

BioSpace25 - Biodiversity insight from Space
10 - 14 February 2025 | ESA-ESRIN | Frascati - Italy



Eco-patterns: towards a standardised methodology to assess peatland condition remotely.

Eleanor Thomson, Olga Tutubalina, Marcus Spiegel, Thomas Fenal, Richard Lindsay



High Resolution imagery (<50cm)

Widely available
Low cost

+



Proprietary Deep Learning Technology

Based on facial recognition technology

=



"Precision monitoring for biodiversity"

Three focus habitats



GO BON

CEOS



General Biodiversity Mapping



Peatlands



Urban

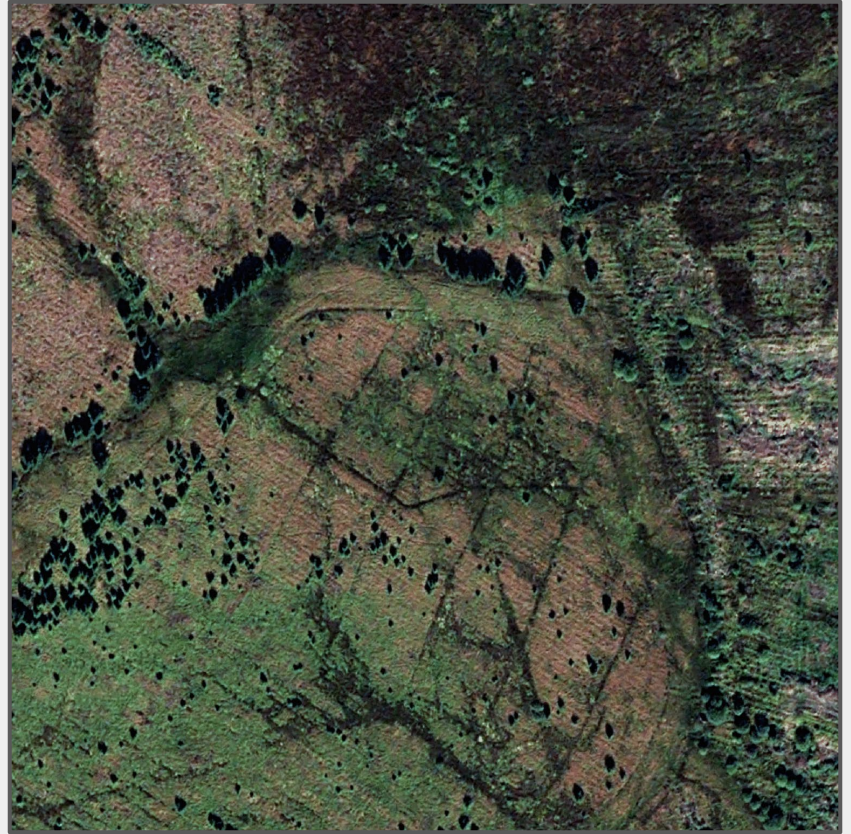


Agriculture



Mapping and monitoring invasive species

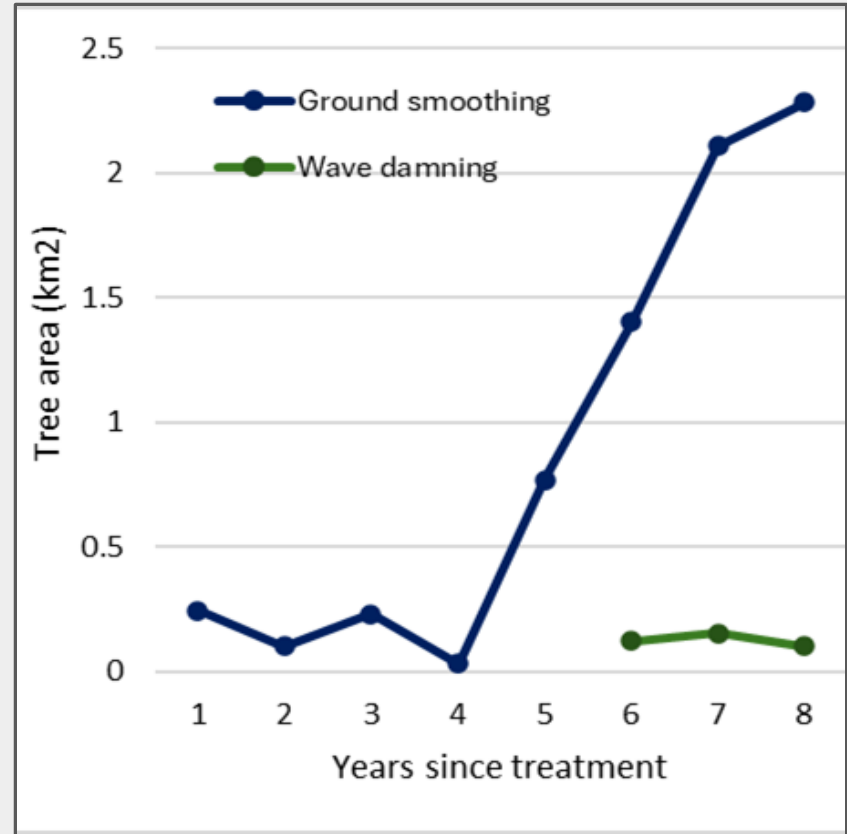
Gentian detected the invasive **Sitka spruce** trees on a peatland restoration site in Scotland



Mapping and monitoring invasive species

Gentian compared two methods of **Sitka spruce** removal:

- Ground Smoothing
- Wave Damning



Eco-patterns project



GO BON

CEOS



Lead by Gention in collaboration with the University of East London
Focussed on ***ecosystem condition***



Peatlands



Open Mosaic Habitat



Innovate
UK



 gention



Peatland patterns



GO BON

CEOS



Pools and hollows



Dry tussocks



Peat cuttings

Field assessment



GO BON

CEOS



Wales:
Cors Caron



Field assessment



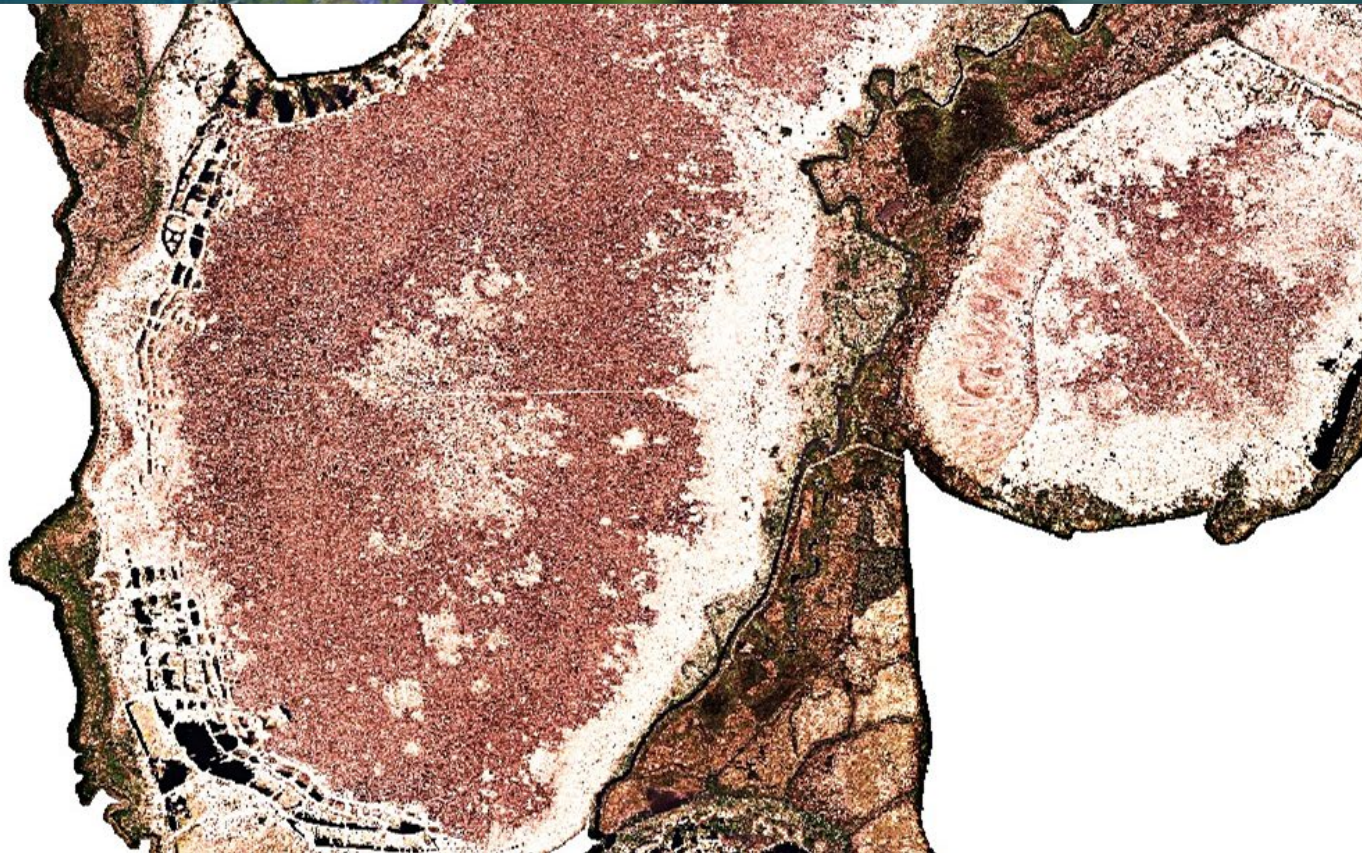
GEOBEN

CEOS



Wales:
Cors Caron

Spectrally
adjusted to bring
out contrasts



Field assessment



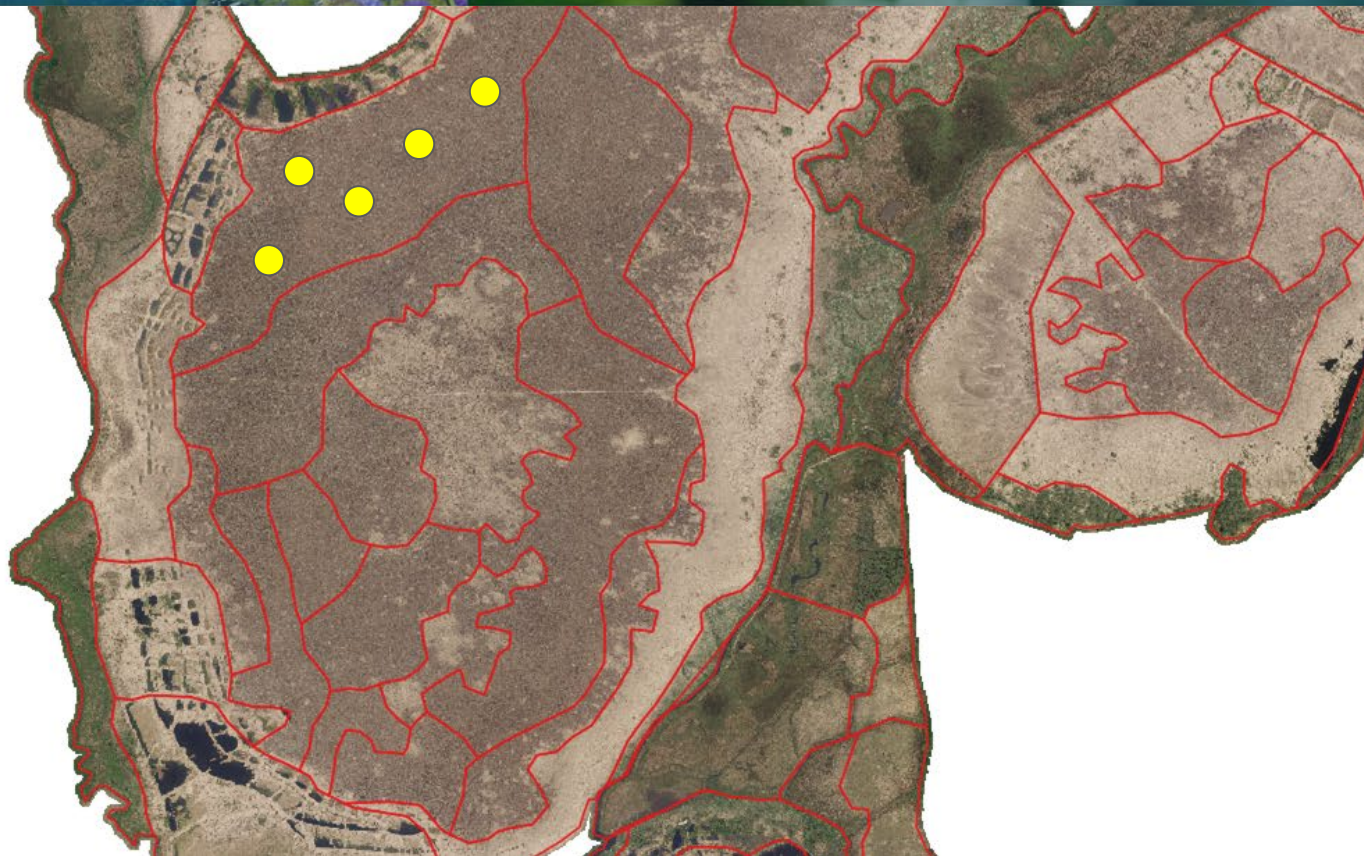
GOBEN

CEOS

esa

Wales:
Cors Caron

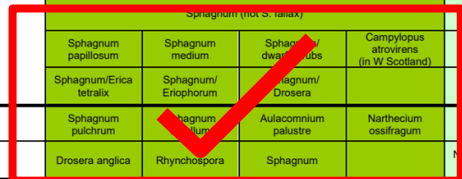
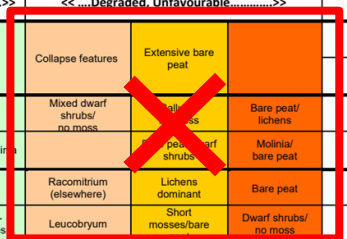
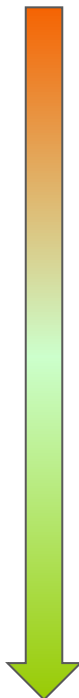
Macrotope
boundaries drawn



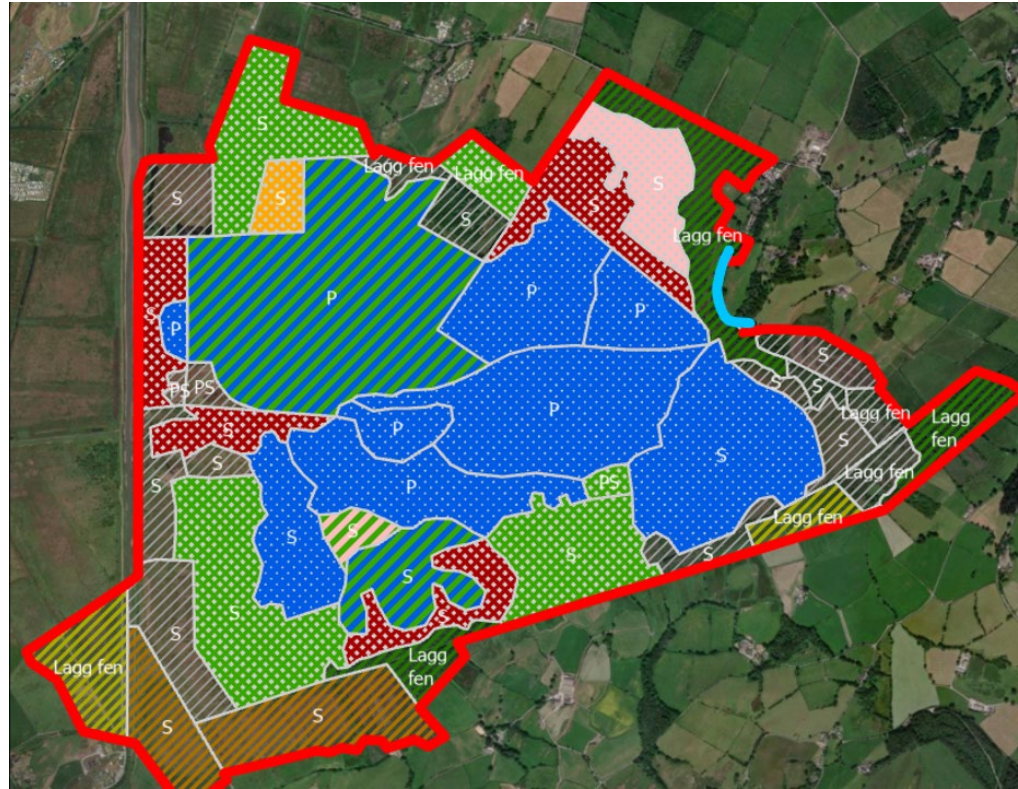
Peatland condition matrix



Mire pattern no:		Site:		Peat depth	Date	Time (to link photos)	Recorder	Notes:			
Zone (relation to w/t)	DFR (321) Freq.	Vegetation types : Terrestrial zones				Primary (original) / Secondary (cut-over) surface (circle relevant condition)			Extra veg types		
		Relatively 'active', likely to be favourable condition <.....>				<<...Degraded, some recovery...>>	<<...Degraded, Unfavourable.....>>				
T5 (peat mound found only in far north & west of Scotland (1 m+))		Sphagnum/ dwarf shrubs	Feather mosses	Calluna/Empetrum	Racomitrium	Cladonia/bare peat		Collapse features	Extensive bare peat		
T4 (erosion complex hagg top) (50 cm+)		Sphagnum mosses		Hypnoid mosses	Mixed dwarf shrub/ hypnoid moss	Calluna/hypnoid moss cover	Racomitrium	Mixed dwarf shrubs/ no moss		Bare peat/ lichens	
						Molinia/hypnoid moss cover	Racomitrium/Molinia				
T3 (hummock) (30 cm-50 cm)		Sphagnum		Racomitrium (in far W Scotland)		Hypnoid mosses	Polytrichum commune	Racomitrium (elsewhere)	Lichens dominant	Bare peat	
		Sphagnum fuscum	Sphagnum papillosum	Sphagnum austini [imbricatum]	Sphagnum capillifolium	Sphagnum subnitens	Hypnoid/Polytrichum mosses	Leucobryum	Short mosses/bare	Dwarf shrubs/ no moss	
TK (tussock) (hard unyielding feature obvious underfoot)		Schoenus nigricans (only in far W of Scotland)	Sphagnum over Eriophorum vaginatum tussock	Sphagnum over Molinia tussock	Sphagnum over Trichophorum tussock	Eriophorum vaginatum with some Sphagnum	Molinia with some Sphagnum	Molinia caerulea	Eriophorum vaginatum on bare peat	Trichophorum cespitosum on bare peat	Juncus effusus with moss
						Trichophorum with some Sphagnum		Deschampsia flexuosa			Juncus effusus in grassland
T2 (high ridge) (15 cm-30 cm)		Sphagnum				Hypnoid mosses	Eriophorum vaginatum	Dwarf shrubs/ no moss	Lichens dominant	Bare peat	
		Sphagnum/ Rubus chamaemorus	Sphagnum/Erica tetralix	Sphagnum medium	Sphagnum/ Eriophorum	Calluna with some Sphagnum	Dwarf shrubs/ hypnoid mosses	Eriophorum vaginatum/ no moss	Bare peat/ dwarf shrubs		
		Sphagnum papillosum	Sphagnum capillifolium	Sphagnum/ Molinia	Sphagnum/ dwarf shrubs	Sphagnum subnitens	Hypnoid/Polytrichum mosses	Sphagnum compactum	Bare peat/ Trichophorum		
		Sphagnum fuscum	Sphagnum austini [imbricatum]								
T1 (low ridge) (1 cm-15 cm) If S. capillifolium is dominant at this level it suggests drying		Sphagnum (incl S. fallax)				Hypnoid mosses	Eriophorum vaginatum	Dwarf shrubs/ no moss	Lichens dominant	Bare peat	
		Sphagnum papillosum	Sphagnum medium	Sphagnum/ dwarf shrubs	Campylopus atroviridis (in W Scotland)	Sphagnum capillifolium dominant	Sphagnum tenellum dominant	Dwarf shrubs/ hypnoid mosses	Bare peat/ dwarf shrubs		
		Sphagnum/Erica tetralix	Sphagnum/ Eriophorum	Sphagnum/ Drosera		S. fallax			Bare peat/ Trichophorum		
T1/A1 (0 cm-5 cm) edges of pools/ hollows, or 'runnets'		Sphagnum pulchrum	Sphagnum papillosum	Aulacomnium palustre	Narthecium ossifragum	Sphagnum fallax		Sphagnum compactum	Bare peat/ Trichophorum	Bare peat	
		Drosera anglica	Rhynchospora	Sphagnum		Moss-Sphagnum moss					



Peatland patterns



Ground-truthed data



GO BON

CEES



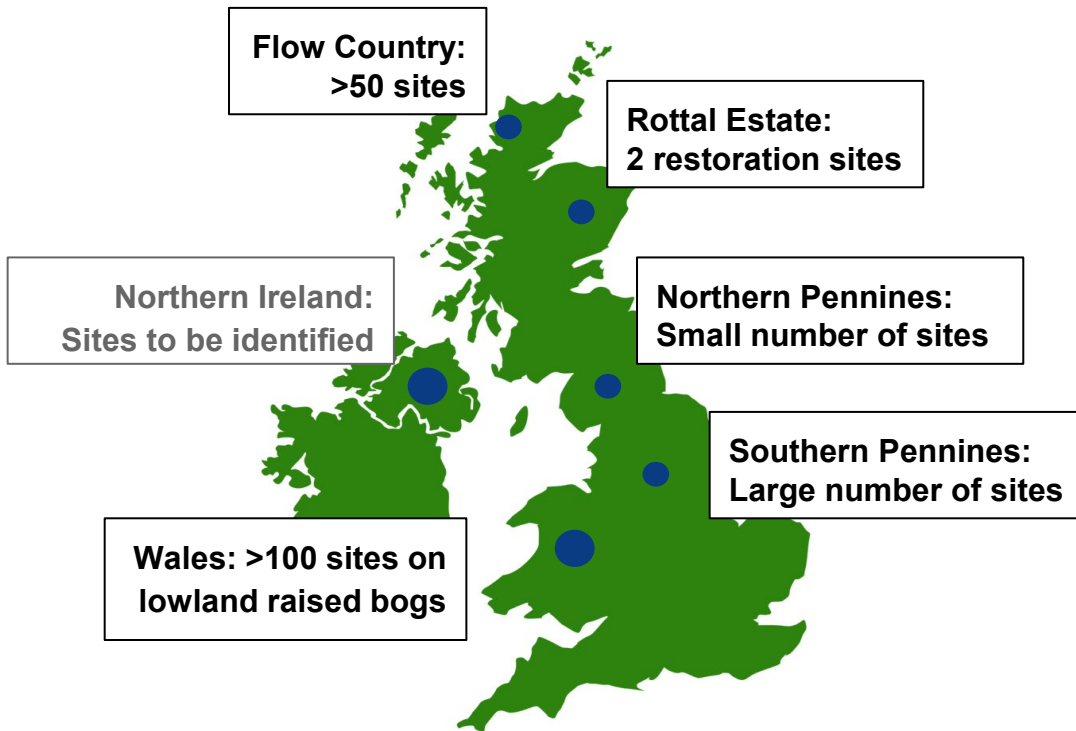
National Trust



West Midlands
Combined Authority



NatureScot
NàdarAlba



Cyfoeth
Naturiol
Cymru
Natural
Resources
Wales

BSG
ecology



Delivering what matters



- We are currently training and validating our AI models with the first sets of ground-truthed data and imagery.
- Validation with project partners during summer of 2025.

Recommendations:

- ❖ Consider both vegetation and microtopes in peatland condition assessment
- ❖ Prioritise spatial patterns in mapping of peatland condition
- ❖ Develop peatland condition matrices for areas beyond the UK and connect this to both a biodiversity assessment and carbon storage.

The background of the slide is a high-resolution aerial satellite image of a river valley. The river winds through the center, surrounded by lush green vegetation and brownish, possibly agricultural or forested, land. The terrain appears to be hilly or mountainous.

Any Questions?