WETLAND FUNCTIONAL ASSESSMENT

Hydrological, biogeochemical and ecological wetland functions can be assessed using Earth Observation data and multi-criteria analysis to meet the challenges of wetland management and conservation.

The challenge

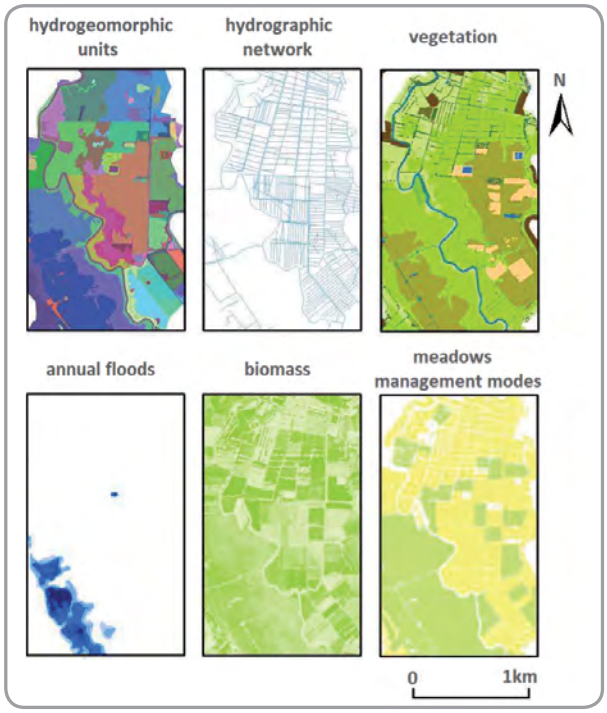
Wetlands have hydrological, biogeochemical, and ecological functions that are widely recognised. Traditionally, functional assessment approaches have been based on field observations, and therefore, have been limited to sites of a few hectares. However, some processes, such as nutrient fluxes that influence water quality, need to be considered on a catchment scale. Earth observation data represent a potentially practical and economically suitable tool for extracting functional descriptors of wetlands.

The space based solution

Wetland functions are differentiated into spatial units accounting for multiple criteria extracted from various spatial data source. These wetland-related geographic information system layers are derived from Earth observation data available on a fine and large-scale making this method reproducible on any other study sites. The spatially-explicit criteria used to map these functional indicators are the following: a map of the hydrogeomorphic units, a hydrographic network map, a vegetation map, a map of annual floods duration, a map of biomass production, a map of the meadows management modes and finally a map of the external limits of the wetlands All these maps can be derived from airborne-based and/or space-based solutions such as Lidar and stereoscopic data, optical and radar time-series from which vegetation indices are extracted for instance. All these maps express the controlling variables that determine the functional performances of the wetlands for various ecosystems services. They are then combined using multi-criteria analysis to evaluate the overall functional assessment of wetlands.

Benefits to Citizens

Most of the described data are freely available, which is of great interest for managers. Mapping of hydrological, biogeochemical, and ecological wetland functions over large areas is an efficient tool for policymakers and other stakeholders including water authorities, nature conservation agencies, and farmers. To date, the feedback received from managers highlights the usefulness of European Functional Assessment Procedures (PROTOWET, EVALUWET) in mapping and simulating ecosystem functions across different scenarios; this facilitates compromises amongst the stakeholders. Furthermore, these maps have enabled a characterisation of the functional connections that are present at catchment level, and



GIS layers derived from Earth observation data that were used to characterize the wetlands examined; Couesnon marshes, Brittany, France.

Thematic Area: BIODIVERSITY AND ENVIRONMENTAL PROTECTION

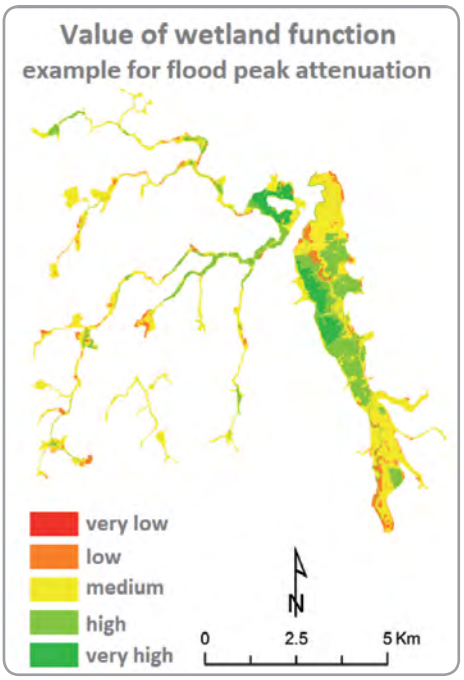
Region of Application: BRITTANY

Sentinel mission used: S2

Copernicus Service used: –

Usage Maturity Level: 3

this has led to the objective identification of sites that qualify for restoration or compensation measures under the Habitats and Water Framework Directives of the European Union. Specifically, this tool has the potential to provide a mapping of ecosystem services, conservation management priorities, and possible improvements in water resources management.



Map of wetland functions at the catchment scale. Example for the Flood peak attenuation; Couesnon marshes, Brittany, France.

> "This application has transformed the way we manage the public land of Sougéal marshes for biodiversity and conservation issues."
>
> ***Aurélien Bellanger, Communauté de Communes du Pays de Dol et de la Baie du Mont-Saint-Michel***

Outlook to the future

Lately, preliminary tests using cost-free Sentinel-1/2 time series pointed out that this data could improve the result. Specifically, multispectral Sentinel-2 data provide a more detailed characterisation of vegetation at the level of plant associations, whilst SAR Sentinel-1 time-series are relevant to accurately monitor surface water extent. Thus, Sentinel data should lead to the development of finer descriptors related to soil properties, such as moisture content or nutrient concentrations.

Acknowledgements

This study was supported by the Zone Atelier Armorique programme (CNRS), KALIDEOS Bretagne (CNES). We are also grateful to local authorities (Communauté de Communes du Pays de Dol et de la Baie du Mont-Saint-Michel) and water managers (SAGE Couesnon).

Laurence Hubert-Moy [1], Sébastien Rapinel [1], Eric Pottier [2], Cendrine Mony [3] and Aurélien Bellanger [4]
1. UMR LETG 6554 CNRS, France
2. UMR IETR 6164 CNRS, France
3. UMR ECOBIO 6553 CNRS, France
4. Communauté de Communes du Pays de Dol et de la Baie du Mont Saint Michel, France
Email: laurence.hubert@univ-rennes2.fr

ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication "**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**", 2018, Edited by NEREUS, the European Space Agency and the European Commission.
The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains.

Funded by the European Union, in collaboration with NEREUS. Paging, printing and distribution funded by the European Space Agency.