

Applying the S²EEA EA at site-level: lessons learned from two Irish projects

Francesco Martini & Cian White

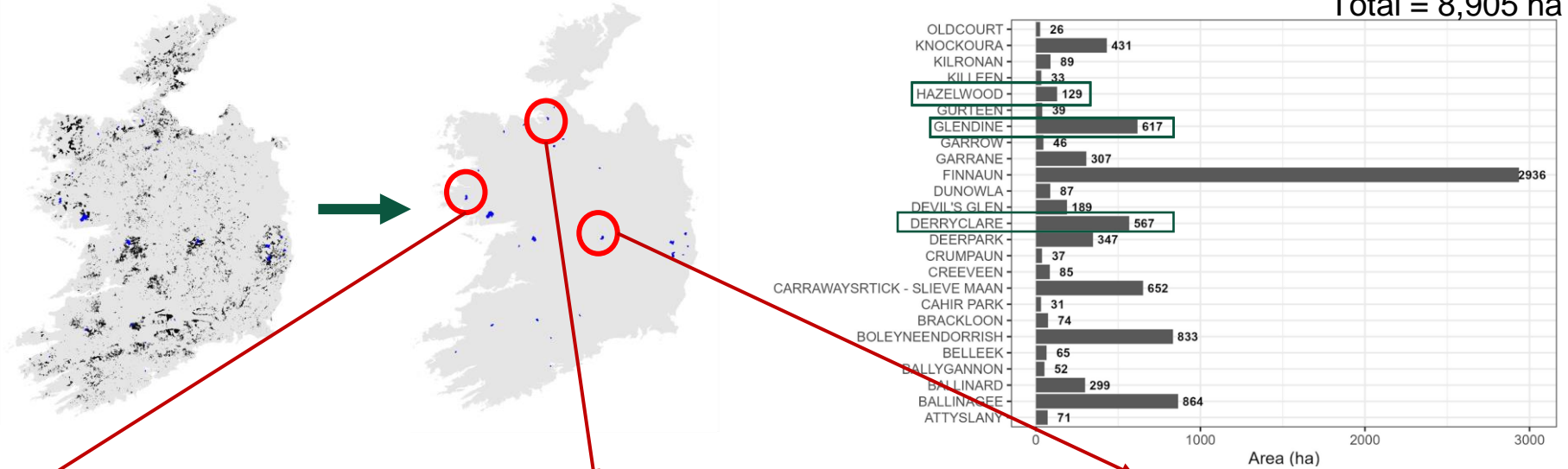
Trinity College Dublin

Athens

22 May 2024

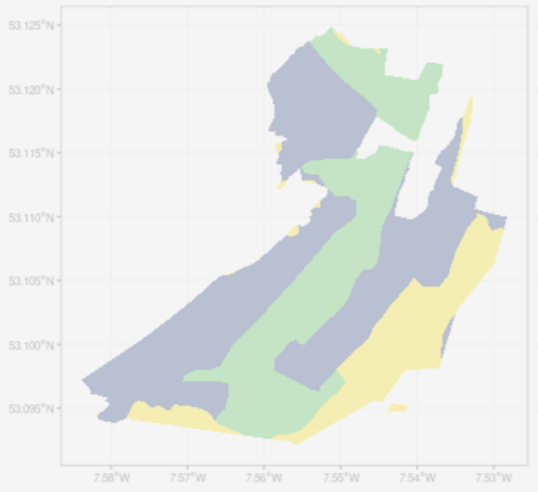
For-ES aims to develop decision support tools (DSTs) to potentially help in the management of Coillte forested and non-forested areas, as well as privately owned forests, for **balanced delivery of multiple ecosystem services** using a Natural Capital Accounting (NCA) framework to support modelling.

Coillte is a semi-state-owned forestry company which manages ~7% of Irish land ~50% of its forests (440K ha)

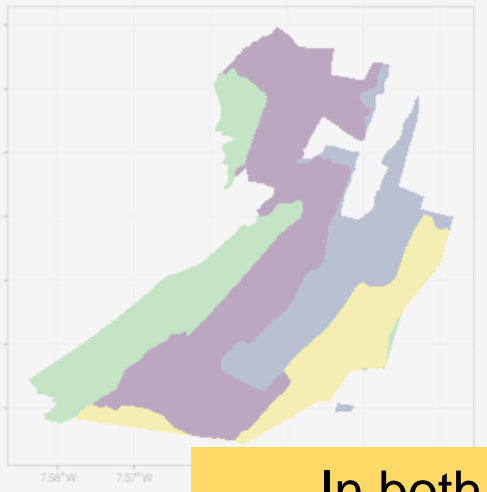


Creating Extents Accounts

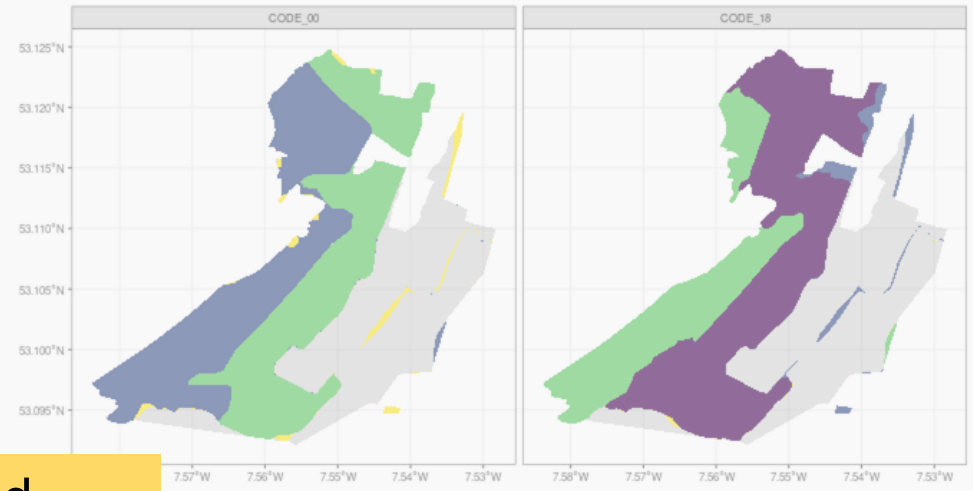
Glendine - 2000



Glendine - 2018

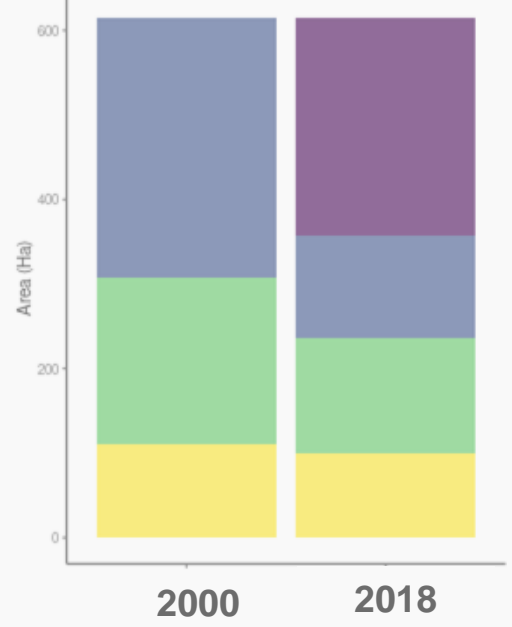


Area change 2000 - 2018

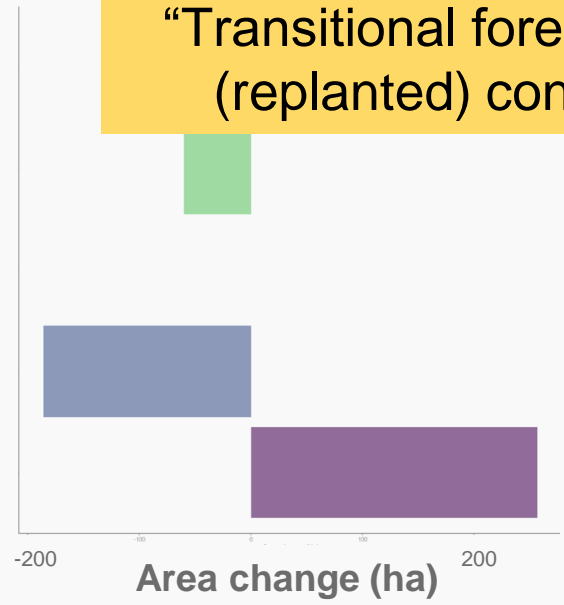


In both cases on the ground validation can highlight inaccuracies: "Transitional forest" can be young (replanted) conifer plantation.

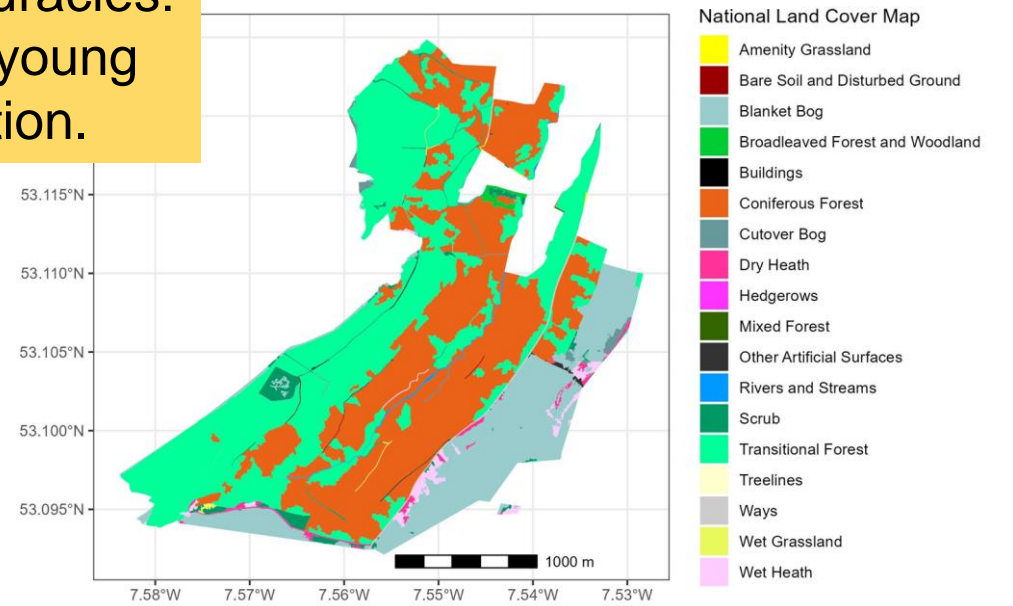
Habitat composition




Eco



NATIONAL LAND COVER MAP (2018)



Accounting for forest condition in Europe based on an international statistical standard

[Joachim Maes](#), [Adrián G. Bruzón](#), [José I. Barredo](#) , [Sara Vallecillo](#), [Peter Vogt](#), [Inés Marí Rivero](#) & [Fernando Santos-Martín](#)

Nature Communications **14**, Article number: 3723 (2023) | [Cite this article](#)



Select condition indicators (n = 15)

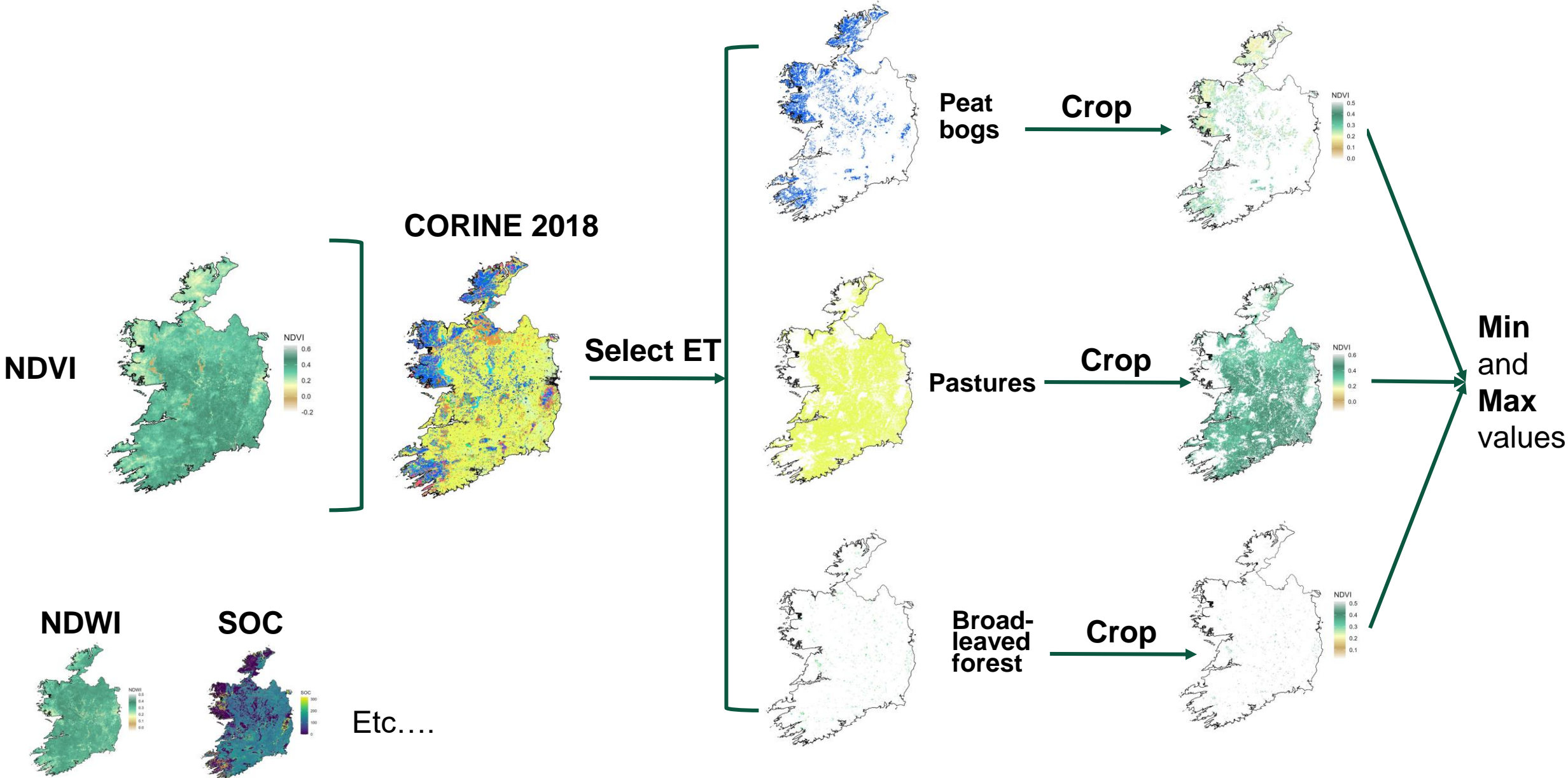
Nature+Energy

The [Nature+Energy project](#) is founded on the idea that wind farms have the potential to provide so much more than renewable energy. If managed properly, the biodiversity on onshore wind farms has the potential to not only take even more carbon out of the atmosphere, but also to improve the resilience of ecosystems to climate change and to enhance the provision of ecosystem services, such as pollination, water filtration and habitat provision. There is much potential to enhance nature's contributions to people through improving our understanding of how habitat quality, diversity and connectivity can be enhanced by wind farm land-management for conservation.

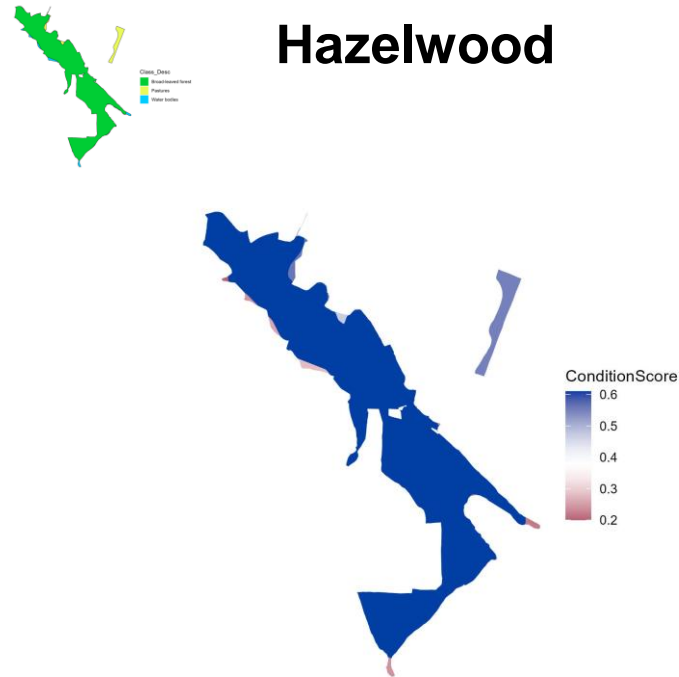
- Used CORINE to delimit ecosystem assets
- Only for ~2018

The condition accounts are **Work in Progress** and may change

SEEA Ecosystem Condition Typology Class		Variables	
Abiotic	Physical state	Soil Drainage	*
		WFD Risk (Rivers & Lakes)	
	NDWI		
Biotic	Chemical state	Soil Organic C	*
		PIP-P & PIP-N	*
	Compositional state	Protected species	*
		Biodiversity	*
	Structural state	Tree Cover Density	
		Tree height	*
		Vegetation Carbon	*
Functional state	NDVI		
	River Q Value		
Landscape	Landscape characteristics	Shape Index	
		Proportion of PA	



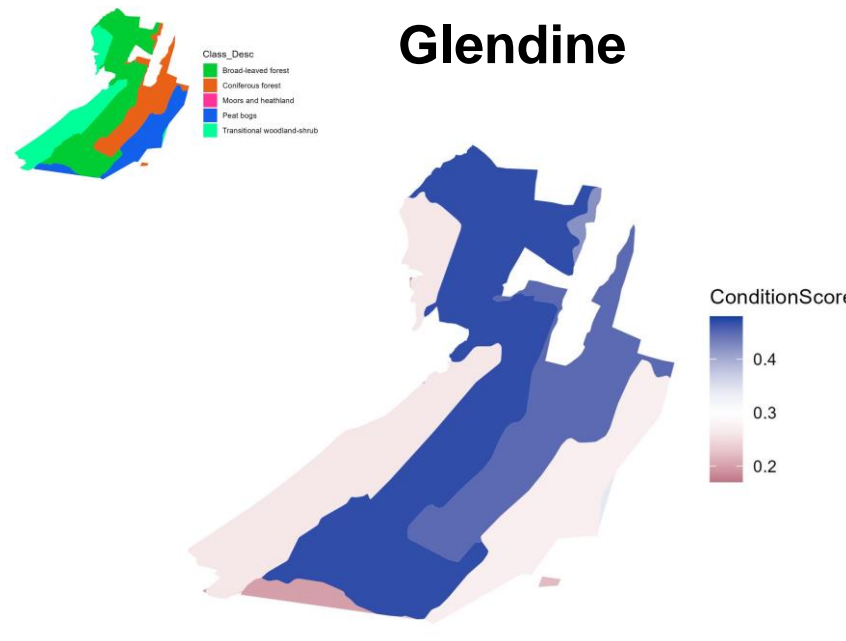
Hazelwood



Condition score

- 231 = 0.55
- **311 = 0.61**
- 512 = 0.26

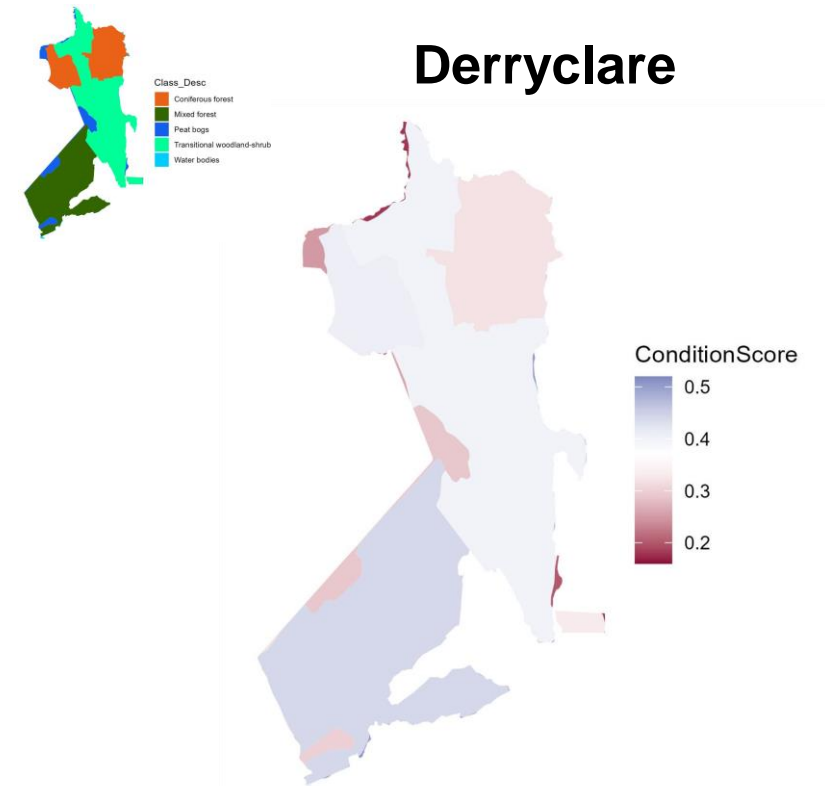
Glendine



Condition score

- **311 = 0.47**
- **312 = 0.45**
- 322 = 0.38
- **324 = 0.33**
- **412 = 0.27**

Derryclare



Condition score

- **312 = 0.41**
- 313 = 0.44
- **324 = 0.40**
- **412 = 0.29**
- 512 = 0.43

The condition accounts are **Work in Progress** and may change

Take-home messages

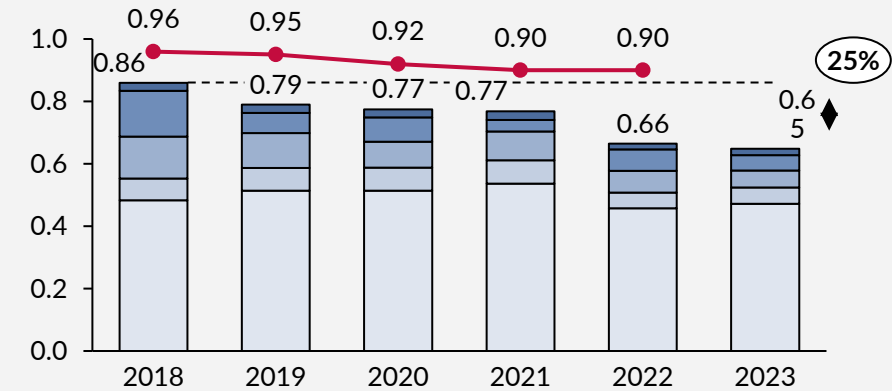
- **Extent.** Different Ecosystem Types map are available, each with its own limits: CORINE not ideal, but National Land Cover Map not available for private users (yet?), and perhaps resolution too high for its own good (0.1ha)?
- **Condition.** Most data are somewhat limited for use at small spatial scale:
 - Spatial resolution (different, some too coarse)
 - Temporal resolution (intervals not always available, different years)
- Challenging deciding which indicators to select
- Communication with stakeholders is key



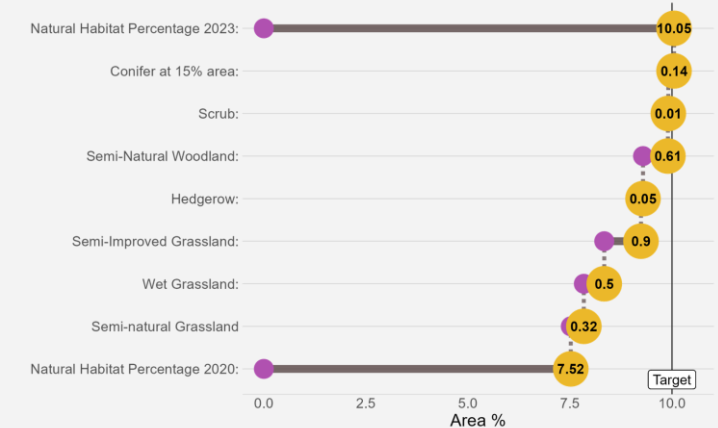
At Carbery Group's Shinagh dairy farm, strategies were employed to reduce the carbon footprint and enhance biodiversity.

Mitigation Strategy	2020	2021	2022	2023
White clover inclusion in pasture	█	█	█	█
Red clover inclusion in silage		█	█	█
Multispecies inclusion in pasture	█	█	█	█
Protected urea as main fertiliser		█	█	█
Extend grazing management		█	█	█
Use native feeds		█	█	█
Reduce ration				█
Feed anti-methanogenic additives				█
Chemically amend slurry			█	█
Spread slurry during the spring				█
Low emissions slurry spreading	█	█	█	█
Reduce replacement rate				█
Reduce electricity demand		█	█	█
Reduce fuel inputs			█	█
Increase production milk solids			█	█

Shinagh Carbon Footprint (kgCO₂/kgFPCM)

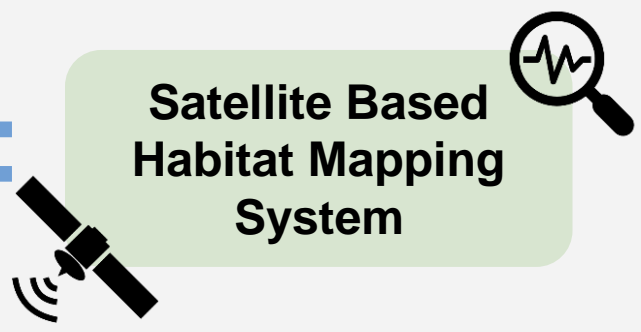


Shinagh Habitat %: 2020 - 2023

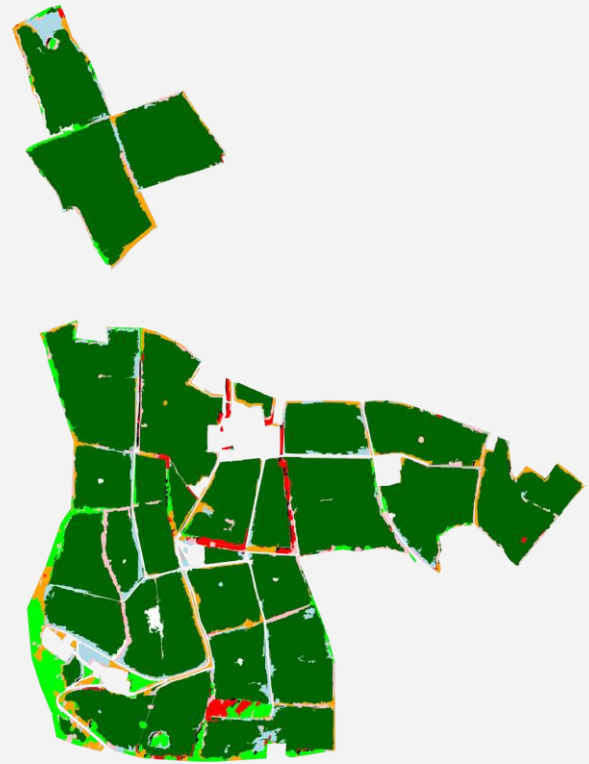


Purpose of Work:

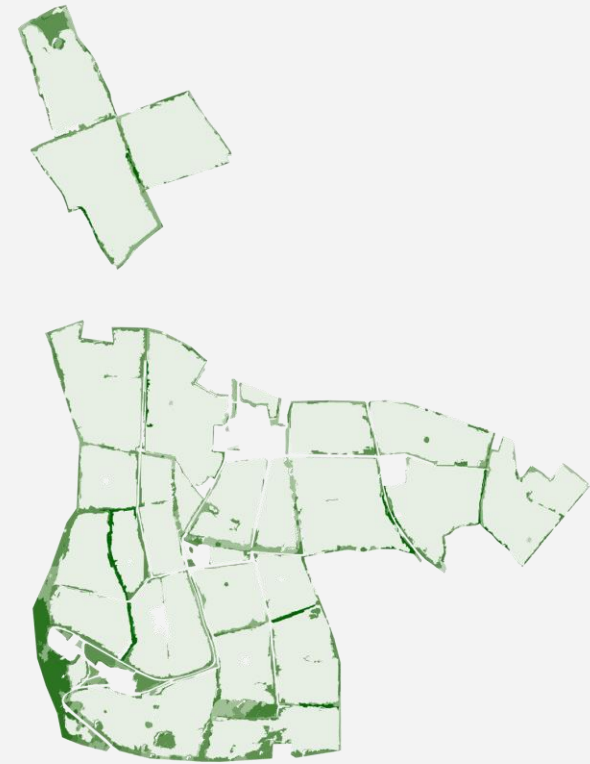
Satellite Based
Habitat Mapping
System



AOI + Satellite
Image

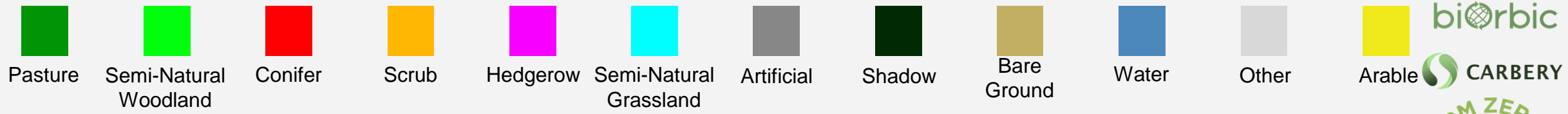


Habitat Map

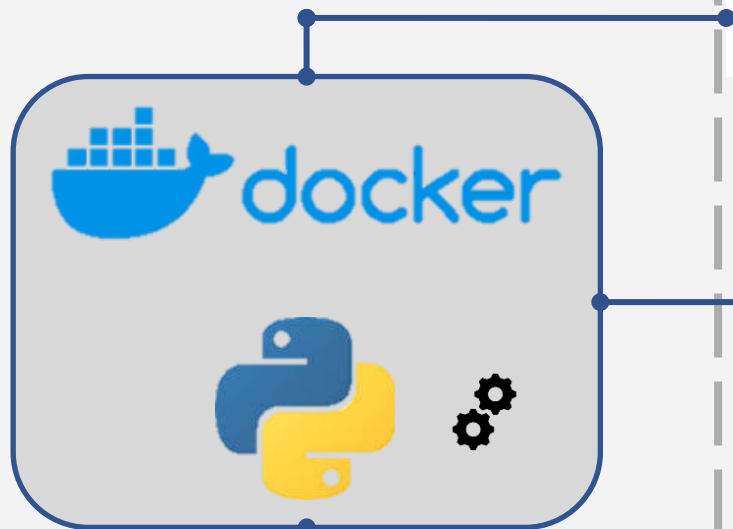


Condition Map





Application

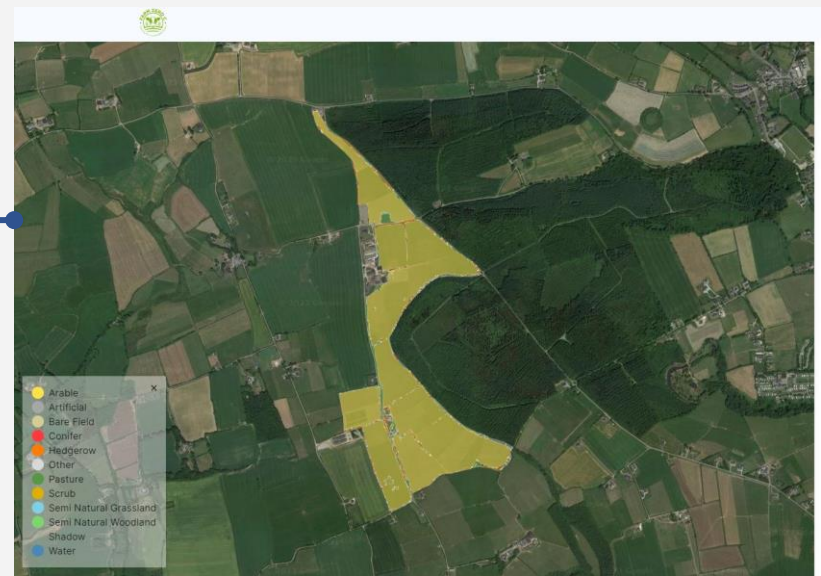


21 May 2024

Supply Chain Dashboard

Upload

Code	Coop Code	Created At	Farm Size	Habitat Percentage	Status	Habitat Table	Farm Map
AA5	AAA	07/11/2023 - 04:21	215326	0	Success	Table	Map
BB1	BBB	07/11/2023 - 11:10	12681.1	5.57	Success	Table	Map
BB2	BBB	07/11/2023 - 12:41	215326	0	Success	Table	Map



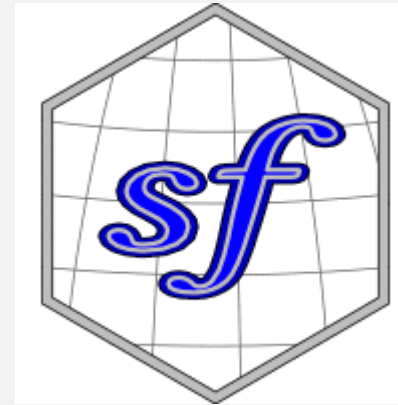
Automated recommendation system

AA5

Habitat Name	Area	Percentage	Recommended Area Increase	Recommendation
Semi-Natural Woodland	0	0	0.325664	We recommend an increase of Semi-Natural Woodland by 0.325664 HA
Hedgerow	0	0	0.421357	We recommend an increase of Hedgerow by 0.421357 HA
Semi-Natural Grassland	0	0	0.756281	We recommend an increase of Semi-Natural Grassland by 0.756281 HA
Scrub	0	0	0.262383	We recommend an increase of Scrub by 0.262383 HA
Conifer	0	0	0.384314	We recommend an increase of Conifer by 0.384314 HA

Habitat Condition

- R Shiny Script
- Open Source
- Each polygon scored between 1 – 10
 - 1 poor for biodiversity
 - 10 good for biodiversity



```
/*  
RMSPA  
A R extension  
Morphological Spatial Pattern Analysis  
-----  
begin           : 2022-04-12  
copyright       : (C) 2022 by European Commission JRC  
email           : peter.vogt@ec.europa.eu|  
email           : diego.migliavacca@gmail.com  
***/
```

Scoring Woody Features

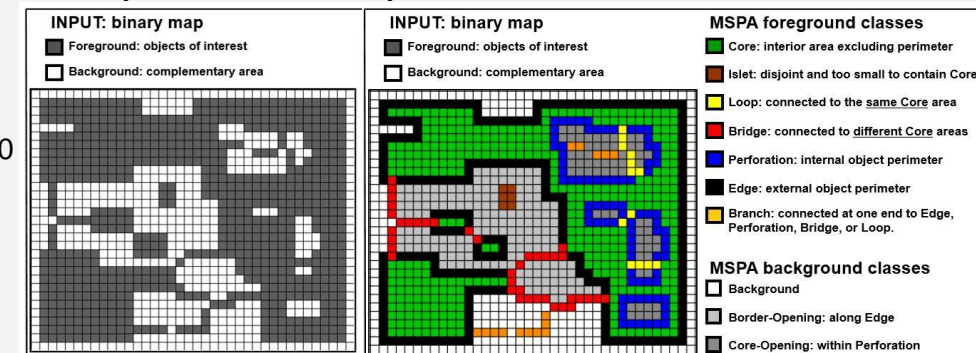
Woody Features scored using 5 measures:

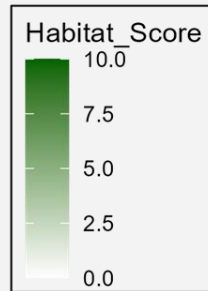
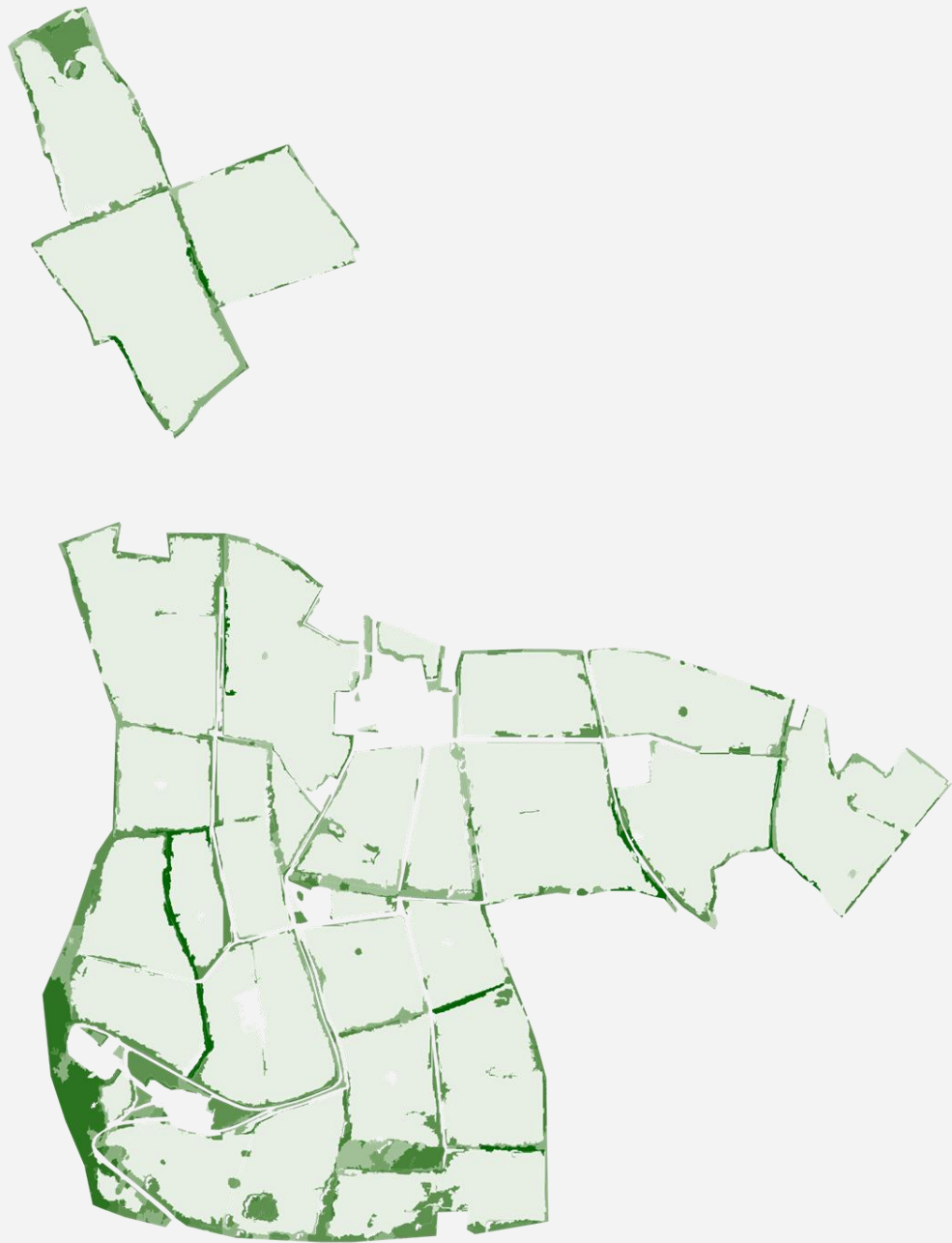
- Habitat Type (0 - 2 points)
 - Conifer ~ 0, Scrub ~ 1, Semi – Natural Forest ~ 2
- Area (0 - 2 points)
 - Over 2 ha ~ 2, between 2 and 0.5ha ~ 1, less than 0.5ha ~ 0
- Shape Index (0 – 2 points)
 - High shape index (lots of edge) ~ 2, medium shape index ~ 1, low shape index ~ 0
 - Rewarding edge here as edges have specific communities of biodiversity
- Connectivity (0 – 2 points)
 - High connectivity to other patches ~ 2, medium connectivity ~ 1, low connectivity ~ 0
- Degree of Core Habitat
 - > 50% of habitat is core ~ 2, > 50% is a connection between patches ~ 1, > 50% is edge ~ 0
 - Opposite of shape index, rewarding core habitat

Conefor Command Line Call from R



R Morphological Spatial Pattern Analysis Script from European Commission





Habitat	Mean Score	Min Score	Max Score
Pasture	1	1	1
Semi-Natural Woodland	6.04	2	9
Conifer	2.85	0	4
Scrub	4	1	5
Hedgerow	7.8	2.5	10
Semi-Natural Grassland	7	7	7
Artificial	1	1	1
Bare Field	1	1	1
Total Habitat Score (0-10)	5.38		

Next Steps And Lessons

Next steps

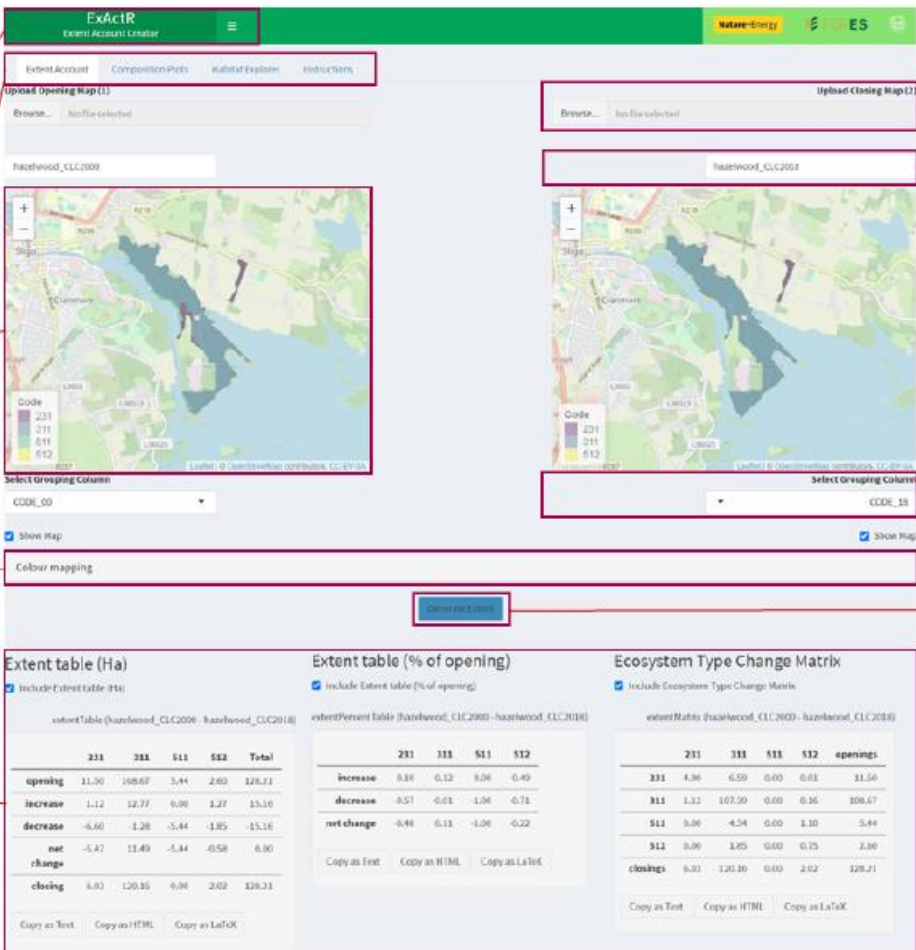
- Extent and condition change measurement using ExActR App
- Apply to whole dairy supply chain

Lessons:

- Measuring services directly can be easier than condition
 - Soil carbon
- Is Generic condition score useful?
 - Pasture productivity, biodiversity, water quality all very different processes!

ExActR: A Shiny app for creating ecosystem extent accounts

Anthony Gibbons ^{1*}, Francesco Martini ³, Cian White ³, Jane C. Stout ³,
Ian Donohue ², Andrew Parnell ¹



The screenshot shows the ExActR Shiny app interface. The app title and sidebar toggle are at the top left. Navigation tabs include 'Extent Account', 'Comparison Plots', 'Kubital Explorer', and 'Instructions'. There are two 'Upload' buttons for 'Opening Map' and 'Closing Map', each with a file selection field. Below these are two maps showing the same area with different extent data. A 'Select Grouping Column' dropdown is present below each map. A 'Generate Extent' button is located below the maps. At the bottom, there are three tables: 'Extent table (Ha)', 'Extent table (% of opening)', and 'Ecosystem Type Change Matrix'. Each table has a 'Copy as Text', 'Copy as HTML', and 'Copy as LaTeX' button.

App title and Sidebar toggle

Navigation Tabs

Leaflet map

Colour mapping

Extent accounts

File upload

Timepoint name

Grouping column

Generate Extent



Jane Stout



Yvonne Buckley



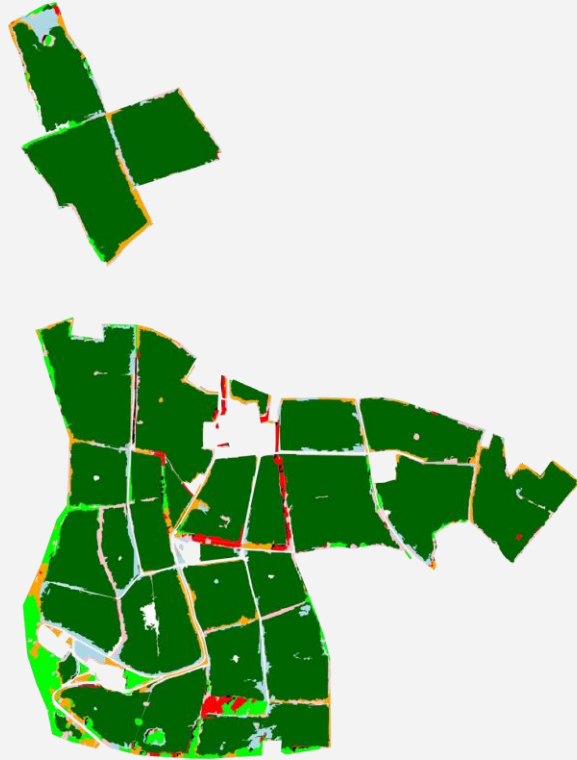
Mary Kelly-Quinn



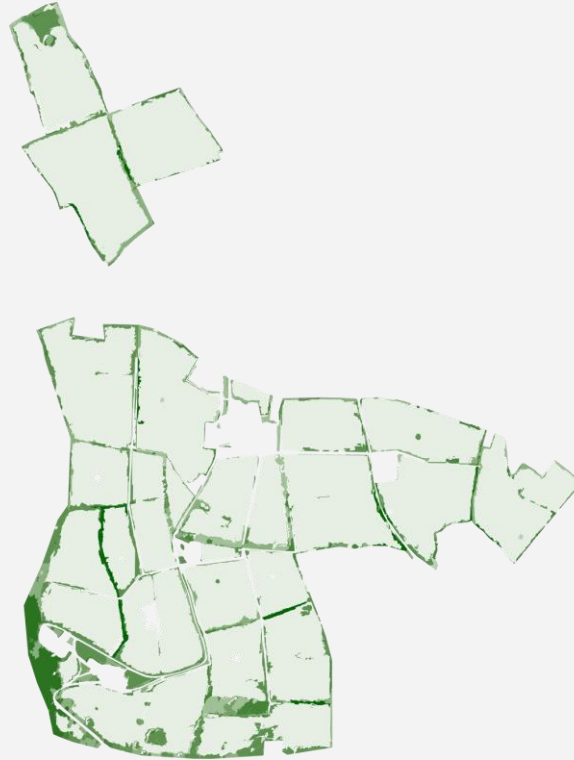
Kathleen Conroy



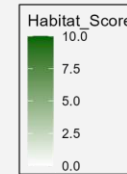
A World Leading SFI Research Centre



Landcover Map



Condition Map

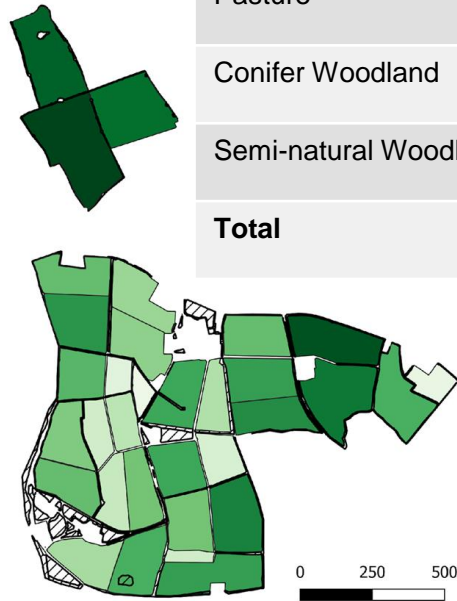


- Carbon Sequestration
- Carbon Storage
- Water Remediation

Service Maps

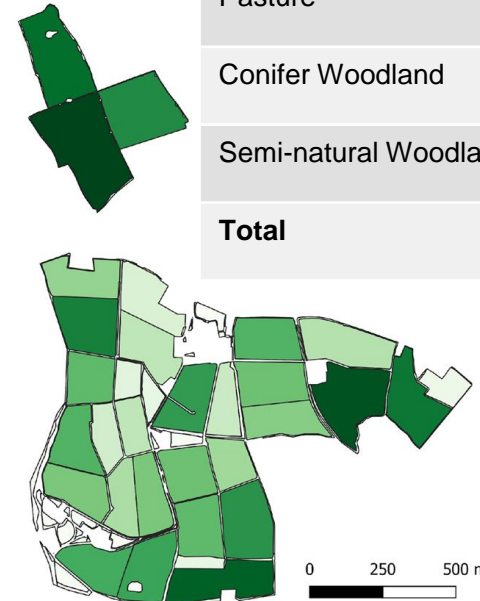
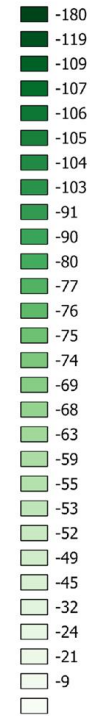
Natural Capital

CO2 Flux 2021



Landcover	Flux (tonnes CO2)
Pasture	-1463
Conifer Woodland	-25
Semi-natural Woodland	-9
Total	-1497

CO2 Flux 2022



Landcover	Flux (tonnes CO2)
Pasture	-2441
Conifer Woodland	-24
Semi-natural Woodland	-12
Total	-2477

Natural Capital

