Earth Observation for Habitat and Feature Mapping

Earth Observation has been used successfully for a variety of environmental monitoring purposes. This document presents case studies on landcover mapping, the detection of features such as hedgerows and the evaluation of change in the landscape.

Complexity

- Clear method and straightforward
- Clear method but complex
- Possible; needs research

Resource

- £ Low
- ££ Medium
- £££ High

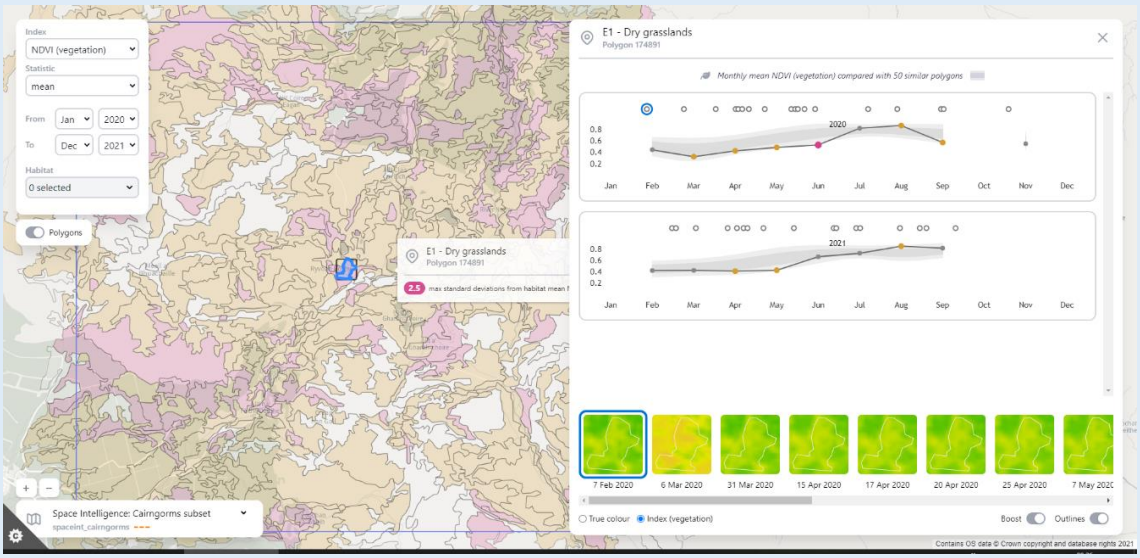
Case Study I: Change detection

JNCC have developed a decision-support tool which uses EO derived habitat maps and Sentinel-1 and 2 indices to highlight and track ground changes over time. The app informs site managers and policy makers about unusually high or low index values in an area and aims to support decisions on more targeted site visits and better allocation of resources. The tool currently holds data from 2018-2023 for all of England and a pilot area in the Scottish Cairngorms and is therefore suitable to monitor abrupt events such as flooding, or a hay cut as well as long term changes such as habitat restorations.

The method is based on the generation of vegetation indices which highlight habitat properties such as vegetation greenness or water content. Time series data of different indices can be compared to better understand the type of change that has been detected in an area. Feedback from site managers and habitat experts has already helped to develop the app but further testing with ground experts is required to better understand how detected changes can be interpreted and linked to change on the ground. One limitation is caused by the scarcity of cloud free imagery, especially in winter. This could be improved by including commercial, high-resolution data into the analysis or by increasing the understanding of Sentinel-1 derived data which is more complex but freely available. Frequency of updates to the dataset is currently not known.

£££

A workflow for processing the required data is already in place but needs a small expert team to improve and maintain. Data storage and processing is already taking place in the JASMIN cloud environment and Amazon Web Services (AWS) which come with a small annual charge. Further charges will occur from the ESRI license which is used to make the outputs available to users in an online dashboard. Costs would increase if data with very high spatial resolution is purchased for this work only or if more complex data processing (e.g. coherence) is required to improve the method.



Case study I: Landscape evaluation tool

Further products and applications

Semi-Natural habitats/ saltmarsh mapping / bare ground mapping /eroded peatland mapping/ bracken mapping

Earth Observation for habitat and feature mapping

Case Study II: Landcover mapping

NatureScot and Space Intelligence use EO data to create nationwide, high resolution habitat maps at EUNIS level 2. The product is updated annually and is therefore suitable for providing insight into habitat changes over time. This can assist landowners and policy makers with land-use decision making such as the targeting of areas and habitats for restoration activities.

The method is owned by Space Intelligence and based on machine learning algorithms. Freely available Copernicus data alongside commercial high-resolution data and ground surveys are used as input for the classification. Research into the accuracy and error rates of the product is available and continuously fed into the method for improvement. Outputs are only available in raster format with 20m resolution which limits downstream applications. NatureScot are therefore investigating methods to vectorise the dataset for use in a wider range of applications.

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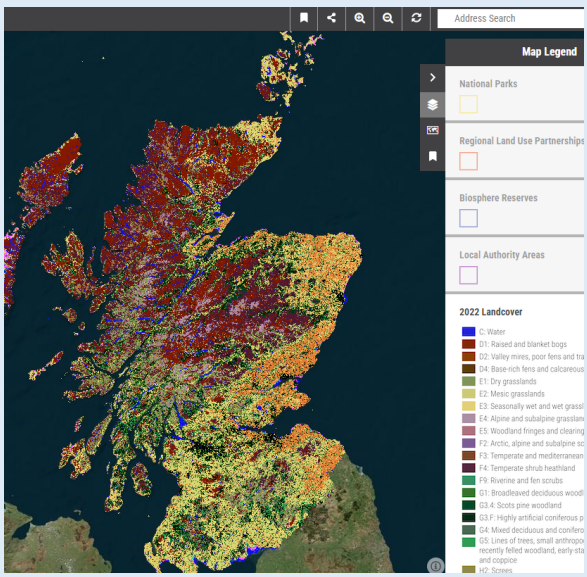
A workflow for processing the required data is already in place but owned by Space Intelligence who improve and maintain the method. Costs for annual map updates are not known. Similar methods for in-house generation of habitat maps are available but would require an expert team to implement and maintain. Additional costs would arise for data storage and processing in a cloud environment.



Case study II: Landcover map of Scotland

Case study III: OS hedgerow mapping

Case Study III: Hedgerow mapping

Ordnance Survey use high resolution aerial imagery alongside height information to map all hedgerows in England. The dataset is available as OS Landscape Features Layer and is updated regularly.

The method combines existing OS field boundaries with machine learning algorithms and is already used operationally for subsidy claims by RPA. Due to an automated workflow, mapping is repeatable and consistent, and the map is updated regularly. The product is currently only available for England and rollout to Scotland would require effort and an agreement with OS. Academic methods for in-house generation of hedgerow maps are available but would require significant effort and an expert team to implement and maintain.

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A workflow processing the required data is already in place but available for England only. Data storage and processing is hosted by OS and expanding the mapping to Scotland would likely come with medium to high costs and require an agreement. Once established, there would be a continuous licence fee for the use of the product.

Published: 2024-03. Reference to any specific product or entity does not constitute an endorsement or recommendation by JNCC or Scottish Government. Other products may be available.