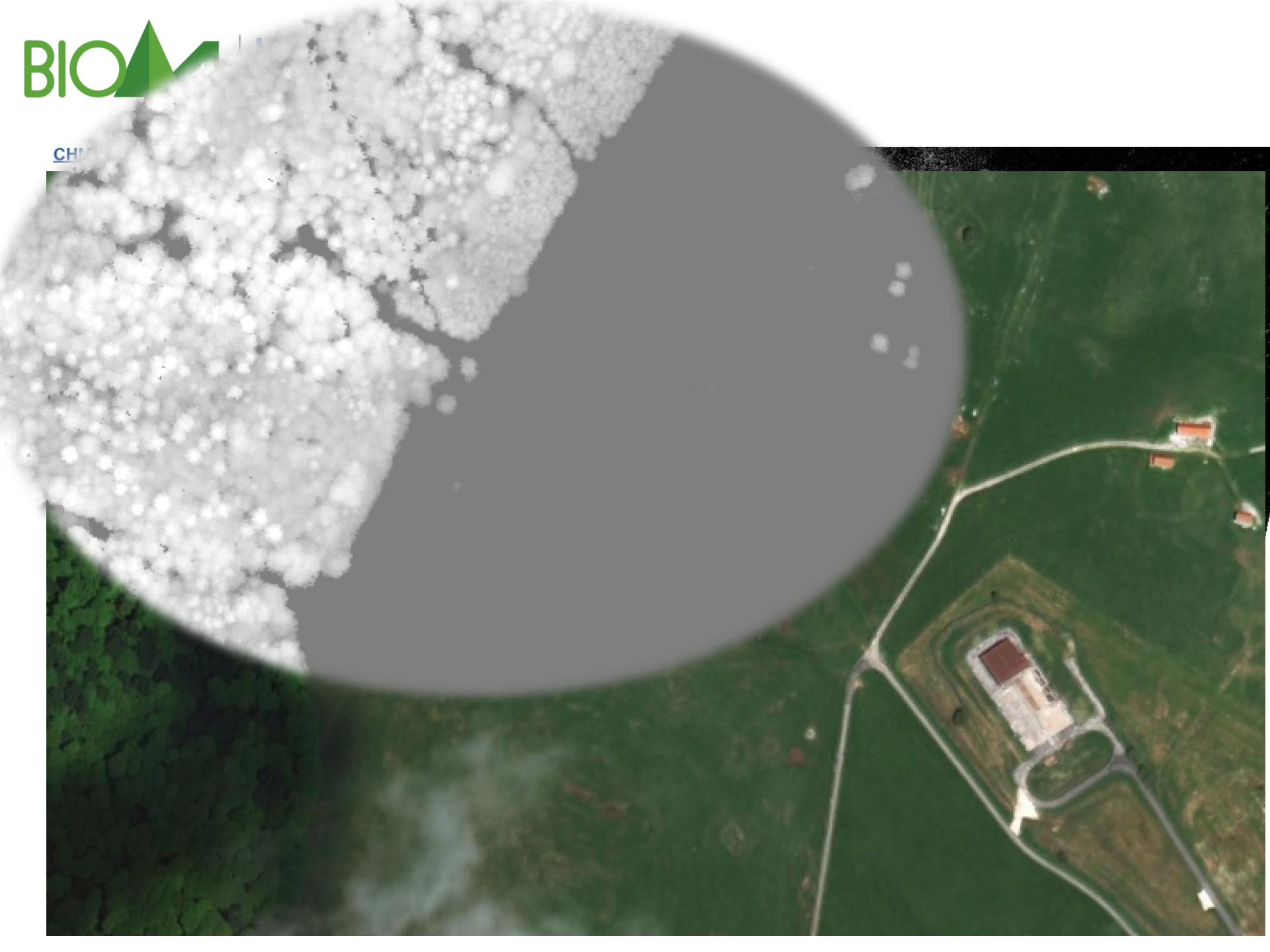
LiDAR

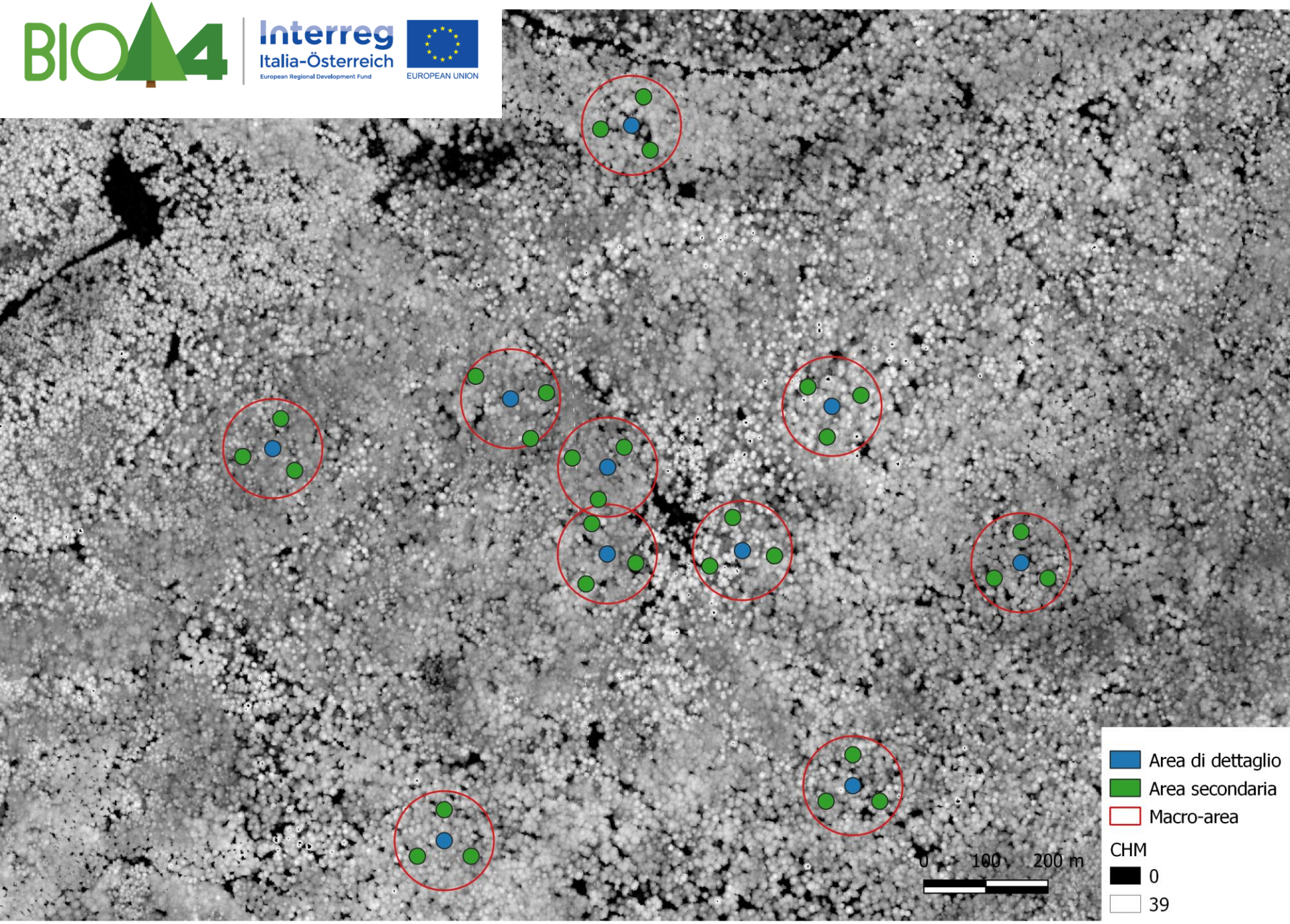








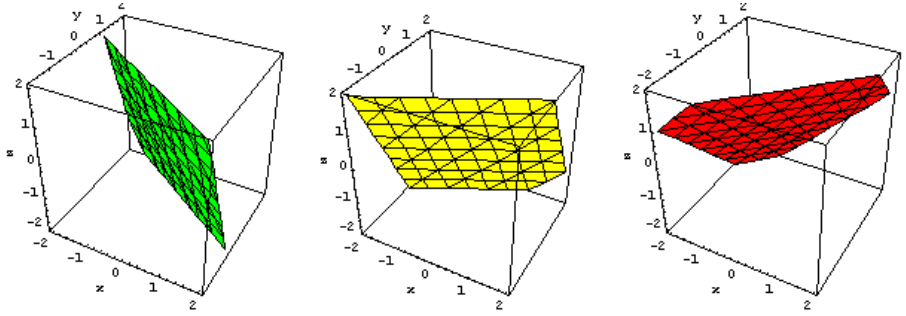



Area di dettaglio
Area secondaria
Macro-area
CHM
0
39
0
100
200 m

Servizio per l'elaborazione di una modalità innovativa di valutazione speditiva (rapida, efficace ed affidabile) della biodiversità degli ecosistemi forestali. Progetto Interreg V-A 2014-2020 Italia Austria "BIOΔ4 – Nuovi strumenti per la valorizzazione della biodiversità degli ecosistemi forestali transfrontalieri" (Codice progetto ITAT2021)

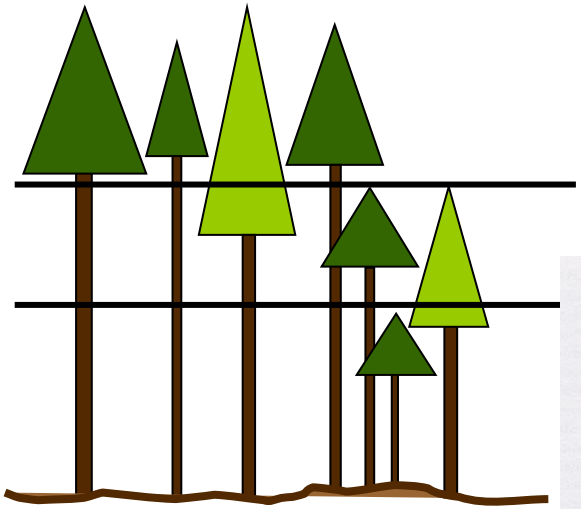
DOTT. FOR. DANIELE BELLI 32046 San Vito di Cadore (BL)	DOTTORI FORESTALI ASSOCIATI CASSOL E SCARIOT SEDICO (BL)	STUDIO ASSOCIATO PAN Pergine Valsugana (TN)

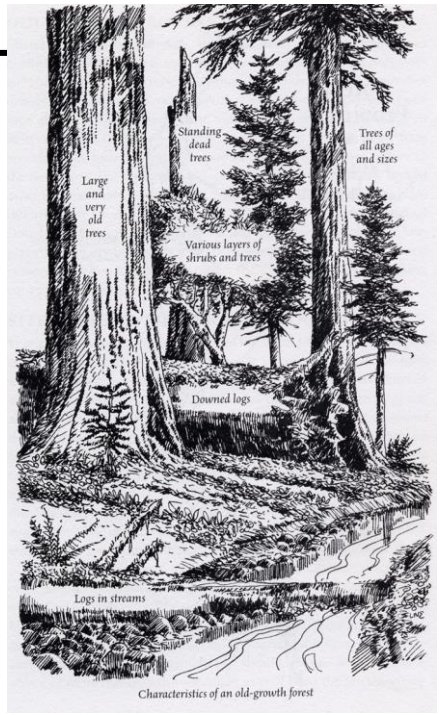
Pian Cansiglio , 25.06.2019



Parametri strutturali

Indicatori biodiversità specifica
presenza di habitat





Indicatori *semplici*

Facilmente *replicabili*

Rilevabili ed implementabili nella *pianificazione* ordinaria

Automatizzabili **(dati telerilevati disponibili)**

La foresta gestita può essere una ''risorsa per la biodiversità''

Gestione sostenibile a 360°

Table 1
Average value of the biodiversity indicators and the removed basal area in the plots with different management practices

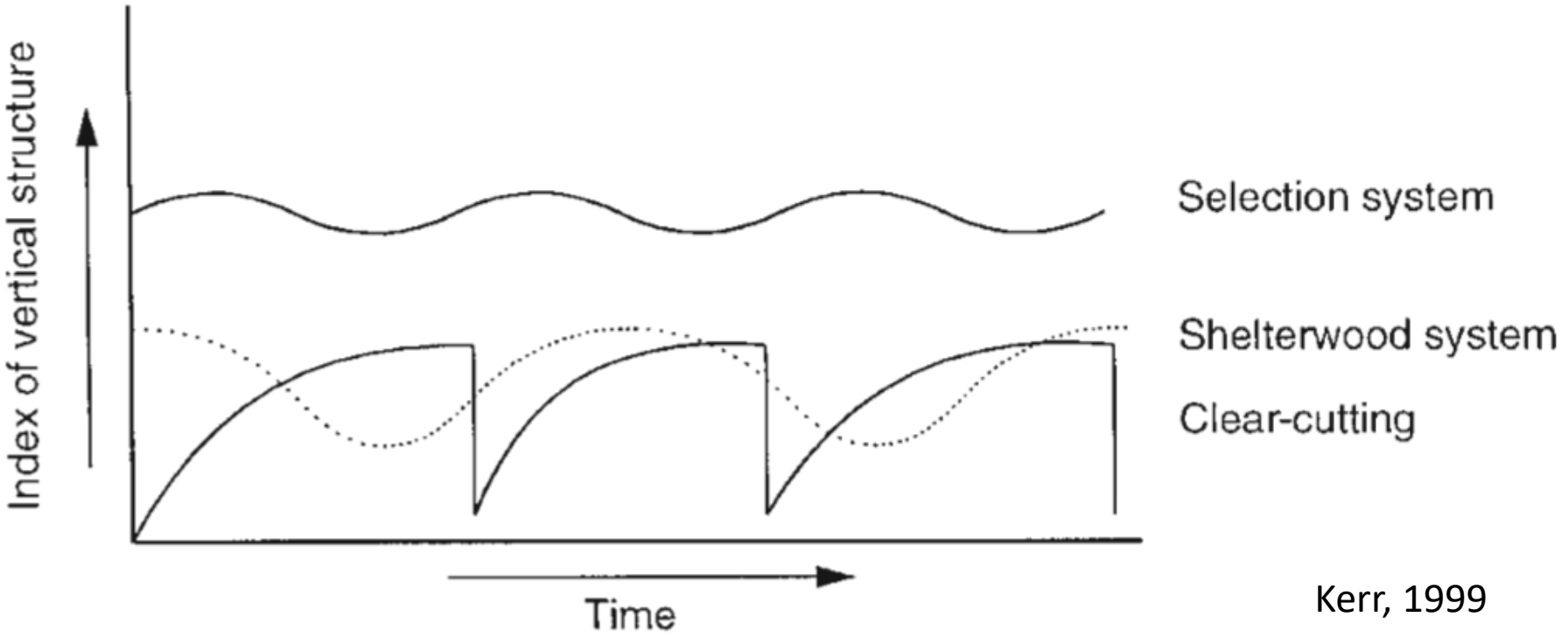
Silvicultural treatments	Number of plots	Removed basal area (%)	Biodiversity indicators					
			Snags (stems/ha)	Large-diameter trees (stems/ha)	Shrub abundance (canopy cover × height)	Shrub species richness (number of species)	Tree species richness (number of species)	Tree species diversity (Shannon index)
Unmanaged	7192	12.40	28.97	2.03	680.36	5.86	2.17	0.42
Managed (any treatment)	2616	32.05**	23.85**	1.58**	640.89	6.08**	2.31**	0.47**
Regeneration								
Clearcutting	81	64.19**	41.06	0.44	556.06	5.63	1.93*	0.38
Shelterwood	12	48.97**	5.01	0.00	435.83	5.67	1.75	0.39
Selection	1901	33.90**	22.60**	1.34**	644.31	6.10**	2.28**	0.46**
Stand improvement								
Cleaning	158	14.77**	26.72	3.87*	659.65	5.67	2.52**	0.54**
Pre-commercial thinning	67	33.97**	32.17	0.08**	525.57	5.76	2.21	0.43
Thinning	283	26.21**	29.27	2.91**	713.41	5.99	2.68**	0.57**
Pruning	114	11.81*	12.11	0.98	527.54	7.10**	2.05	0.39

Asterisks indicate mean values significantly different from those of the unmanaged plots ($^{*}p < 0.05$ and $^{**}p < 0.01$, Mann–Whitney test).

Torras & Saura, 2008

Fotografia dinamica della biodiversità

Obiettivi a livello di particella o proprietà?



Kerr, 1999

Siamo solo all'inizio.....

il meglio deve ancora venire.....

Grazie per l’attenzione…..
emanuele.lingua@unipd.it
claudio.betetto@unipd.it