

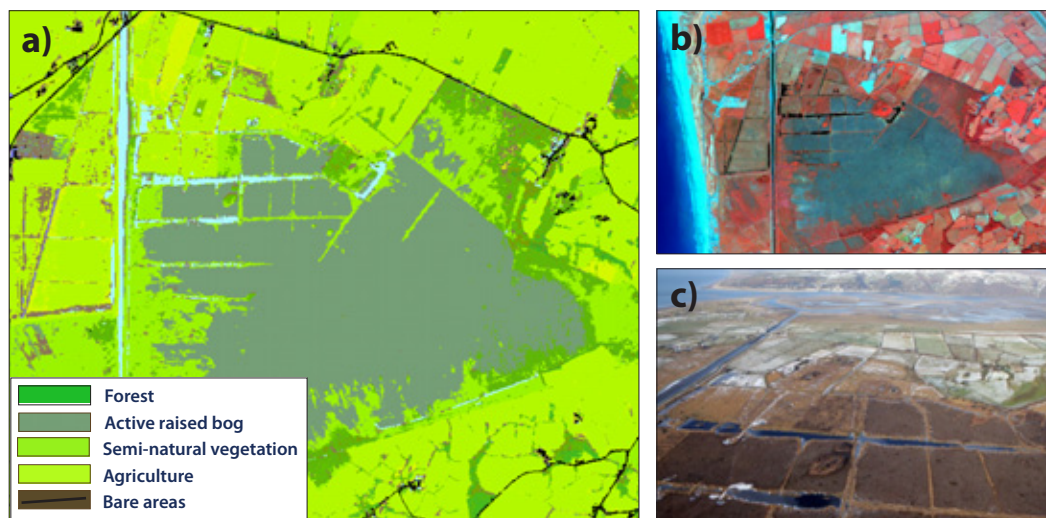
FROM SPACE TO SPECIES: MONITORING BIODIVERSITY



Biodiversity is the measure of the variety and richness of life on Earth. Europe hosts a unique set of natural diversity, including hot spots such as the Mediterranean Sea and the Alps. However, pressures resulting from population growth, agricultural activities, invasive species, urbanisation, climate change and many other factors are causing degradation to ecosystems and a decline in biodiversity. The European landscape is also increasingly fragmented by infrastructure, which blocks migration and divides species in unsustainably small populations. In 1992, with the aim to assure the long-term survival of its most valuable and threatened species and habitats, the EU Habitats Directive established a network of protected sites all over Europe called "Natura 2000".

Copernicus offers satellite-based monitoring services to support the sustainable management of protected areas and safeguard ecosystems.

Although satellites cannot measure biodiversity as such from space, the data they deliver are extremely useful and effective in mapping environmental change, observing trends, building inventories and calculating indicators of fragmentation, acreages and corridors – all of which are vital for safeguarding ecosystems and preserving the range of species they support. Besides monitoring the disruption of natural habitats, satellite imagery helps to focus conservation and restoration strategies, thereby improving the effectiveness of biodiversity policies and management programmes. This kind of monitoring is generally based on high to very-high resolution multispectral satellite sensors. However, investigations are being made into complementary techniques using instruments such as radar and lidars.



The main image a) shows the classification of general habitat categories in Cors Fochno, Mid Wales, generated using b) multi-temporal WorldView data. In c) an aerial photography of the bog in Cors Fochno is shown. The peat land complex of Cors Fochno (also known as Borth bog) lies within the estuarine floodplain of the Afon Dyfi and comprises one of the largest raised bog in UK and the most expensive tract of primary (un-cut) bog in lowland Britain. For this reason Cors Fochno is part of the NATURA 2000 network.

Source: BIO_SOS; image a) processed by Dr. Richard Lucas, University of Aberystwyth; image b) WorldView; image c) provided by Toby Driver, RCAHWW

Facts

In Europe, 42% of mammals, 15% of birds and 45% of butterflies and reptiles are considered endangered. The EU aims to halt the loss of biodiversity within its borders by 2020.

Natura 2000 is the cornerstone of the EU's nature and biodiversity policy, and

- > identifies some 200 habitat types and 700 species of plants and animals of community interest
- > protects 26 000 sites, which accounts for about 18% of the EU's land area
- > generates an income of €50 to €85 billion per year

Benefits



Satellite-based data

- > supports European, national and local authorities in monitoring the state of European habitats
- > supports research, monitoring and assessment of biodiversity

Policy Objectives

- > The Habitats Directive
- > Strategic Plan for Biodiversity
- > EU Biodiversity Strategy for 2020
- > United Nations Convention on Biological Diversity
- > Ramsar Convention on Wetlands

Copernicus services

The Copernicus Land Monitoring Service uses satellite data to provide regular geospatial information on habitats and ecosystems, thereby supporting sustainable management of protected areas and endangered species.

Example products:

- > Very-high resolution hot spot monitoring for biodiversity along riparian and Natura 2000 areas
- > High-resolution datasets at European scales for forest, agricultural areas, water, wetlands and small water bodies
- > Biophysical variables at a global scales, including state of vegetation, energy budget and water cycle

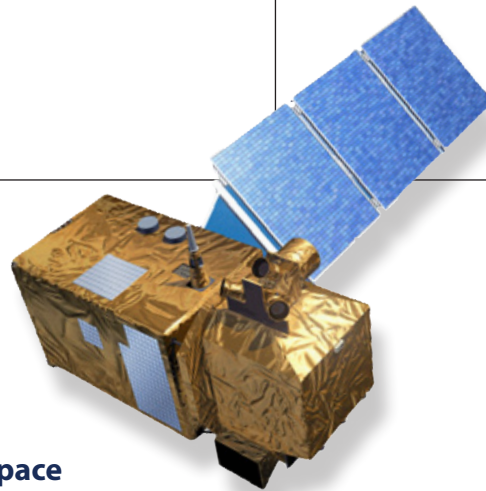
Sentinel contribution

The Copernicus Sentinel-2 mission will support active biodiversity monitoring by:

- > delivering 10 m spatial resolution optical images all over the globe
- > guaranteeing consistent time series, to follow vegetation phenological cycles throughout the year
- > allowing the monitoring of rapid changes over large areas with the increased swath width and the short revisit time of 2 to 5 days

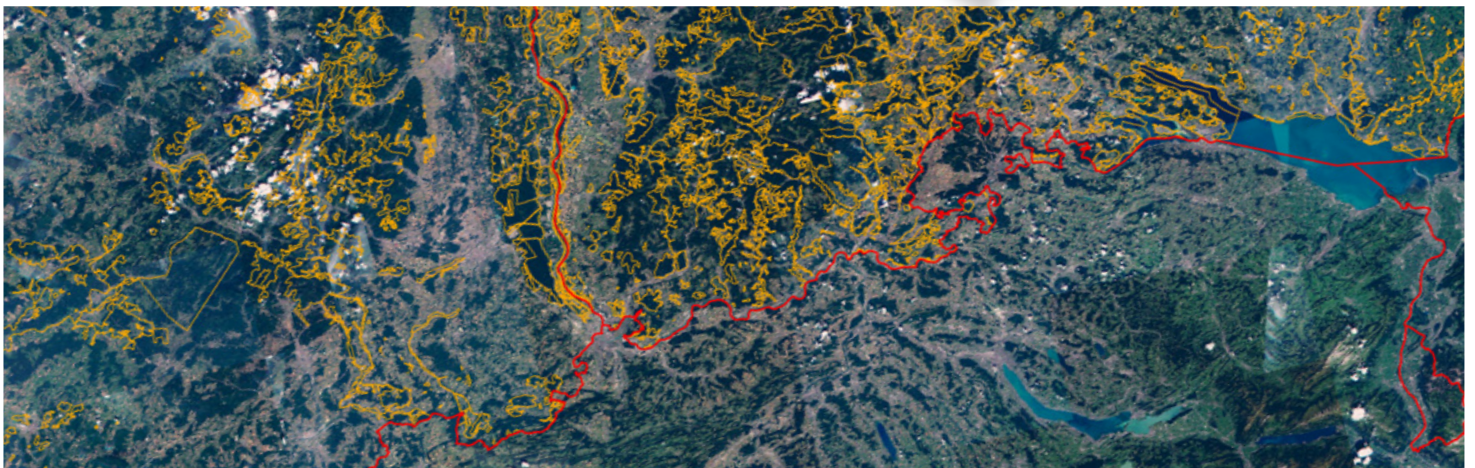
Next steps

- > Improve EO capabilities and harmonise observation systems for habitat monitoring
- > Improve data interpretation methods to monitor changes and disturbances of protected areas
- > Enhance international cooperation on satellite-based biodiversity monitoring
- > Integrate EO products and in-situ products into operational activities of those institutions that are in charge of monitoring biodiversity



Sentinel-2

High-resolution optical habitat monitoring from space



This is a model of the high-resolution images that the future Sentinel-2 mission will deliver with a resolution of 10 m per pixel over a large swath of 290 km. The image has been obtained by composing 82 observations acquired from the German RapidEye satellites, a Copernicus contributing mission. The image shows parts of Switzerland, southern Germany and eastern France, and includes a small part of Austria and Liechtenstein. It covers various Natura 2000 Alpine sites (orange).

Source: EEA; Background image: ESA based on RapidEye

The forthcoming Sentinel-2 mission will provide high-resolution optical information at 10 m (4 bands), 20 m (6 bands) and 60 m (3 bands) with a swath width of 290 km. Together with its twin satellite it will cover the Earth's surface with a repeat cycle of 2 to 3 days at mid-latitudes and 5 days at the equator. The increased swath width along with the short revisit time allows rapid changes in ecosystems to be monitored. Therefore, it is ideally suited to monitor sensitive habitats.

In particular, data from Sentinel-2 will be used for the generation of high-level operational products, such as land cover and land cover change detection maps. The first Sentinel-2 satellite is due to be ready for launch in 2014, with the constellation's second satellite to be launched shortly afterwards.