Trial of innovative approaches to habitat mapping and assessment of condition on protected sites in Northern Ireland (NI)

Over recent decades significant changes in semi-natural vegetation are known to have arisen across NI landscapes. Further variations are anticipated due to climate change. Surveying the condition of large upland habitats in the field requires extensive resources - time, funding, and ecologists. This project investigates how Northern Ireland Environment Agency (NIEA) is using Earth Observation and other technologies in conjunction with ground-based monitoring data to improve habitat mapping and monitoring efficiency.

Data collected in the field for Garron Plateau ASSI/SAC, County Antrim

Blanket bog covers much of the Garron Plateau at an elevation of 330 - 380m representing the largest upland area of intact bog in NI extending over 4,650ha.

Common Standards Monitoring (CSM) is the UK wide recording scheme used to assess the condition of habitat features. In NI, upland CSM is undertaken every six years by recording specified habitat attributes within a series of 2x2m plots across a sample grid. This process was completed for the Garron Plateau in 2004, 2010, 2016 and 2023 by experienced ecologists.

- In 2023 survey effort was 65 team days at considerable cost.
- 476 habitat plots were recorded - 331 of them blanket bog.
- The potential of earth observation techniques to map broad habitat classes is currently being investigated with a view to reducing sampling density in the field together with aerial photography and drone imagery.

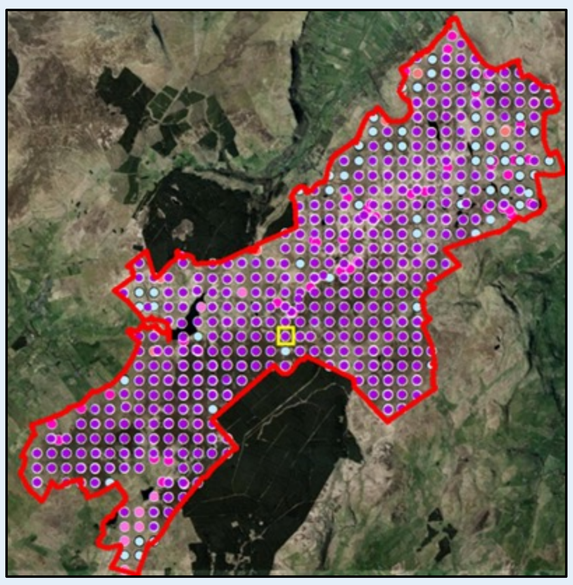


Image 1a) *Garron Plateau blanket bog plots from 2023 highlighting plot CA210*

Image 1b) *Photograph of plot CA210*

Field	Value
OBJECTID	5088
Shape	Point
ASSI_Name	Garron Plateau
Point code	CA210
Photo Number/s	MM6-9
Recorders	MM/MOH
NVC type	M17 Scirp ces-Erio vag
Peat depth (cm)	>100cm
Cutover	No
Dwarf shrub Height (cm)	9
% living dwarf shrub	10
% Calluna living	5
% Erica tetralix	0
% Myrica gale	0
% Calluna dieback	25
Other dwarf shrub?	Empetrum nigrum
Another other dwarf shrub?	None
% Narthecium ossifragum	2
% Graminoids	40
% Molinia_caerulea	0
% Bushy lichens	3
% Sphagnum cover	40
% Thick Sphagnums	10
% Thin Sphagnums	30
% Aquatic Sphagnums	0
% S. fallax/palustre	0
% All Other Bryophytes	10
% Racomitrium lanuginosum	0
% Hypnum spp.	8
% Open water	0
Permanent pool?	No
% Succisa pratensis	0
Succisa in 10x10m	Absent
Drosera spp	No
Eriophorum angustifolium	Yes
Eriophorum vaginatum	Yes
Menyanthes trifoliata	No
Potentilla erecta	No
Rhynchospora alba	No
Trichophorum spp	Yes
Schoenus nigricans	No
Leucobryum glaucum	No
Characteristic species	Campylopus atrovirens, Sphagnum capillifolium, S. cuspidatum, S. palustre
% Bare peat	0
% Campylopus introflexus	0
% Bracken	0
Dung in plot	Absent
Poaching in plot	Absent
Dung in 10x10	Absent
Poaching in 10x10	Absent
Uprooting of dwarf shrub	Absent

Image 1c) *Survey data for plot CA210*

Living Map of Northern Ireland

This project is working to produce a habitat 'probability map' at landscape scale. NIEA, in partnership with JNCC, has conducted scientific testing of an efficient, standardised method of mapping the extent of broad habitat classes and land cover types, based on a Natural England design model. In 2023 NIEA conducted a proof-of-concept 'test exercise', aiming to provide reliable, probability-based maps; utilising satellite imagery, field collected data, and a modern machine learning approach.

The Garron Plateau project used quality data from "boots on the ground" field surveys (as depicted in Images 1a-c) as training data to inform machine-learning algorithms on the typical characteristics of different habitats for the Living Map. CSM field data from across the NI Protected Site Network has been utilised, from 2010-2018.

The probability-based map outputs (below) also require access to these quality field survey records, as a means of determining, or 'ground truthing' the statistical accuracies of each habitat type mapped.

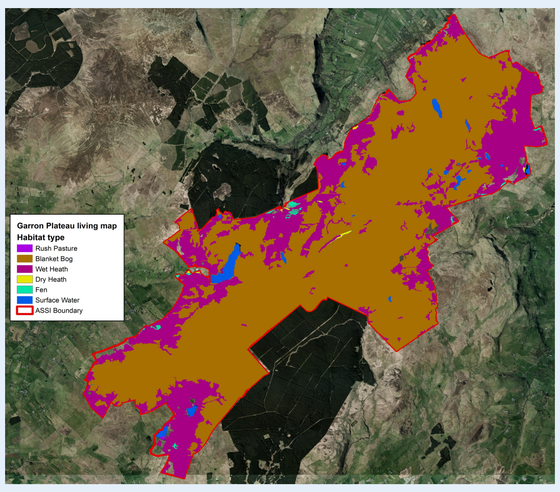


Image 2a) *Output of Living Map for the Garron Plateau 'unpublished based on 2018 satellite imagery'.*

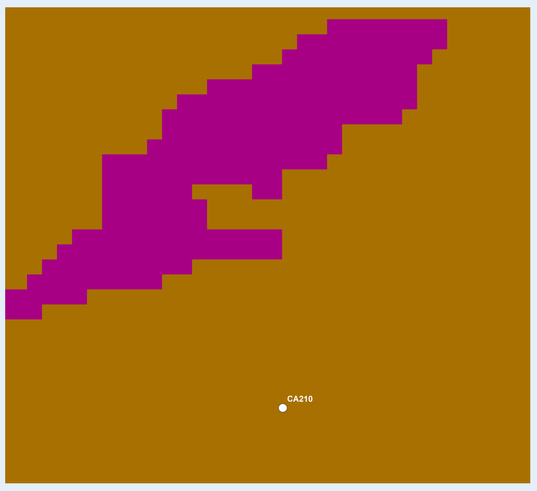


Image 2b) *Plot CA210 sits within a polygon that has an 81.4% probability of being an area of Blanket Bog.*

Output data from Living Maps

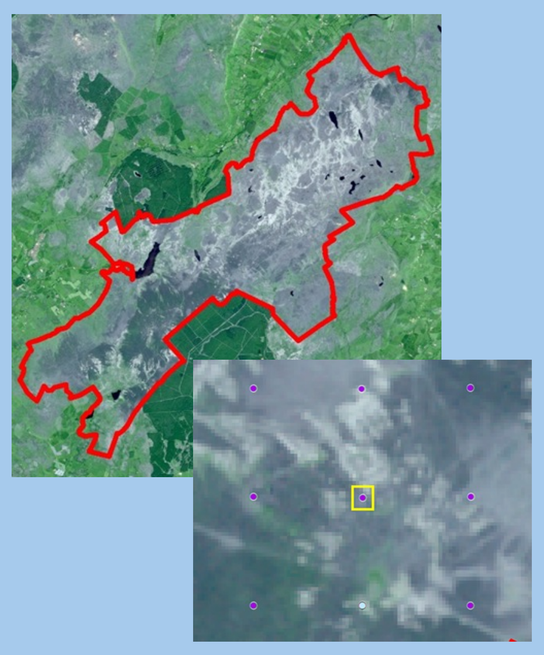
Field	Value
A Prediction	Blanket Bog
A Probability	81.4
B Prediction	Wet Heath
B Probability	15.9

Image 2c) *Living Map data table detailing habitat predictability information for CA210*

Lessons learned and recommendations made from this test exercise will be incorporated into a production phase project (development in 2024/25). This map will provide a comprehensive and current spatial model, a Living Map, which regularly records the extent of broad habitat classes and land cover types for Northern Ireland to help inform environmental policy decision making, measure national habitat extent and facilitate connectivity assessments for targeting nature recovery.

Earth Observation Data

Copernicus Satellite Imagery

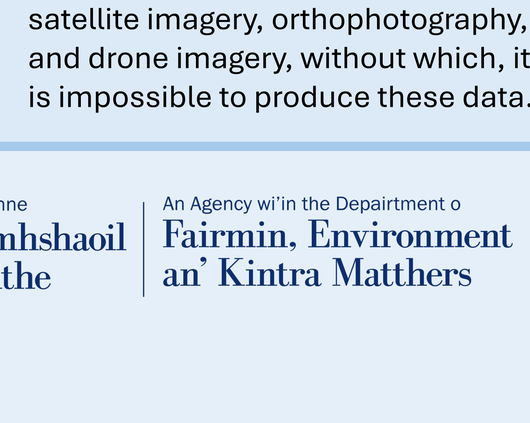


- Through the concept of a Living Map for NI, EO data can produce a blanket bog probability map with > 80% accuracy.
- However, provides only limited detail on habitat condition.

Orthophotography Aerial Maps

- Aerial photography provides a scale-accurate bird's-eye view of the landscape.
- Useful for monitoring landscape change over time, such as burning or scrub encroachment.
- A useful tool for planning fieldwork.

Drone imagery



- Drone imagery is currently used to map the extent of saltmarsh vegetation communities in NI.
- A similar technique is being developed to monitor upland habitats alongside satellite and orthophotography images to minimise field assessment and improve efficiency.

Optimal weather conditions are essential in capturing accurate satellite imagery, orthophotography, and drone imagery, without which, it is impossible to produce these data.

NIEA Northern Ireland Environment Agency
Gníomhaireacht Comhshaoil Thuaisceart Éireann
Norlin Airlan Environment Agency
www.daera-ni.gov.uk

An Agency within the Department of Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

Gníomhaireacht de chuid na Roinne Talmhaíochta, Comhshaoil agus Gnóthaí Tuaithe

An Agency wi'in the Depairtment o Fairmin, Environment an' Kintra Matthers

Poster produced by Maria O'Hagan, a placement student from Queens University Belfast, in collaboration with NIEA