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Habitat Mapping & Quality Monitoring: Insights from the Biodiversa+ Habitat Pilot

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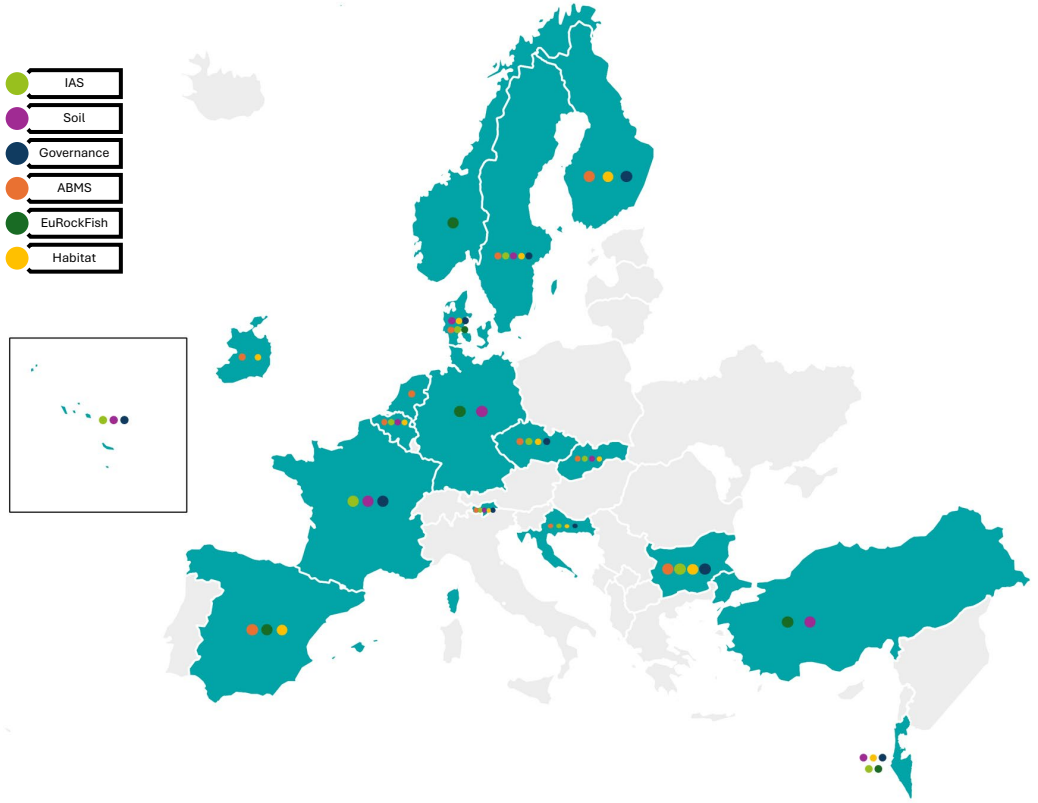
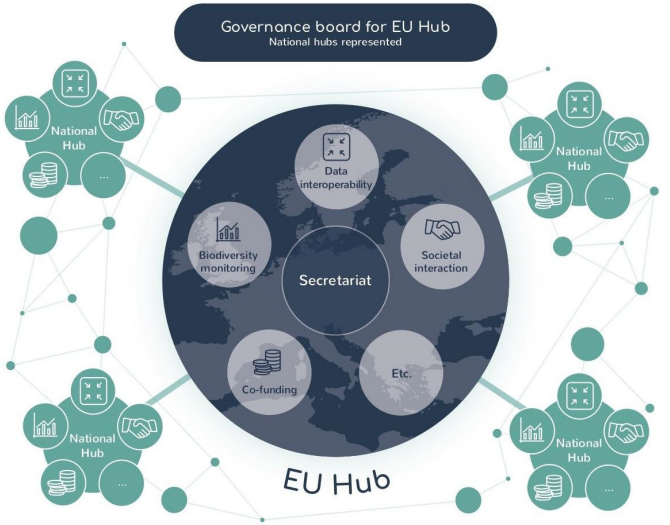
Biodiversa+ aims to establish a network of transnational long-term biodiversity monitoring schemes

Establishing the networks (B+ pilots)



Establish coordination models



i.e., EBOCC and National BOCCs

Demonstrate network benefits

- Comparability and scalability
- Resource optimization
- Policy alignment
- Cross-Border solution

Identify alternative funding mechanisms

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Co-funded by the European Union

800 M €	165 M €	83	41
Overall budget	EU Contribution	Partners	Countries

Biodiversa+ Pilot- Mapping and Monitoring of Grasslands and Wetlands using Remote Sensing Methods

11 countries

Main aims

- Evaluating capacity of remote sensing methods to map and monitor grassland and wetland habitats
- Assess current RS methods[1] and support development of harmonised monitoring protocols for the EU
- Capacity building

Usability of RS tools in various conditions

- Providing validation for EU Grassland Watch
- Mapping grasslands using RS- and GIS data
- Novel tools for accurate habitat mapping: NaturaSat using Sentinel, UAV and orthophoto data and machine learning
- Indicators and time series of conditions
- Developing EO tools for fine-resolution habitat structures & changes

Pilot partners: Autonomous province of Bolzano (Italy), Catalonia (Spain), Bulgaria, Croatia, Denmark, Finland, Czech Republic, Ireland, Sweden, Slovakia, Flanders (Belgium)

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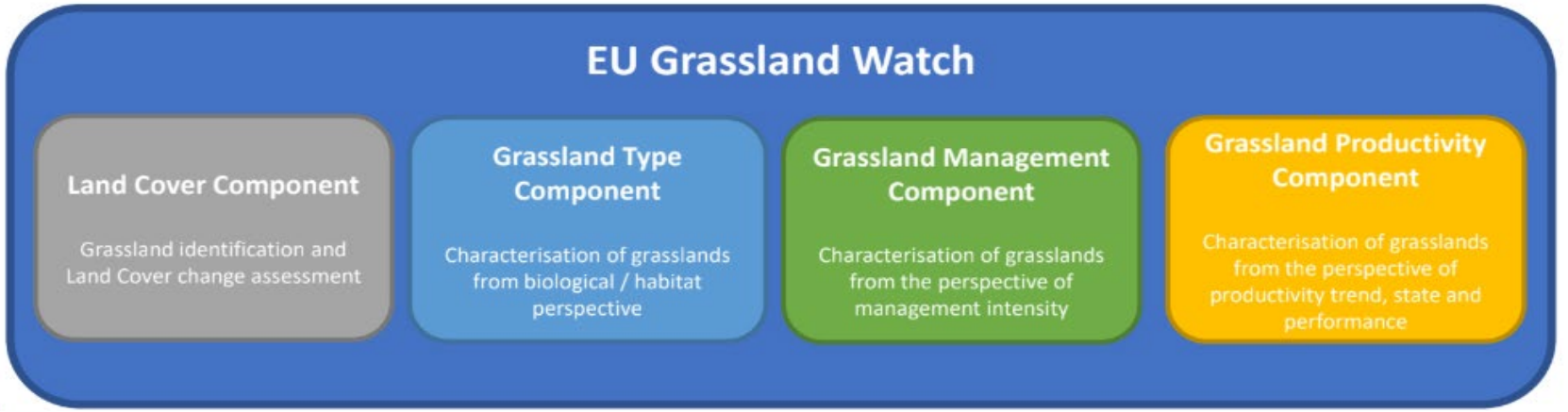
1. Habitat pilot review of RS methods. PM.

Providing test beds and validation sites for EU Grassland Watch



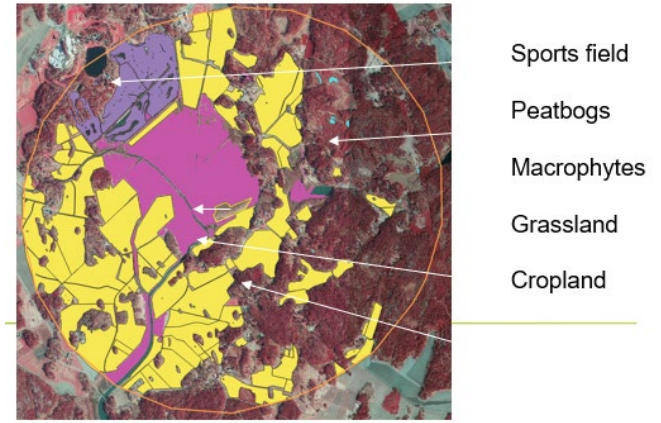
EU GRASSLAND WATCH

https://ec.europa.eu/eu-grassland-watch/

- ✓ Validation of EU GW outputs in prototyping N2000 areas with high resolution datasets from pilot partners (vegetation maps, management data, etc)
- ✓ Comparison of EU GW outputs with other classification and quality indicator workflows tested in the Habitat pilot
- ✓ Assessing added value for current quality monitoring workflows (N2000 monitoring, NRL etc)
- ✓ Where data allows, validating temporal changes in showcase N2000 grasslands

Mapping open grass-featured habitats using RS- and GIS data

Evaluating feasibility of RS and GIS-based methods in mapping grassland habitats, in separation of semi-natural grasslands from other open grass habitats, testing potential of finding “new” grasslands or abandoned croplands with potential for restoration



Key data sets

- *In situ* polygons for semi-natural grasslands (EUNIS R1 + R2), other types (e.g. artificial grasslands, transitional woodland)
- *Sentinel-2:* Yearly reflectance mosaics & statistical seasonal features from NDVI (monthly composites), vegetation phenology & productivity
- *Sentinel-1:* Monthly growing season composites
- *Digital Elevation Model, Aerial orthophotos*

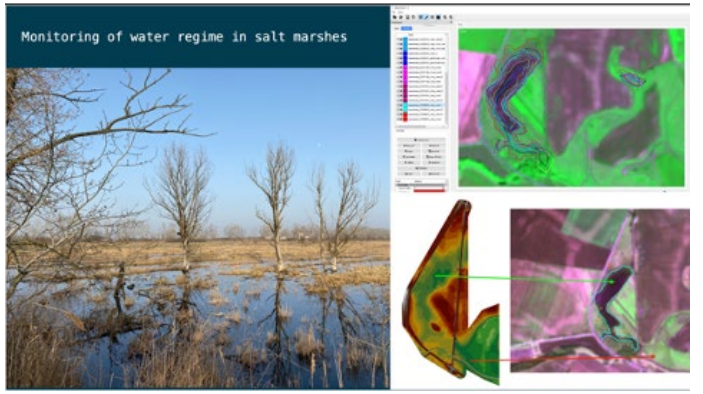
Methods

- Use existing GIS data to exclude non-focal areas
- Collection of training and validation points from GIS data
- Process RS and GIS data, build the datacube, extract values for points
- Build Random Forest classification model: feature selection, predict, assess model performance and feature importance

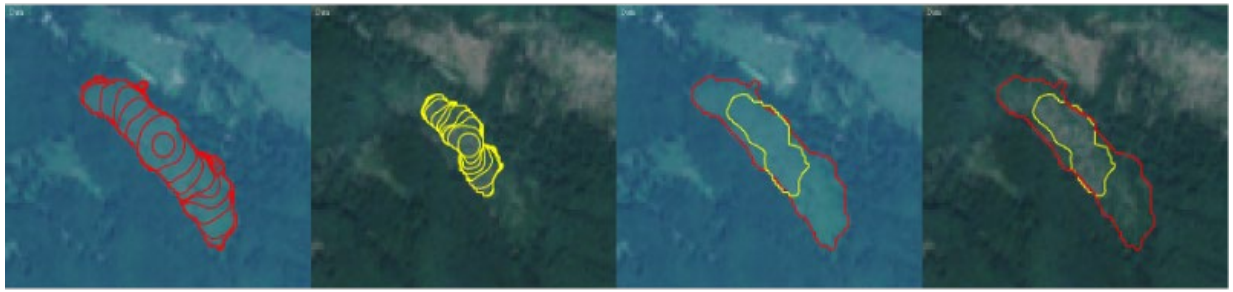
Novel tools for accurate habitat mapping: NaturaSat using Sentinel, UAV and orthophoto data and machine learning

Objective: to prepare accurate maps of habitats and to monitor their change in area and quality

Input data: Sentinel-2 data / UAV data / orthophoto / historical maps



Results expected: exact maps with pixel accuracy, relevancy maps of habitats, detected changes for habitat quality and extent, identification of wetland water regime, identification of historical river branches, diversity hotspots identification, etc



Constraints: large training dataset is needed for habitat automatic identification. Historical maps must be transformed with correct topological changes.

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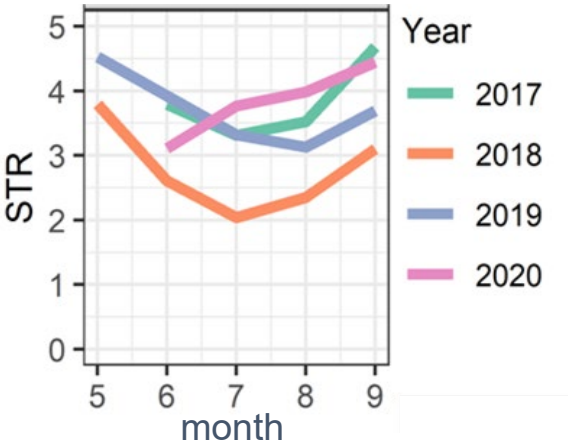
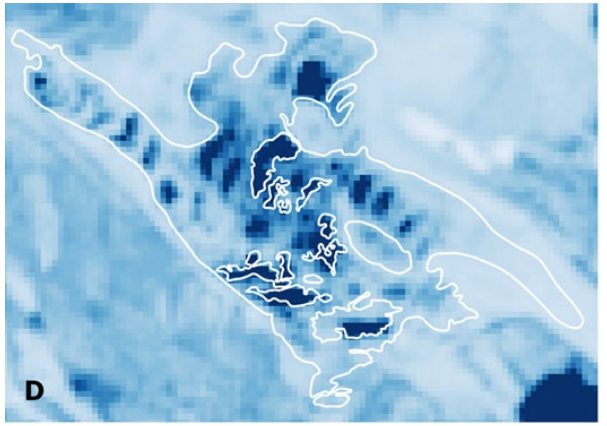
From time series to condition indicators- wetland hydrology

- Developing approaches for monitoring hydrological condition in wetlands
- Goal is to define a set of hydrology indicators from open Sentinel data
  - Considering…
    - Dynamic nature of wetland hydrology
    - Challenges of satellite data: resolution limits in small size wetlands etc.
    - Applicability of methods in multiple wetland types in different regions
  - Similar metrics can be used for various water-dependent habitat types around Europe, with habitat-specific indicators and thresholds
  - Capacity building: utilizing Copernicus cloud computing services to produce statistical time series of moisture and water-cover extent for habitat polygons
- Validating various water-cover classification algorithms in different permanently/seasonally inundated wetland types around Europe





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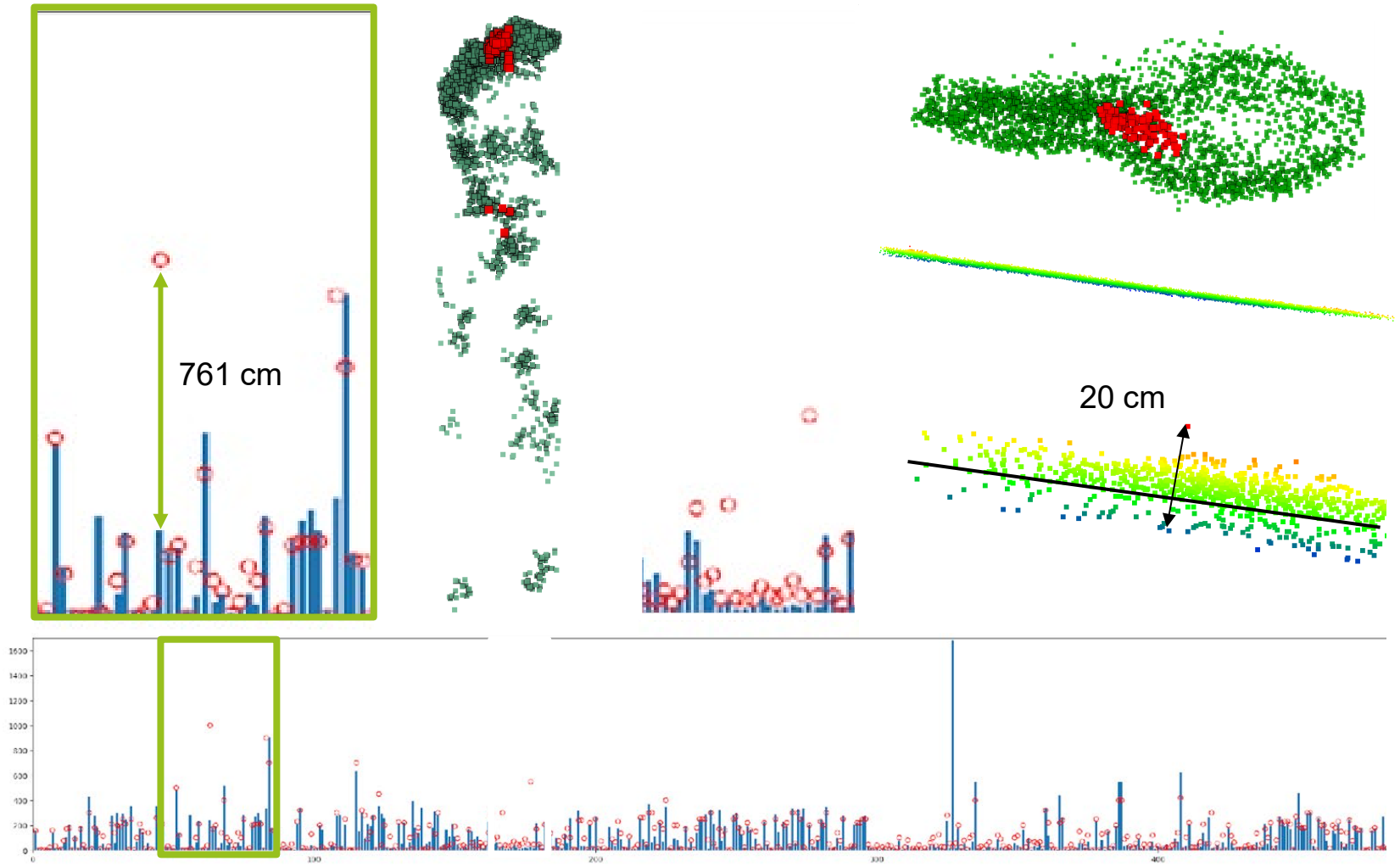
Developing EO tools for fine-resolution habitat structures with drone analysis

Discrepancies between raw lidar (blue bar) and measured (red dot)
Use deep learning to better predict vegetation height from raw lidar point cloud



Field-measured (red circles) vs. vegetation heights directly derived from drone lidar (blue bars)

Graphics by Agata Walicka

Aim: Habitat condition assessment from vegetation height and cover, in cooperation with Mambo project.

Method: UAV borne lidar and machine learning/deep learning

Output: raster of vegetation height and cover in 20-100 cm resolution
Can be used for:

- everyday practical management
- track structural changes, e.g. encroachment
- assess habitat condition for reporting to the EU

Advantage:

- Very high-quality data with high precision
- Scalability

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EUROPEAN PARTNERSHIP

Co-funded by the European Union

Key recommendations for future work
Facilitate:

- long-term networks & cross-sectorial cooperation
- products fit for policy on appropriate scales, local, regional, country, EU, global
- trans-national co-designed of in-situ and RS observation network

Thank you!

Main contacts for habitat pilot: Co-led by the
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More information: https://www.biodiversa.eu/biodiversity-monitoring/pilots/