

Italy

National Focal Centre

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Status

In response to the 2012/14 call for data, in order to test dynamic modeling on vegetation changes in selected sites, the dynamic model VSD+ was applied to four forest sites. These sites have been chosen because they are characterized by the presence of important plant communities for Italy, and are included in the Italian ICP Forests network (level II plots). Table IT.1 shows for each site the main environmental characteristics and representative tree species.

Table IT.1 Italian forest sites for the VSD+ application.

Site Info	EMI1	LAZ1	LOM1	PIE1
Name	Carrega	Monte Rufeno	Val Masino	Val Sessera
Latitude	44.7183	42.8306	46.2378	45.6819
Longitude	10.2017	11.9139	93.5211	80.6819
Altitude	200	690	1190	1150
No. of species	39	76	49	30
Prevalent tree species	oak forest	oak forest	spruce (and fir) forest	beech forest
Age	55	45	90	65
Protection	2	0	3	2
Eunis Class	G1.7	G1.7	G4.6	G4.6
PROPS vegetation type	Ligurian-middle Apennine downy oak forests	Middle Apennine mixed hop-hornbeam-downy oak forests	Central European Galium odoratum-	Galium odoratum-

Data sources

The data have been provided by Italian National Forest Service (Corpo Forestale dello Stato) and collected in the framework of the National Program for Forest Ecosystems Monitoring (ConEcoFor) as part of the collaboration between ICP M&M and ICP Forest.

The modeling chain has been applied without the use of the Access™ tools provided by CCE.

- MetHyd has been run to calculate mineralization/nitrification/denitrification modifying factors;
- VSDin file has been compiled to be uploaded by GrowUp module;
- GrowUp has been run to calculate uptake and compile VSDin file with uptake data;
- VSD+ model has been run and then PROPS module has been selected for vegetation analysis.

Table IT.2 shows the input data including the sources and the processing methodology.

Results and discussion

The biodiversity indices have been calculated by PROPS module, taking into consideration two options:

- 1) by considering the observed list species;
- 2) by considering the list of the species according to the site's EUNIS classification.

Biodiversity indices and the lists of the species observed and in according to the EUNIS Classes are reported in Figures IT.1-2 and Tables IT.3-4, respectively - for the indicated sites. It appears evident that the species hypothesized on the basis of the EUNIS classification are less than those really detected in field. This disagreement may be caused by lack of information about the Italian flora in the model PROPS database.

Table IT.2 Data, sources and processing methodology.

VARIABLE	UNITS	EMI1	LAZ1	LOM1	PIE1	SOURCES AND PROCESSING
Thick	m	0.600	0.531	0.527	0.312	European soil database
Bulkdens	g/cm ³	1.063	1.183	0.905	0.722	European soil database
Theta	m ³ /m ³	File	File	File	File	MetHyd output
pCO2fac	atm	24.348	24.016	20.202	19.683	European soil database
Clay_ct	%	21	25	15	18	Daffinà et al. (2003)
CEC	meq/kg	125.175	178.814	197.535	155.043	Mapping Manual eqn. 5.2
Cpool_0	g/m ²	14791.48	2515.464	3033.45	2553.225	By VSD calibration process
CNrat0		10.0091	12.77778	38.0181	17.87879	By VSD calibration process
IgKAIBC	depending on exchange model	0.098003	0.8378	1.5988	1.503	By VSD calibration process
IgKHBC	depending on exchange model	6.148333	3.9702	1.8791	4.279	By VSD calibration process
expAl		3	3	3	3	Constant
IgKAlox		8	8	8	8	Constant
TempC	C°	File	File	File	File	MetHyd output
percol	m/yr	File	File	File	File	MetHyd output
Nadep	eq/m ² /yr	File	File	File	File	By ICP Forest measured
Cadep	eq/m ² /yr	File	File	File	File	By ICP Forest measured
Mgdep	eq/m ² /yr	File	File	File	File	By ICP Forest measured
Kdep	eq/m ² /yr	File	File	File	File	By ICP Forest measured
Cldep	eq/m ² /yr	File	File	File	File	By ICP Forest measured
NH3_dep	eq/m ² /yr	File	File	File	File	By ICP Forest scaled on GP scenario
NOx_dep	eq/m ² /yr	File	File	File	File	By ICP Forest scaled on GP scenario
SO2_dep	eq/m ² /yr	File	File	File	File	By ICP Forest scaled on GP scenario
EAlobs		8.5	4.12	4.9	7.2	By ICP Forest measured
EHobs		8.3	4.5	5	7	By ICP Forest measured
cAlobs	eq/m ³	-	0.248556	0.33		By ICP Forest measured
cBcobs	eq/m ³	-	0.36	0.0023		By ICP Forest measured
cHobs	eq/m ³	-	0.000624	-		By ICP Forest measured
pHobs		4.03	6.053	5.75		By ICP Forest measured
bsatobs	eq/m ³ /yr	3.08	0.36			By ICP Forest measured
CNratobs	g/g	17.65	11.4838			By ICP Forest measured
Cpoolobs	g/m ²	3176	2773			By ICP Forest measured
Nawe	eq/m ³ /yr	0.0241049	0.014048	0.0100498	0.003563	Mapping Manual eqn. 5.39
Kwe	eq/m ³ /yr	0.0144629	0.008429	0.0060299	0.002138	Mapping Manual eqn. 5.40
Cawe	eq/m ³ /yr	0.0554410	0.032310	0.0231144	0.008195	Mapping Manual eqn. 5.41
Mgwe	eq/m ³ /yr	0.0216943	0.012643	0.0090448	0.003207	Mapping Manual eqn. 5.42
Ca_upt	g/m ² /yr	File	File	File	File	GrowUp output
Mg_upt	g/m ² /yr	File	File	File	File	GrowUp output
K_upt	g/m ² /yr	File	File	File	File	GrowUp output
N_gupt	g/m ² /yr	File	File	File	File	GrowUp output
Ni	eq/ha/yr	File	File	File	File	GrowUp output
Nfire	eq/ha/yr	File	File	File	File	GrowUp output
Nvol	eq/ha/yr	File	File	File	File	GrowUp output
Nfix	eq/ha/yr	File	File	File	File	GrowUp output
Clf	g/m ² /yr	File	File	File	File	GrowUp output
Nlf	g/m ² /yr	File	File	File	File	GrowUp output
Nimobs	eq/m ² /yr	File	File	File	File	GrowUp output
Ndeobs	eq/m ² /yr	File	File	File	File	GrowUp output

Figure IT.1 EMI1 and LAZ1 plots - biodiversity indices elaborated by VSD+ PROPS with observed species (A; C) and EUNIS classes species' list (B; D).

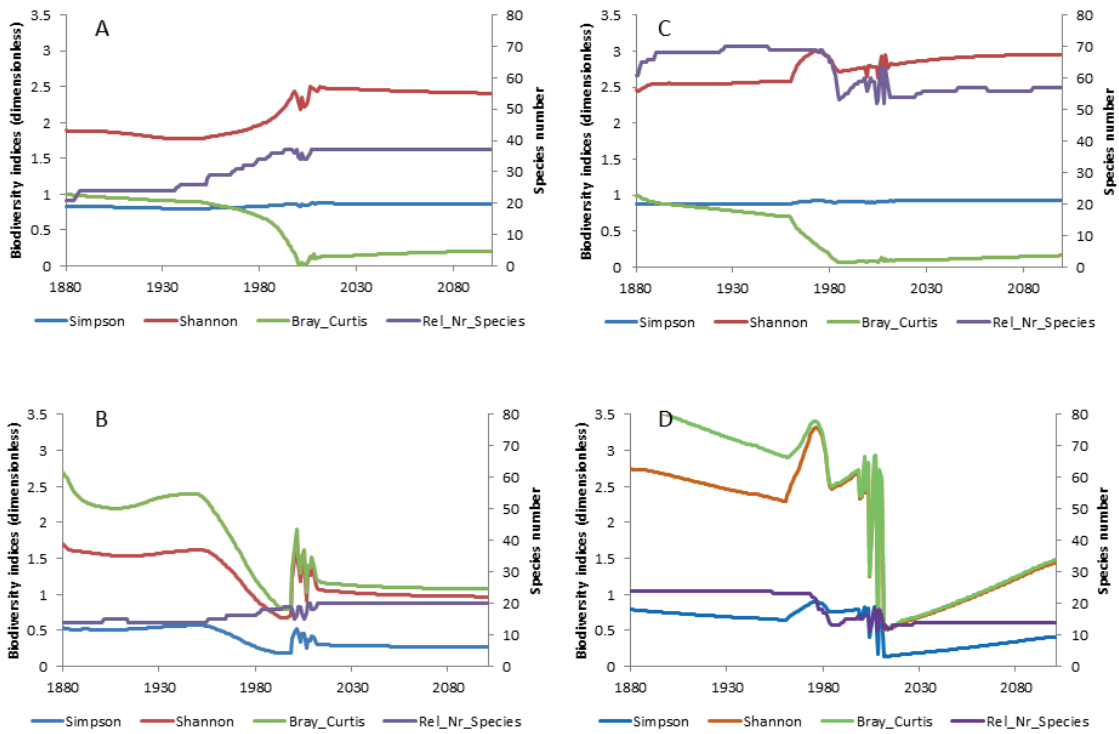


Figure IT.2 LOM1 and PIE1 plots - biodiversity indices elaborated by VSD+ PROPS with observed species (A; C) and EUNIS classes species' list (B; D).

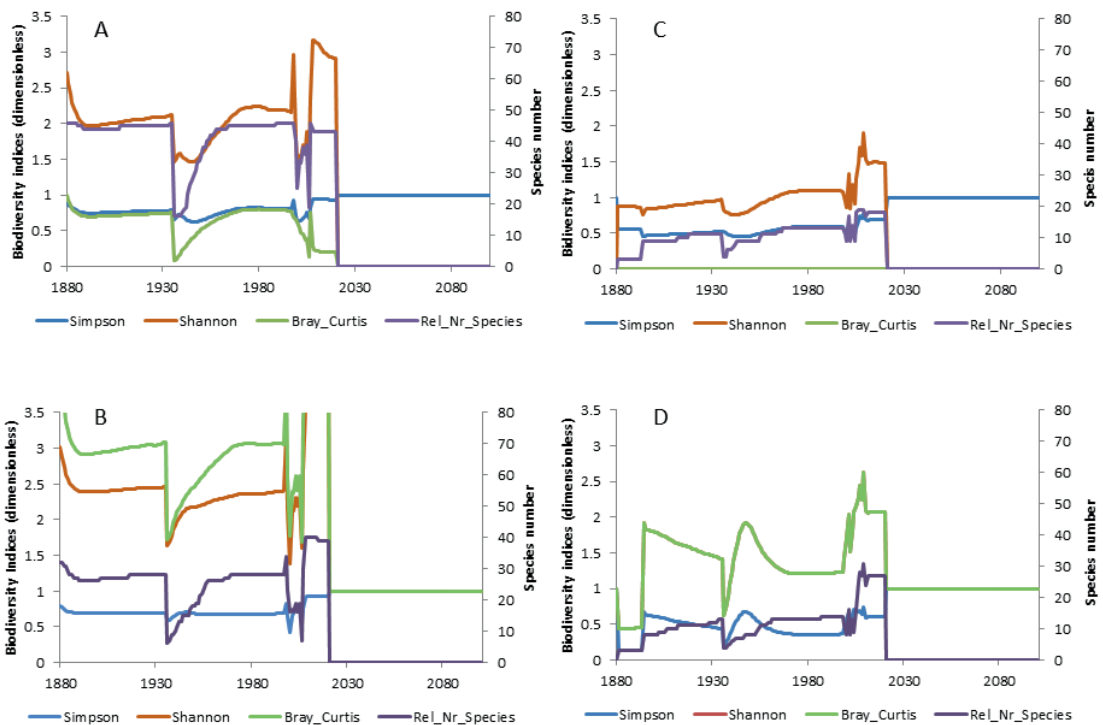


Table IT.3 EMI1 and LAZ1 observed species list and EUNIS class species list.

EMI1 Observed Species	EMI1 EUNIS Class Species	LAZ1 Observed Species	LAZ1 EUNIS Class Species
Acer_pseudoplatanus	Acer_campestre	Acer_campestre	Acer_campestre
Alliaria_petiolata	Bupthalmum_salicifolium	Agrimonia_eupatoria	Acer_monspessulanum
Aremonia_agrimonoides	Campanula_medium	Agrostis_capillaris	Buxus_sempervirens
Brachypodium_pinnatum	Cornus_mas	Ajuga_reptans	Campanula_trachelium
Calluna_vulgaris	Cornus_sanguinea	Anemone_nemorosa	Clematis_vitalba
Carex_flacca	Crataegus_monogyna	Anthericum_liliago	Cornus_mas
Carpinus_betulus	Cyclamen_repandum	Anthoxanthum_odoratum	Crataegus_monogyna
Castanea_sativa	Fraxinus_ornus	Brachypodium_sylvaticum	Daphne_laureola
Corylus_avellana	Hedera_helix	Buglossoides_purpureoaeerulea	Euphorbia_amygdaloides
Cruciata_laevipes	Helleborus_foetidus	Carex_flacca	Euphorbia_dulcis
Dicranella_heteromalla	Knautia_drymeia	Carpinus_betulus	Fraxinus_ornus
Erica_arborea	Ligustrum_vulgare	Cephalanthera_longifolia	Helleborus_foetidus
Festuca_heterophylla	Melittis_melissophyllum	Clematis_vitalba	Hepatica_nobilis
Fraxinus_excelsior	Ostrya_carpinifolia	Clinopodium_vulgare	Knautia_drymeia
Fraxinus_ornus	Peucedanum_cervaria	Cornus_mas	Laburnum_anagyroides
Genista_germanica	Quercus_pubescens	Crataegus_laevigata	Ligustrum_vulgare
Genista_tinctoria	Rosa_sempervirens	Crataegus_monogyna	Lonicera_etrusca
Hedera_helix	Sorbus_domestica	Crocus_venus	Melica_uniflora
Hieracium_racemosum	Sorbus_torminalis	Cruciata_glabra	Melittis_melissophyllum
Holcus_lanatus	Teucrium_chamaedrys	Cytisus_scoparius	Ostrya_carpinifolia
Hypericum_montanum	Viburnum_lantana	Dactylis_glomerata	Prunus_mahaleb
Hypnum_cupressiforme		Dicranum_scoparium	Quercus_cerris
Juglans_regia		Digitalis_lutea	Quercus_pubescens
Lathyrus_niger		Erica_arborea	Viola_reichenbachiana
Lilium_bulbiferum		Euphorbia_dulcis	
Lonicera_caprifolium		Eurhynchium_praelongum	
Luzula_forsteri		Festuca_heterophylla	
Mespilus_germanica		Fragaria-vesca	
Molinia_caerulea		Fraxinus_ornus	
Platanthera_bifolia		Genista_germanica	
Polygonatum_odoratum		Hedera_helix	
Prunus_avium		Hieracium_racemosum	
Pteridium_aquilinum		Holcus_mollis	
Quercus_cerris		Hypericum_perforatum	
Quercus_petraea		Hypnum_cupressiforme	
Rubus_caesius		Isothecium_alopecuroides	
Sorbus_domestica		Juniperus_communis	
Sorbus_torminalis		Lathyrus_montanus	
Vinca_minor		Lonicera_caprifolium	
		Luzula_campestris	
		Luzula_forsteri	
		Luzula_sylvatica	
		Malus_sylvestris	
		Melica_uniflora	
		Mespilus_germanica	
		Mycelis_muralis	
		Neottia_nidus-avis	
		Oenanthe_pimpinelloides	
		Pinus_pinaster	
		Pinus_strobus	
		Platanthera_chlorantha	

Table IT3 Continued

EMI1 Observed Species	EMI1 EUNIS Class Species	LAZ1 Observed Species	LAZ1 EUNIS Class Species
		Polytrichum_communis	
		Potentilla_micrantha	
		Primula_vulgaris	
		Prunus_spinosa	
		Pyrus_pyraster	
		Quercus_cerris	
		Quercus_ilex	
		Quercus_petraea	
		Quercus_pubescens	
		Ranunculus_lanuginosus	
		Rhinanthus_minor	
		Rosa_arvensis	
		Rubus_hirtus	
		Rubus_ulfifolius	
		Ruscus_acleatus	
		Solidago_virgaurea	
		Sorbus_domestica	
		Sorbus_torminalis	
		Stachys_officinalis	
		Symphytum_tuberosum	
		Tamus_communis	
		Teucrium_scorodonia	
		Torilis_arvensis	
		Viola_alba	
		Viola_reichenbachiana	

Table IT.4 LOM1 and PIE1 observed species list and Eunis class species list.

LOM1 Observed Species	LOM1 EUNIS Class Species	PIE1 Observed Species	PIE1 EUNIS Class Species
Acer_pseudoplatanus	Acer_pseudoplatanus	Anemone nemorosa	Acer_pseudoplatanus
Ajuga_reptans	Actaea_spicata	Athyrium filix-foemina	Actaea_spicata
Anemone_nemorosa	Atrichum_undulatum	Atrichum undulatum	Atrichum_undulatum
Asplenium_trichomanes	Brachypodium_sylvaticum	Avenella flexuosa	Brachypodium_sylvaticum
Athyrium_flix-femina	Bromus_ramosus	Betula pendula	Bromus_ramosus
Betula_pendula	Calamagrostis_varia	Calamagrostis arundinacea	Calamagrostis_varia
Carex_caryophylla	Campanula_trachelium	Calypogeia fissa	Campanula_trachelium
Carex_digitata	Carex_digitata	Carex pilulifera	Carex_digitata
Carex_pallescens	Carpinus_betulus	Chiloscyphus profundus	Carpinus_betulus
Corylus_avellana	Cirsium_erisithales	Dicranella heteromalla	Cirsium_erisithales
Dactylorhiza_majalis	Clematis_vitalba	Dryopteris affinis	Clematis_vitalba
Dryopteris_affinis	Corylus_avellana	Dryopteris carthusiana	Corylus_avellana
Dryopteris_dilatata	Ctenidium_molluscum	Fagus sylvatica	Ctenidium_molluscum
Dryopteris_flix-mas	Cyclamen_purpurascens	Galeopsis tetrahit	Cyclamen_purpurascens
Epipactis_helleborine	Daphne_mezereum	Gymnocarpium dryopteris	Daphne_mezereum
Euphorbia_dulcis	Euphorbia_amygdaloides	Hypnum cupressiforme	Euphorbia_amygdaloides
Fagus_sylvatica	Eurhynchium_striatum	Lophocolea heterophylla	Eurhynchium_striatum
Festuca_altissima	Fagus_sylvatica	Luzula nivea	Fagus_sylvatica
Festuca_heterophylla	Fissidens_taxifolius	Maianthemum bifolium	Fissidens_taxifolius

Table IT4 Continued

LOM1 Observed Species	LOM1 EUNIS Class Species	PIE1 Observed Species	PIE1 EUNIS Class Species
<i>Fragaria vesca</i>	<i>Fraxinus excelsior</i>	<i>Phegopteris polypodioides</i>	<i>Fraxinus excelsior</i>
<i>Fraxinus excelsior</i>	<i>Gentiana asclepiadea</i>	<i>Picea abies</i>	<i>Gentiana asclepiadea</i>
<i>Geranium phaeum</i>	<i>Hedera helix</i>	<i>Plagiothecium laetum</i>	<i>Hedera helix</i>
<i>Gymnocarpium dryopteris</i>	<i>Hypnum cupressiforme</i>	<i>Polygonatum verticillatum</i>	<i>Hypnum cupressiforme</i>
<i>Hieracium murorum</i>	<i>Knautia drymeia</i>	<i>Polytrichum formosum</i>	<i>Knautia drymeia</i>
<i>Homogyne alpina</i>	<i>Lathyrus vernus</i>	<i>Polytrichum formosum</i>	<i>Lathyrus vernus</i>
<i>Laburnum alpinum</i>	<i>Lonicera xylosteum</i>	<i>Prenanthes purpurea</i>	<i>Lonicera xylosteum</i>
<i>Lonicera nigra</i>	<i>Mercurialis perennis</i>	<i>Rhynchostegiella tenella</i>	<i>Mercurialis perennis</i>
<i>Luzula luzulina</i>	<i>Picea abies</i>	<i>Sorbus aucuparia</i>	<i>Picea abies</i>
<i>Luzula nivea</i>	<i>Plagiochila asplenioides</i>	<i>Vaccinium myrtillus</i>	<i>Plagiochila asplenioides</i>
<i>Luzula pilosa</i>	<i>Poa nemoralis</i>		<i>Poa nemoralis</i>
<i>Maianthemum bifolium</i>	<i>Poa stiriaca</i>		<i>Poa stiriaca</i>
<i>Melampyrum sylvaticum</i>	<i>Prenanthes purpurea</i>		<i>Prenanthes purpurea</i>
<i>Milium effusum</i>	<i>Prunus avium</i>		<i>Prunus avium</i>
<i>Oxalis acetosella</i>	<i>Salvia glutinosa</i>		<i>Salvia glutinosa</i>
<i>Phegopteris connectilis</i>	<i>Sambucus nigra</i>		<i>Sambucus nigra</i>
<i>Picea abies</i>	<i>Tilia platyphyllos</i>		<i>Tilia platyphyllos</i>
<i>Polypodium vulgare</i>	<i>Tortella tortuosa</i>		<i>Tortella tortuosa</i>
<i>Potentilla erecta</i>	<i>Ulmus glabra</i>		<i>Ulmus glabra</i>
<i>Prenanthes purpurea</i>	<i>Veronica urticifolia</i>		<i>Veronica urticifolia</i>
<i>Pulsatilla montana</i>			
<i>Ranunculus montanus</i>			
<i>Rubus idaeus</i>			
<i>Saxifraga cuneifolia</i>			
<i>Solidago virgaurea</i>			
<i>Sorbus aria</i>			
<i>Sorbus aucuparia</i>			
<i>Viola biflora</i>			
<i>Viola reichenbachiana</i>			

Conclusions

More work must be done on the species that characterize a specific EUNIS class for the Italian territory before using on PROPS model application EUNIS class in place of the species detected. Statistical analyses performed on the datasets coming from the VSD application highlighted some important problem deriving from the VSD outputs. Direct calculation of the biodiversity indices on the basis of row data (name of species per layer and percentage of coverage) showed some inconsistency between measured and modeled data. This could be due to the forest plot management practices or to the consideration that VSD estimates the probability of occurrence and not the species coverage. The VSD+/props model should be discussed and analysed to improve its performance in predicting biodiversity indices for Italian ecosystems.

References

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