

## Remote Sensing, test cases and future developments at the test-site level

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❑ The *conservation status* report required by Art. 17 of the Habitats (92/43/EEC) directive is based on the new Standard Data Form (2011)

- Range of habitat
- Area covered by habitat type within range
- Structure and functions
- Future prospects
  - Reason for changes
  - **Pressures/threats**

❑ *Users (i.e. management authorities ) need:*

- *Standardized method*
- *Scale 1:5000 or finer;*
- *Long-time data series* for monitoring changes
- *Scientific support* to evaluate the impact of existing policies.

– **The Habitats Directive** (92/43/CEE): conservation status of habitats and species (Art. 17)





# EBV from GEO\_BON

## EXAMPLES OF CANDIDATE ESSENTIAL BIODIVERSITY VARIABLES

EBV class	EBV examples	Measurement and scalability	Temporal sensitivity	Feasibility
Genetic composition	Allelic diversity	Genotypes of selected species (e.g., endangered, domesticated) at representative locations.	Generation time	Data available for many species and for several locations, but little global systematic sampling.
Species populations	Abundances and distributions	Counts or presence surveys for groups of species easy to monitor or important for ES, over an extensive network of sites, complemented with incidental data.	1 to >10 years	Standardized counts under way for some taxa but geographically restricted. Presence data collected for more taxa. Ongoing data integration efforts (Global Biodiversity Information Facility, Map of Life).
Species traits	Phenology	Timing of leaf coloration by RS, with in situ validation.	1 year	Several ongoing initiatives (Phenological Eyes Network, PhenoCam, etc.)
Community composition	Taxonomic diversity	Consistent multitaxa surveys and metagenomics at select locations.	5 to >10 years	Ongoing at intensive monitoring sites (opportunities for expansion). Metagenomics and hyperspectral RS emerging.
Ecosystem structure	Habitat structure	RS of cover (or biomass) by height (or depth) globally or regionally.	1 to 5 years	Global terrestrial maps available with RS (e.g., Light Detection and Ranging). Marine and freshwater habitats mapped by combining RS and in situ data.
Ecosystem function	Nutrient retention	Nutrient output/input ratios measured at select locations. Combine with RS to model regionally.	1 year	Intensive monitoring sites exist for N saturation in acid-deposition areas and P retention in affected rivers.

**Multi-temporal and LIDAR Images for:**

**1) Habitats as proxies**

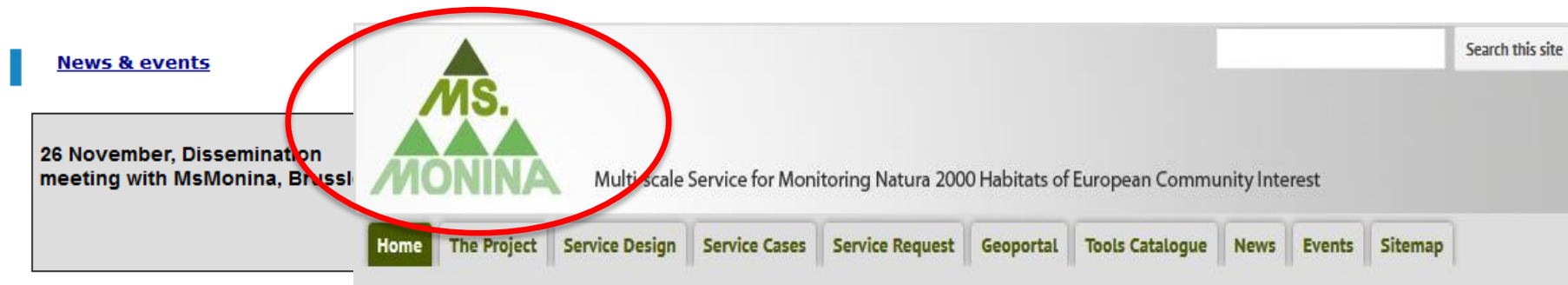
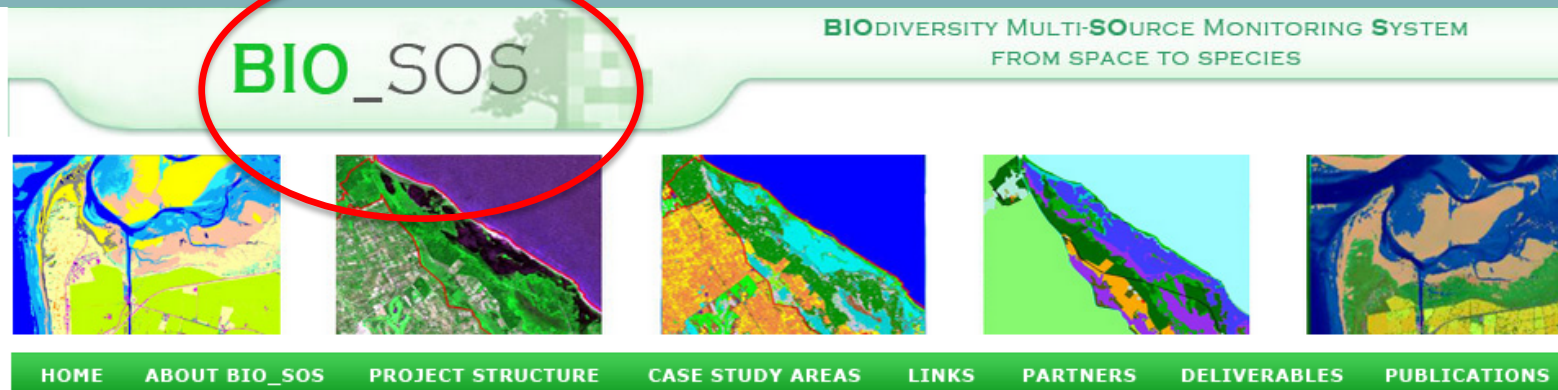
**2) LC/LU and changes; veg. height**

**3) Bio-geo physical variables**





# FP7: BIO\_SOS ([www.biosos.eu](http://www.biosos.eu)) and MS.MONINA (<http://www.ms-monina.eu/home>)



## Relevant Results

[BIO\\_SOS intranet access](#)

[BIO\\_SOS ftp site](#)

[BIO\\_SOS Final Policy Brief](#)

[Geoportal](#)

[White Paper](#)

## LATEST NEWS

**Dissemination Workshop "Satellite Earth observation services for biodiversity and habitat monitoring"** The FP7 SPACE projects MS.MONINA and BIO\_SOS jointly organise a final dissemination workshop, which takes place on November 26th, 2013 in Brussels, Belgium. The workshop will offer an ...

Posted 13 Nov 2013, 04:59 by Lena





# Habitat maps: *expert knowledge to fill the gaps between different domains*

Peak of Biomass  
(April-May)  
**PoB**



Post peak  
(October)  
**PostPoB**



Pre Peak  
(January)  
**PrePoB**



Dry Season  
(July)  
**DS**



## LC/LU in FAO-LCCS: Small and Large Object layers

SO

LO

- A12/A2.A6
- A12/A1.D1.E1
- A12/A1.D1.E2
- A12/A1.D2.E1
- A11/A3.A4
- A11/A3
- A11/(A1orA2).A7.A9
- A11/(A1orA2).A7.A10
- A11/A2.A7.A10
- A11/(A1orA2) cont.
- B28 or B27
- B15
- B16
- B15/A2.A6
- SHADOW

- A11/A3
- A11/A3.A4
- A12/A2.A6
- A12/A1.D1.E1
- A12/A1.D1.E2
- A12/A1.D2.E1
- A11/(A1orA2) cont.
- B15
- B15/A2.A6
- B16
- SHADOW
- A11/(A1orA2).A7.A9
- A11/(A1orA2).A7.A10
- A11/A3 or A11/A2.A7.A10
- B28 or B27
- A11/A2.A7.A10
- A12/A2.A6 + A12/A1.D1.E2
- A12/A2.A6 + A12/A1.D1.E1
- A12/A2.A6 + A12/A1.D2.E1
- A12/A1.D1.E1 + A12/A2.A6
- A12/A1.D1.E2 + A12/A2.A6
- A12/A1.D2.E1 + A12/A2.A6



Brussels, 18-19 November 2013

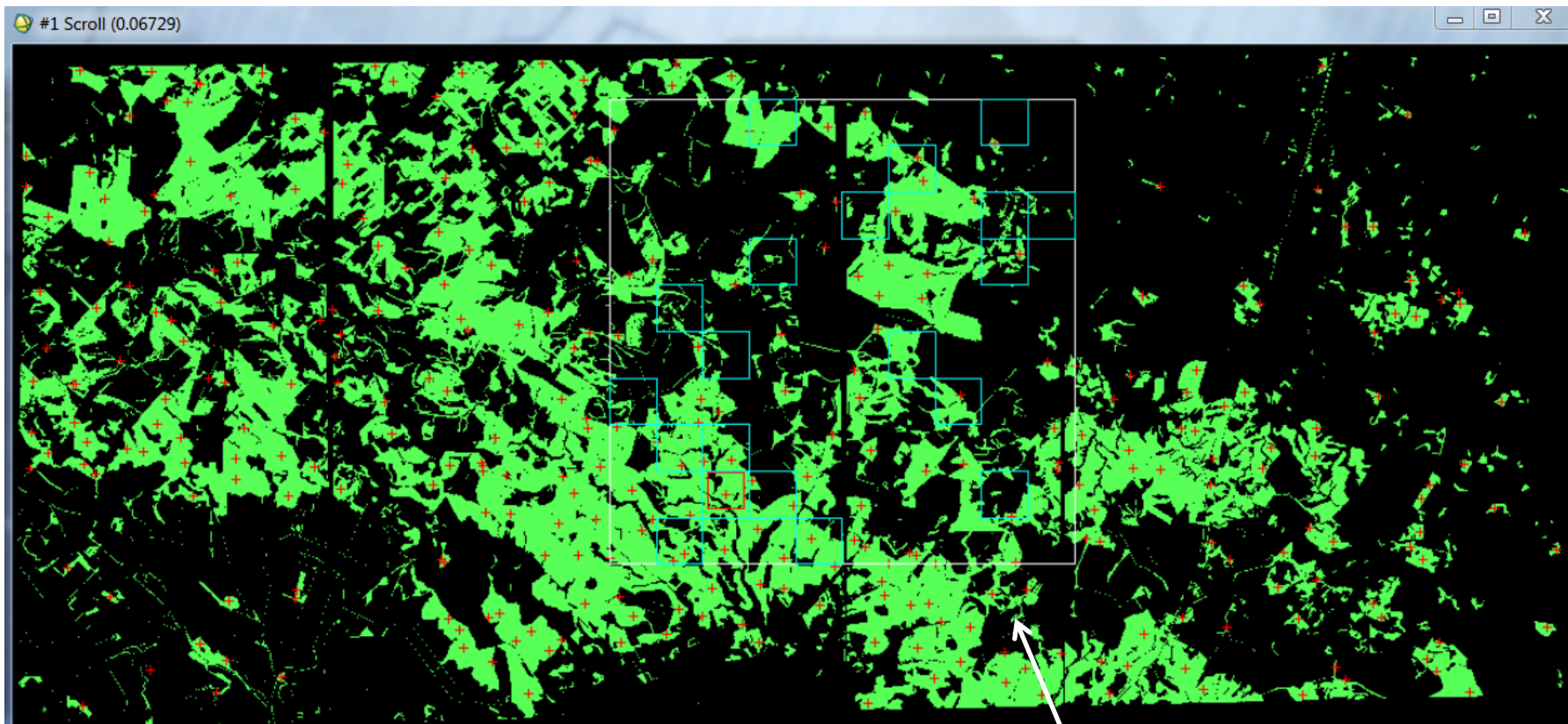






Output product: habitat 62A0.

Murgia Alta(I) about 33km\*15km (485 kmq)



LCCS MAP	OA%	error%
SO classification	84.0%	0.07%
LO classification	84.4%	0.08%

10km x10km  
validation grid



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

**3rd EU BON Stakeholder Roundtable**  
10th – 11th December 2015, Granada, Spain

## LCLU to habitat map translation based on in-situ data

Le Cesine site (I)

(a)

Habitat map: Annex I / Eunis  
Le Cesine site (IT)

Inputs

- a) LCLU map in  
FAO LCCS taxonomy
- b) Environmental attributes in GIS

A24/A2.A5.A13.B4.C2.E5.B13.E7

A24/A1.A4.A12.B3.C2.D3.B10

A24/A2.A6.A12.B4.C2.E5.B11.E6

A24/A2.A6.A12.B4.C2.E5.B12.E6

A24/A2.A5.A16.B4.C1.E5.A15.B12.E6

A12/A2.A5.A11.B4.E5.A13.B13.E7

A12/A2.A5.A11.B4.E5.B13.E7

A12/A2.A5.A10.B4.E5.B12.E7

A12/A1.A4.A10.B3.D1.E2.B9

A12/A1.A4.A10.B3.D2.E1.B9

A12/A1.A4.A11.B3.D1.E1.B10

A12/A1.A4.A10.B3.D1.E1.B9

A12/A2.A6.A11.B4.E5.B12.E6

A11/A3.A5.B2.C2.D3

A11/A1.B1.C1.D1.W7

A11/A1.B1.C1.D1.W8

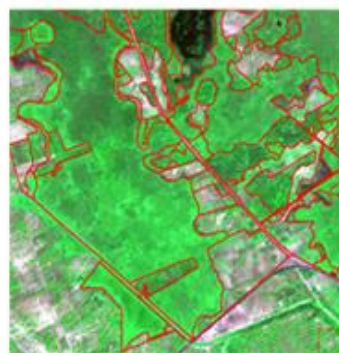
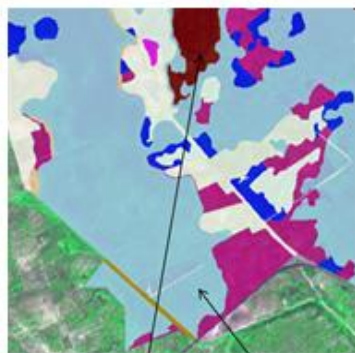
B15/A1.A3.A7.A8

B15/A1.A4.A13.A17



V

Close-up



ANNEX1\_1150

ANNEX1\_1210

ANNEX1\_1310

ANNEX1\_1410

ANNEX1\_1420

ANNEX1\_2110

ANNEX1\_2250

ANNEX1\_3170

ANNEX1\_5330

ANNEX1\_6220

ANNEX1\_7210

EUNIS\_C2

EUNIS\_D5.1

EUNIS\_E1.6

EUNIS\_F5.51

EUNIS\_F5.514

EUNIS\_F6.2C

ANNEX1: 1150

ANNEX1: 1210

ANNEX1: 1310

ANNEX1: 1410

ANNEX1: 1420

ANNEX1: 2110

ANNEX1: 2250

ANNEX1: 3170

ANNEX1: 5330

ANNEX1: 6220

ANNEX1: 7210 OR EUNIS D5.1

EUNIS: C2

EUNIS: D5.2

EUNIS: F5.51

EUNIS: F5.514

EUNIS: F6.2C

EUNIS: G2.91

EUNIS: G3.F1

EUNIS: I.3

EUNIS: J2.1

EUNIS: J4.2



COOPERATION

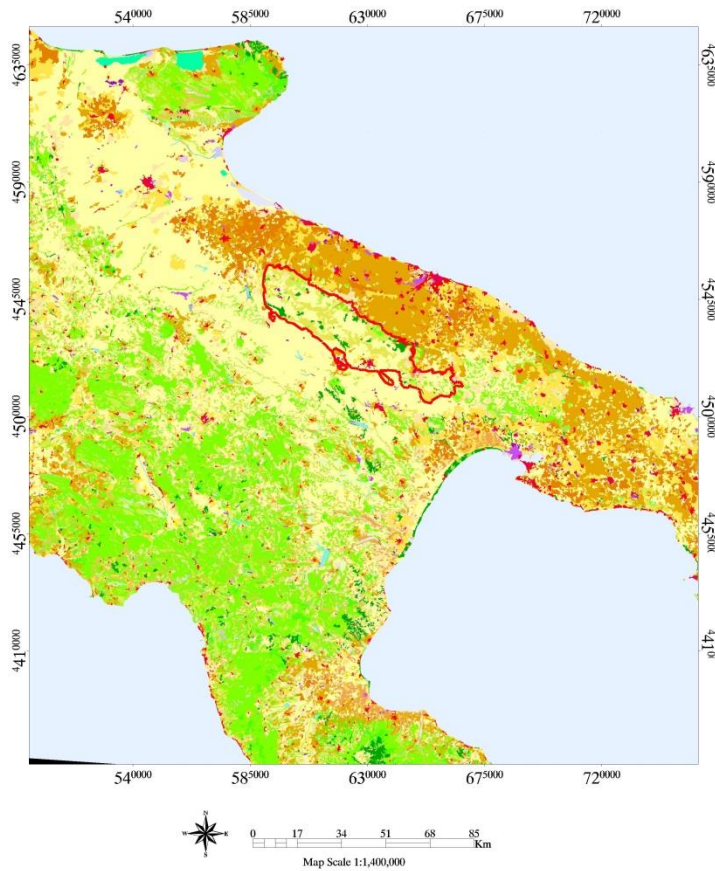
WV



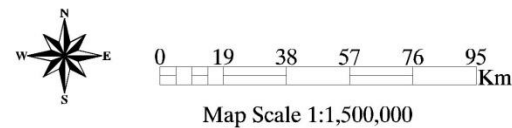
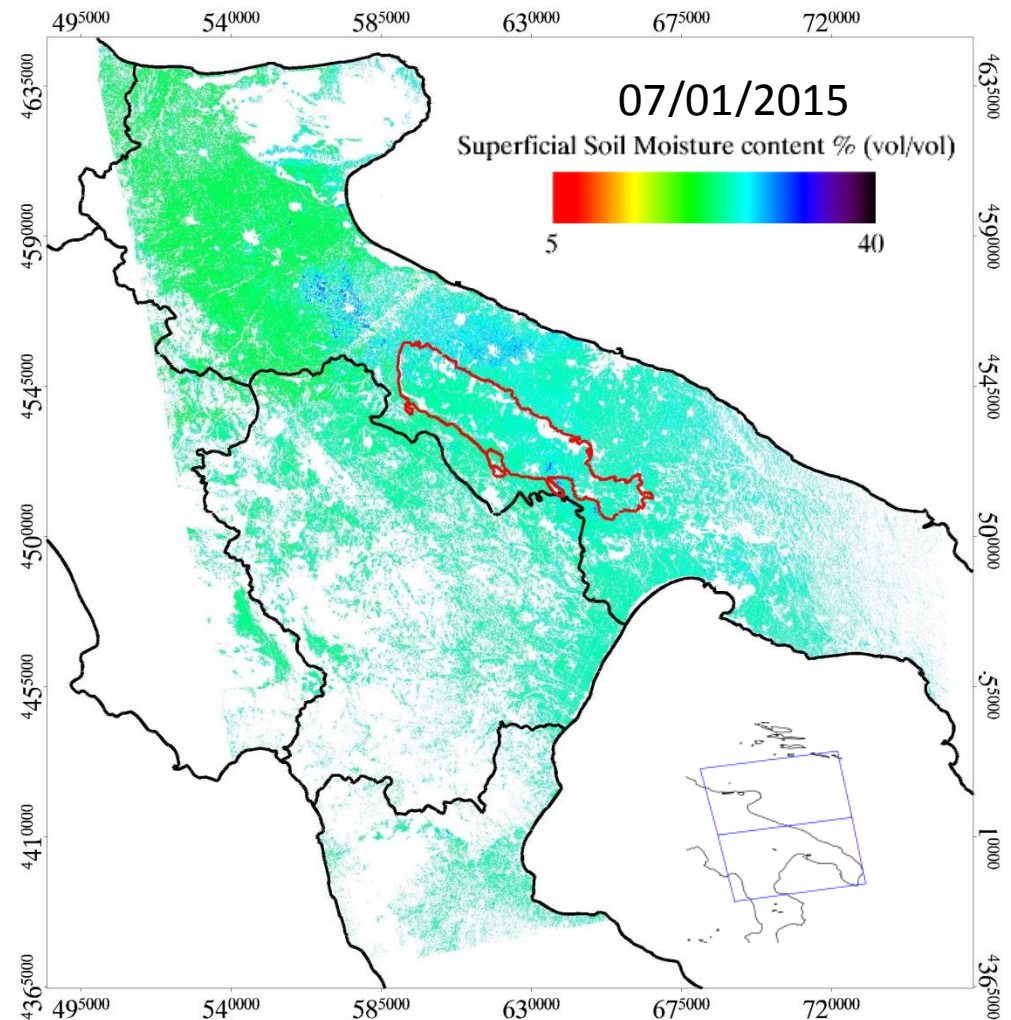


# Superficial soil moisture from Sentinel 1

(CNR ISSIA)



■ Agricultural areas (CORINE)

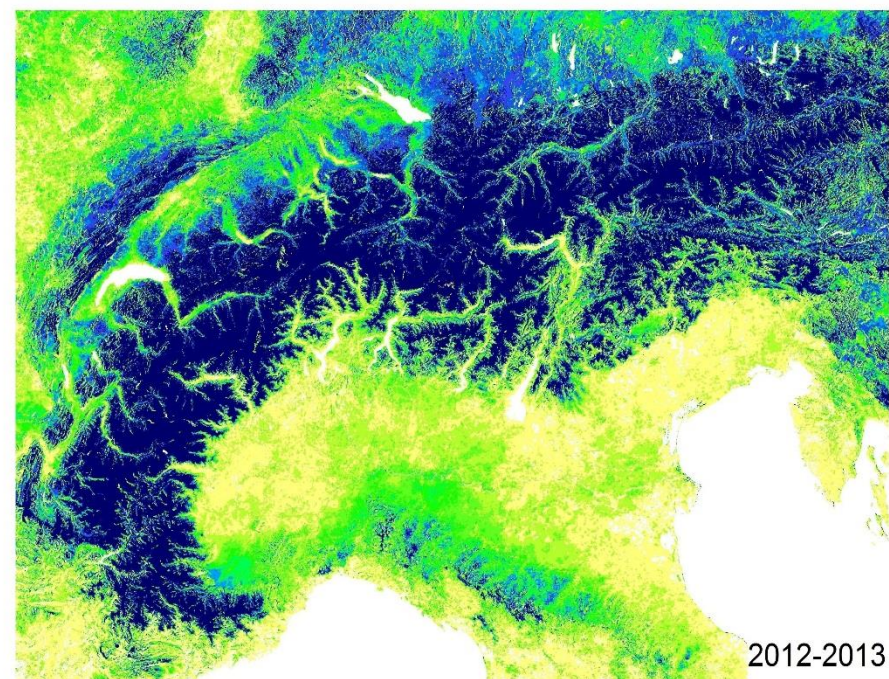
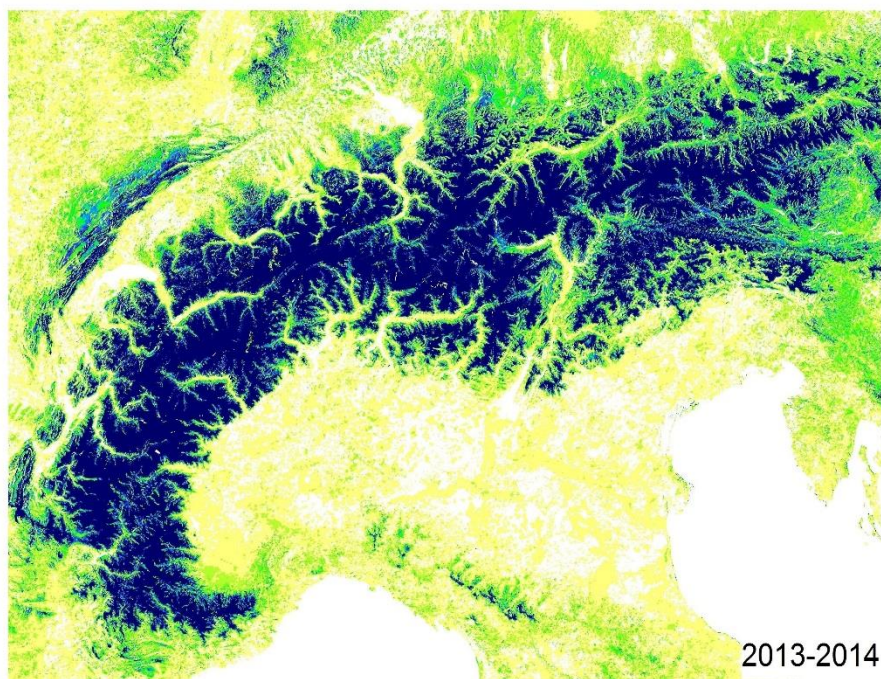




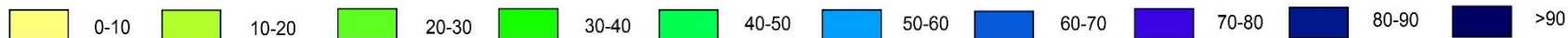


# Snow Cover Duration (credits:EURAC)

The Snow Cover Duration (SCD) have been calculated as number of snow days during the hydrological year for each pixel.

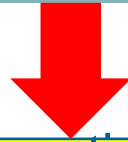


Snow Cover Duration (days)





## Recommendations: EO and in-situ data



“The evolution of ecosystems properties over time can be described using simple math. response functions and the better these functions can be described, the greater insight ecologists can draw about ES dynamics”  
( Kennedy et al., 2014; Front Ecol. Env. 12 (6))

- **Actually abrupt changes of state can mainly be detected at VHR (<4m): only *step functions can be provided.***
- **Sentinels (10-30-60m) data can improve the approximation of such functions.**
- **But for detecting changes and trends archive data are needed**

ECES, FAO and Google have recently established an agreement for global EO mapping): an updated EU-CORINE map will be provided in 2015: can we solicit the collection of in-situ data according to different taxonomies for facilitating taxonomy translations?

- *Protocols for accuracy-uncertainty estimation*





# Recommendation: activation of the ESA DATA Wharehouse 2014-2020 for Biodiversity and ES monitoring from SPACE

ESA UNCLASSIFIED - For Official Use



**esrin**

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00044 Frascati  
Italy

## DOCUMENT

Copernicus Space Component Data Access Portfolio: Data  
Warehouse 2014 - 2020



- person falling within (1) or (2), such as a contractor of a public authority;
- Any research and academic organisation;
  - Contractors of such entities.



This project is funded by the  
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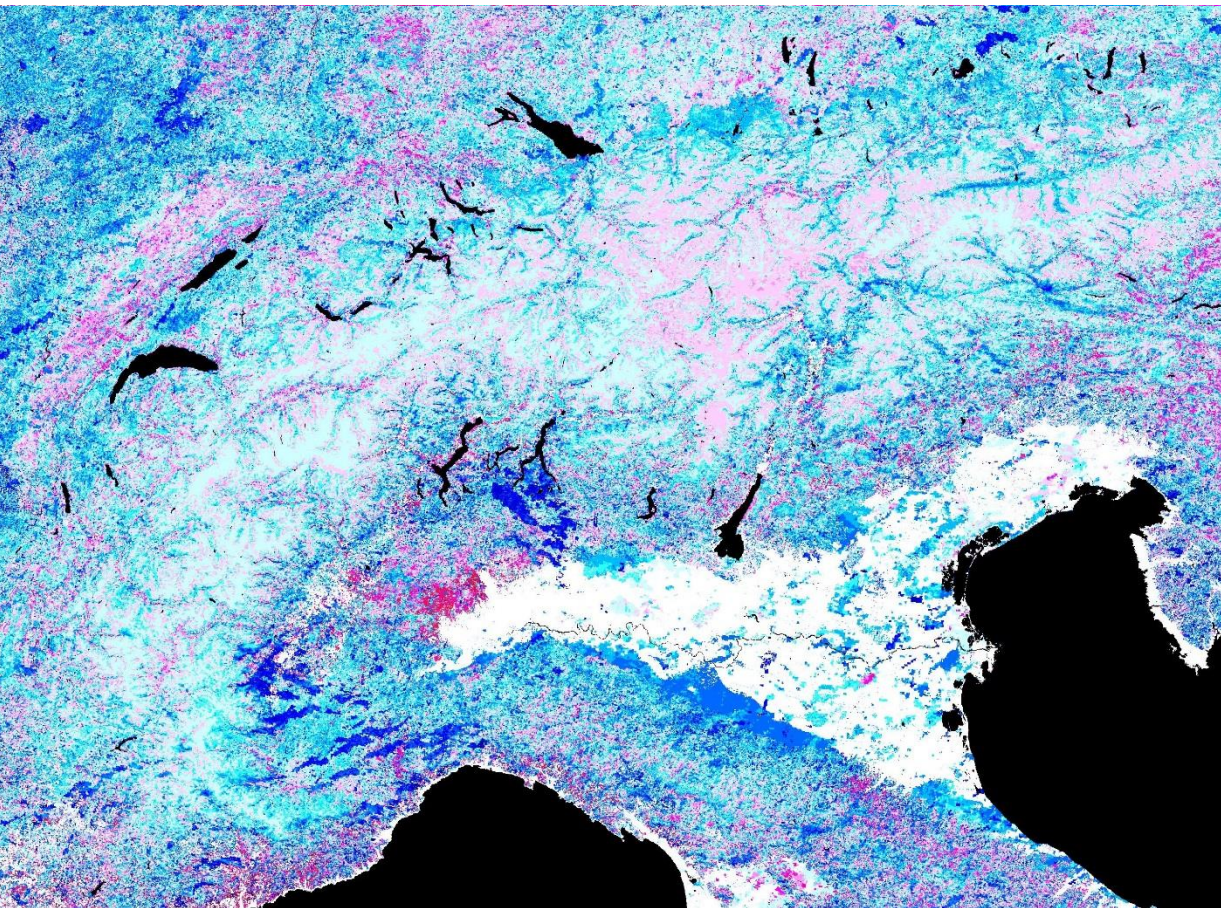
ESA EO BON Stakeholder Roundtable  
10th – 11th December 2015, Granada, Spain



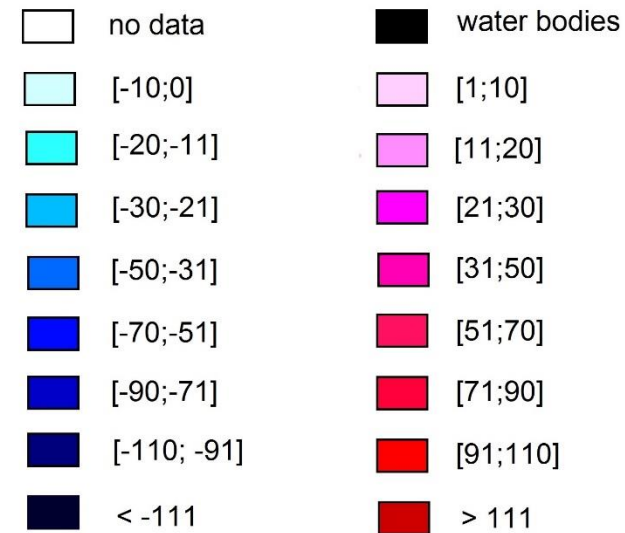


# Snow anomalies (credits:EURAC)

The anomalies of first snow fall (FSF) day and last snow day (LSD) have been calculated for all hydrological years (1<sup>st</sup> October - 31<sup>st</sup> September of the following year) from 2002 to 2014 as difference between the average value over all years and the yearly value of FSF/LSD of each pixel.



**First snow fall anomalies 2010-2011**





# Canopy water content (SAR) (credits:CESBIO)

**Availability:** N/A

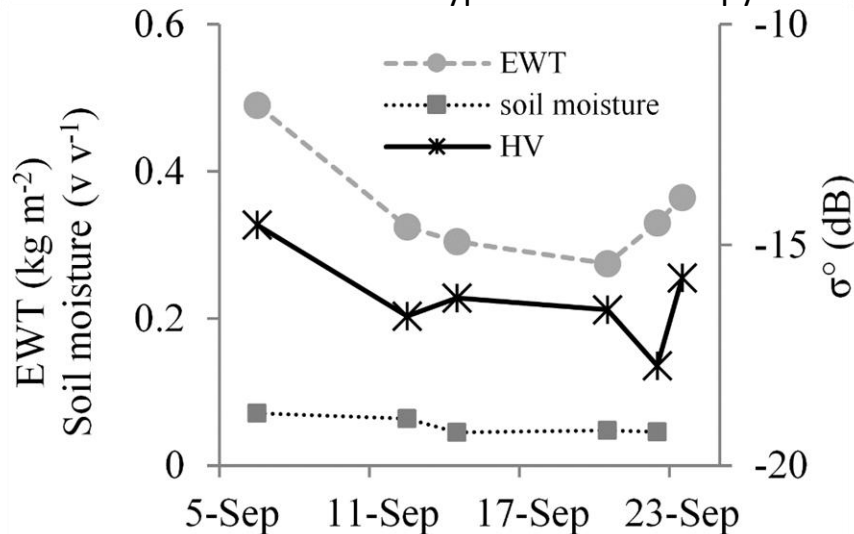
**Proposed sensors:** Sentinel 1

**Method:** time series analysis (pending further development and calibration using in situ data @ Montado and Peneda-Geres PAs)

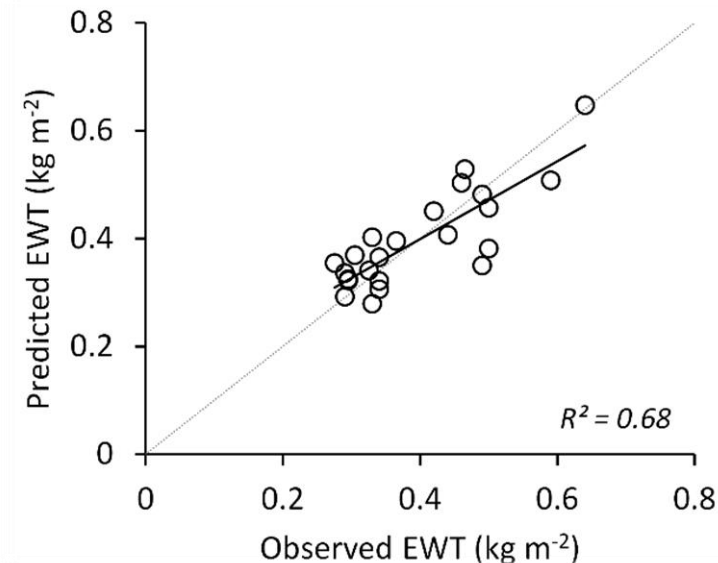
**Product characteristics:** 50-100m resolution

Example in Australia with airborne SAR (PLIS):

Temporal trend of SAR and Equivalent Water Thickness (EWT)  
from L-band airborne SAR – cypress forest canopy



EWT retrieval (empirical modelling)







# LC and habitat maps: *expert knowledge to fill the gaps between different domains*



**WorldView2 (WV2) Pre\_P1 (March)**  
B7,5,2 (NIR1, Red, Blue)



**WV2 Peak\_P1 (July)**  
B7,5,2 (NIR1, Red, Blue)

Port Bog, Southern WALES



# WorldView-2 Time-series (UNSW)



WV2 Pre\_P2 (March)  
B7,5,2 (NIR1, Red, Blue)

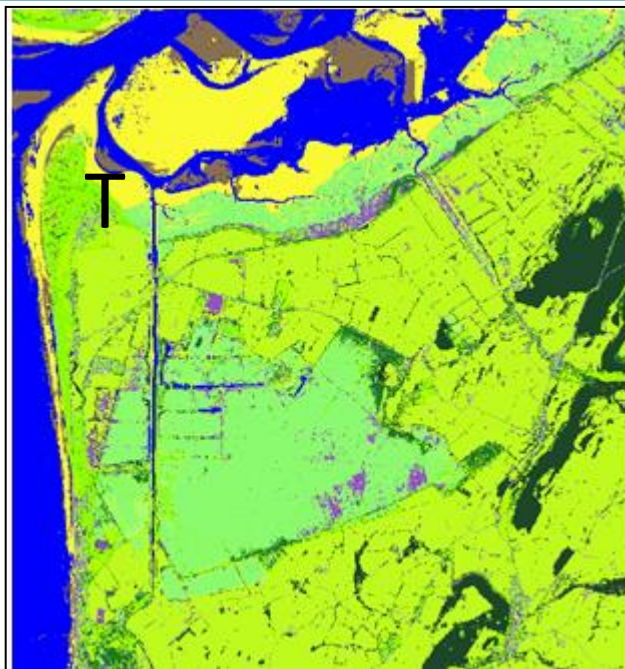


WV2 Peak\_P2 (July)  
B7,5,2 (NIR1, Red, Blue)

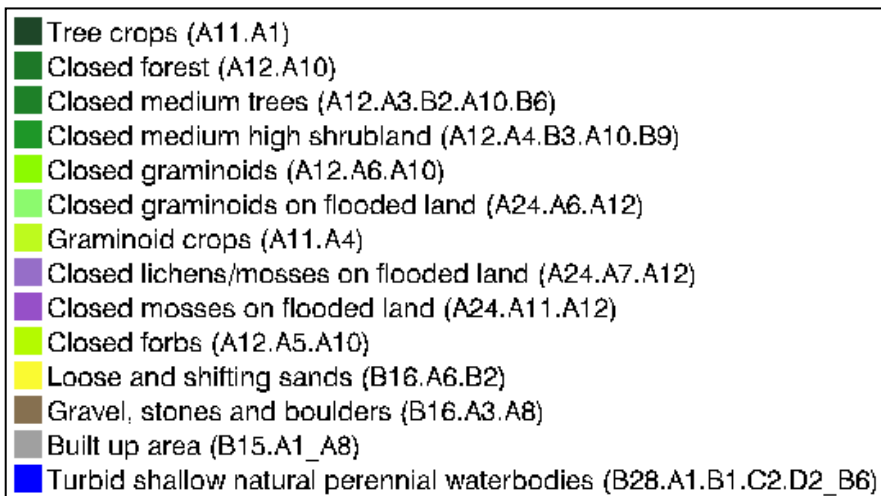




# LC maps: *expert knowledge to fill the gaps between different domains*

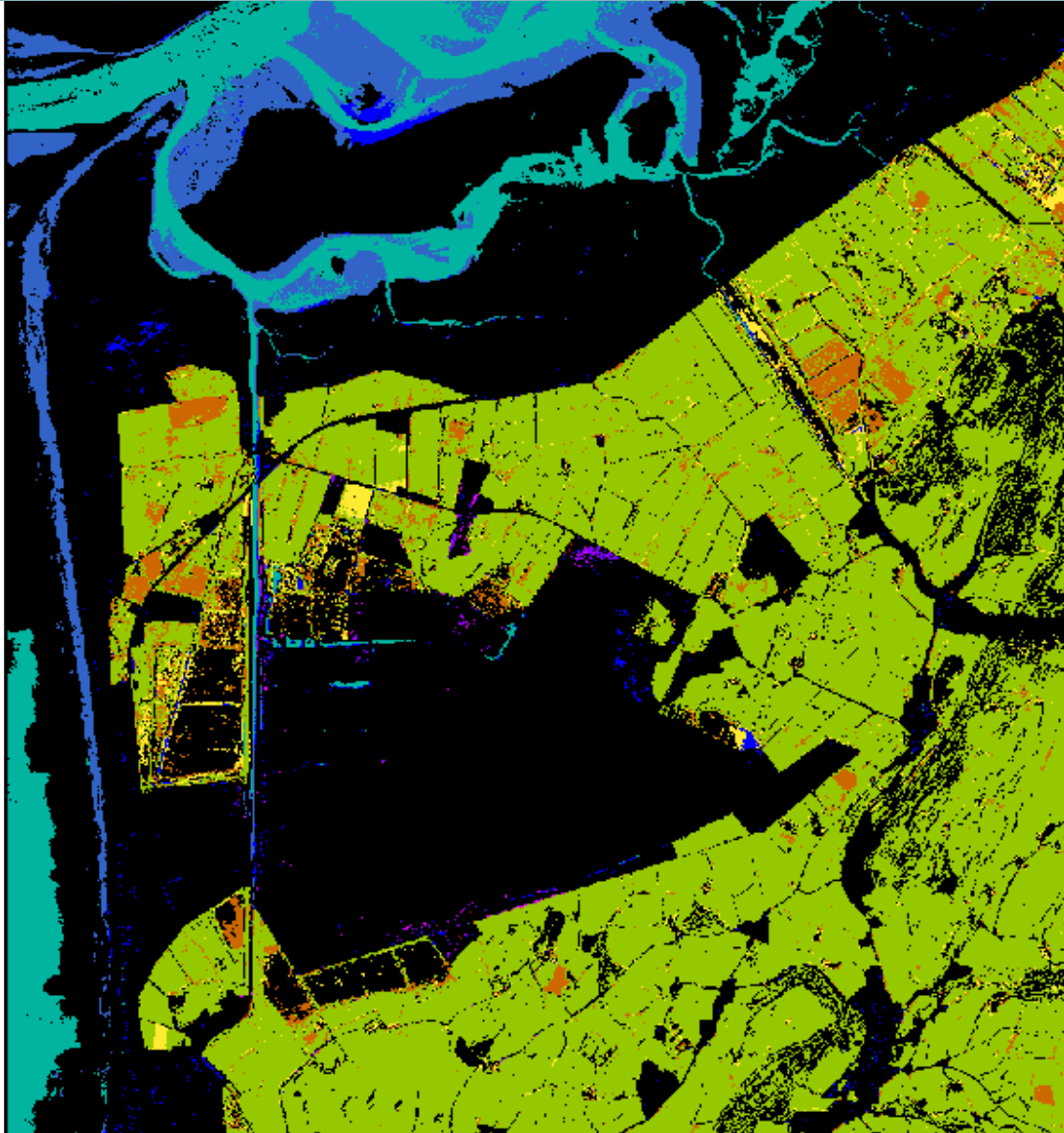


*L4 classification for T1 (left) and T2 (right)*





# LC change map: *expert knowledge to fill the gaps between different domains*



## *Change events*

- Flooding
- Tidal inundation
- Turbidity
- Agricultural expansion
- Agricultural decline
- Cropping
- Deforestation
- Woody shrub decline
- Encroachment of shrubs onto grassland



# CLC3

## 4.2.1 - Salt marshes

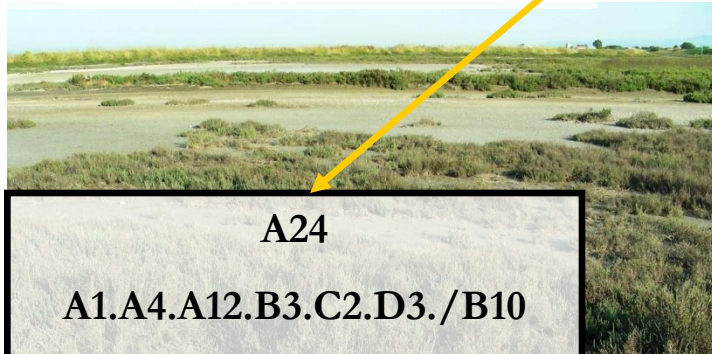
Annex I 1410



Annex I 7210



Annex I 1420



A24

A1.A4.A12.B3.C2.D3./B10

A24

A2.A6.A12.B4.C2.E5/B11.E6

Perennial closed tall grasslands  
on temporarily flooded land



ANNEX I	Lithology-Parent material	Soil sub-surface aspect	Water quality	Floristic attribute
1410	Unconsolid- Clastic sedimentary rock - Sand	Solonchaks	Brakish/Saline water	Juncus spp.; Carex spp
7210	Calcareous rock - Calcarenite	Histosols	Fresh/Brakish water	Cladium mariscus