What is the IDEAL UK Fire Project for?

Toward Informed Decisions on Ecologically Adaptive Land management for mitigating UK Fire

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Introduction – the UK's fire prone landscape

- Heathlands and peatlands account for >50% total burned area

- Peatland landscapes also hold large carbon stocks -> To achieve net zero and halt biodiversity loss, the UK must manage the fire-biodiversity-carbon nexus in these fire-prone landscapes.

- Wildfire land management tools must be optimised to promote fire-resilient environments, whilst recognising what biodiversity and carbon trade-offs occur

Introduction

- There are major uncertainties in knowledge of the impacts (costs and benefits) of fuel management tools

?

IDEAL UK Fire Project

Determining biodiversity and carbon consequences of wildfire fuel management tools across the diversity of UK fire prone landscapes.

Introduction

IDEAL UK Fire Project – assess how effective each practice is:

1) **On habitat quality and biodiversity and carbon**
2) **In limiting the impact of wildfire**

Effects at plot vs landscape scale?

Effect over different timescales?

Synergies

Management

No intervention/rewilding

Wildfire

The Wildlife Trusts; New Forest National Park Authority (2024); Alastair Driver

What data are the IDEAL UK Fire team collecting?

- 1) Testing the effects of prescribed fires/rotational burns and muirburns on soil heating and fire severity
- 2) Plant biodiversity and species occurrence between different management types

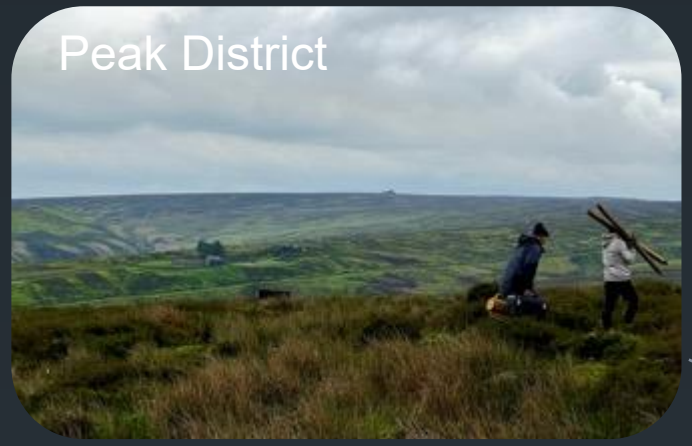
Prescribed burning

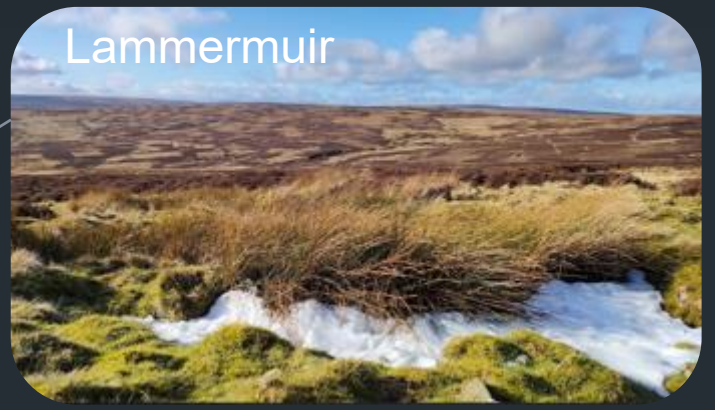
Cut and bailed

Cut and Flailed

3) Insect diversity
4) Bat and bird diversity
5) Carbon fluxes

Where are we collecting the data for land management practices?





Each of the sites have cut and burn management plots and no intervention plots (burned sites are only on shallow peats)

Where are we collecting the data for wildfires?

Heathland wildfire, Fort William (~10 year)

Bleaklow Plateau (20+ year)

Saddleworth Moor (~5 year)

Dorset (5, 10 and 20+ years)

Bodmin Moor (~5 year)

Flow Country (~5 year)

Dornoch (10 year)

Fen Bog, NYM (1-2 years)

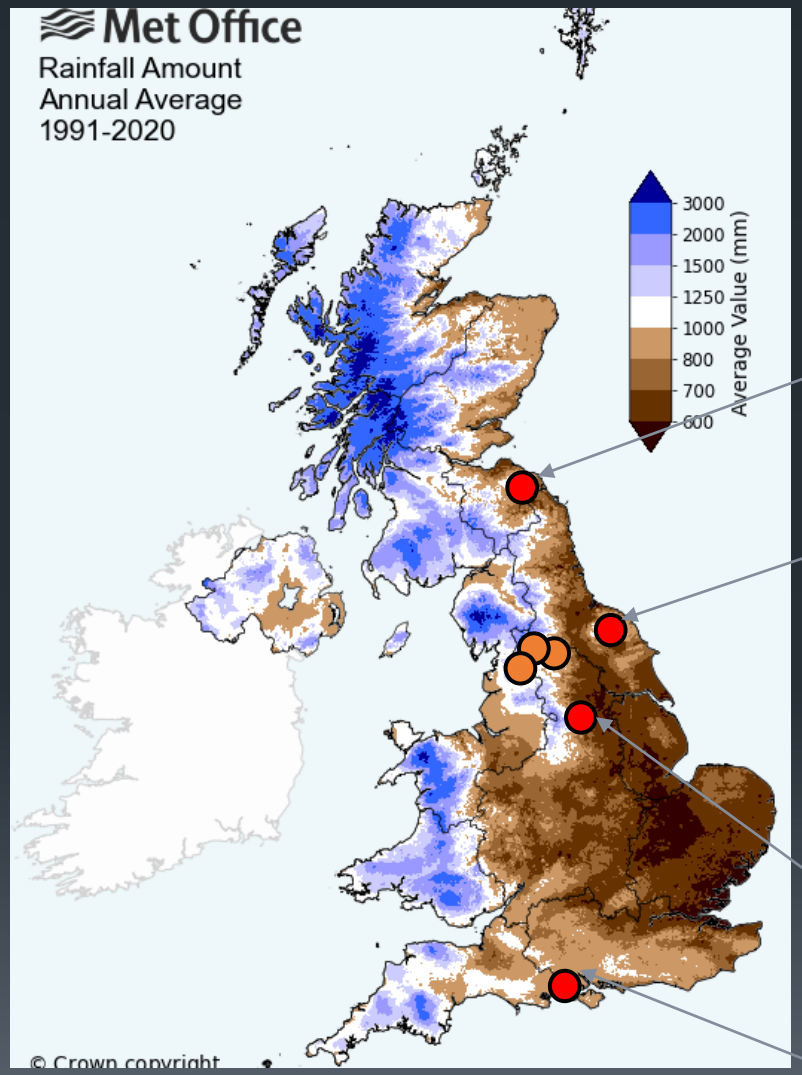
Ilkley Moor (5 year)

Metlham Moor (recent)

Marsden Moor (recent; 5 years)

Stoney Castle Ranges (10 year)

What soil and climate space do our sites occupy?



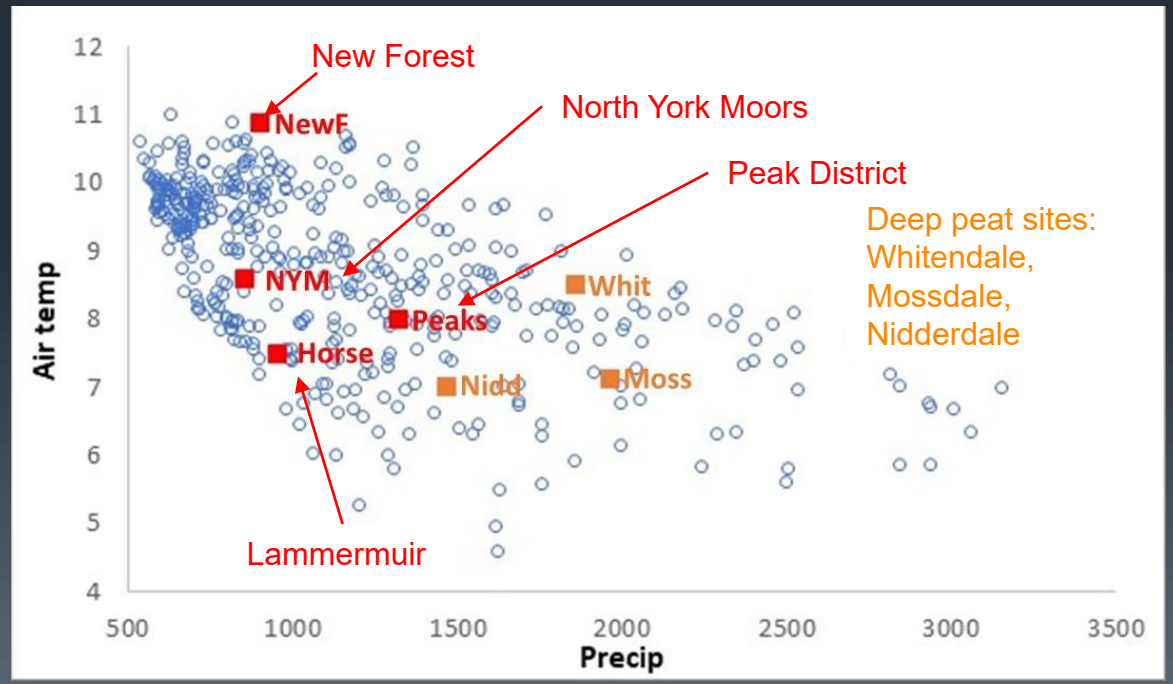
Lammermuir (dry & wet heath, shallow peat)

North York Moors (dry & wet heath, shallow peat)

Peak District (dry heath, shallow & deep peat)

New Forest (dry heath, mineral soils)

- Diverse ecosystems, with varying climate conditions and therefore different underlying soil and vegetation characteristics.
- Sites selected to reflect this diversity



Data Collection

How are we collecting the data?

Soil heating

Thermocouples recording soil temperature during prescribed burn

Carbon fluxes

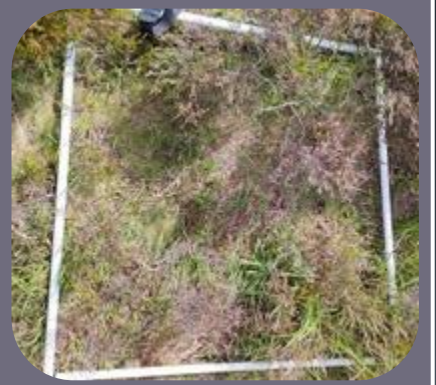
- Seasonal carbon flux measurements taken at each site
- Soil cores for charcoal and carbon analysis

Biodiversity sampling

Passive Acoustic Monitoring

Recordings for bat and bird monitoring

Plant Communities



Quadrats: 5 x each management plot

Insect biomass

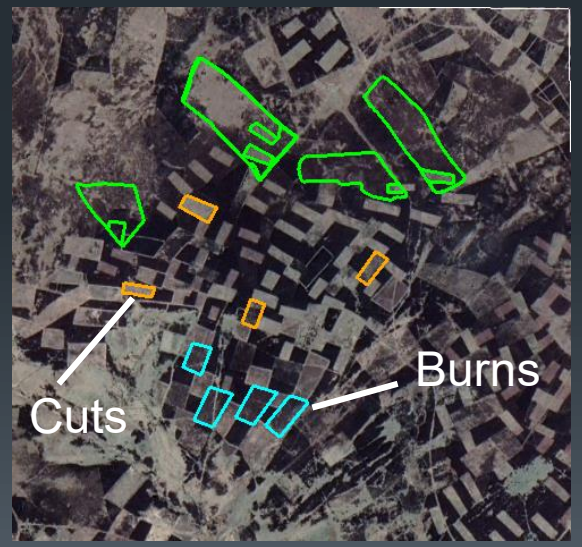
Sweep nets

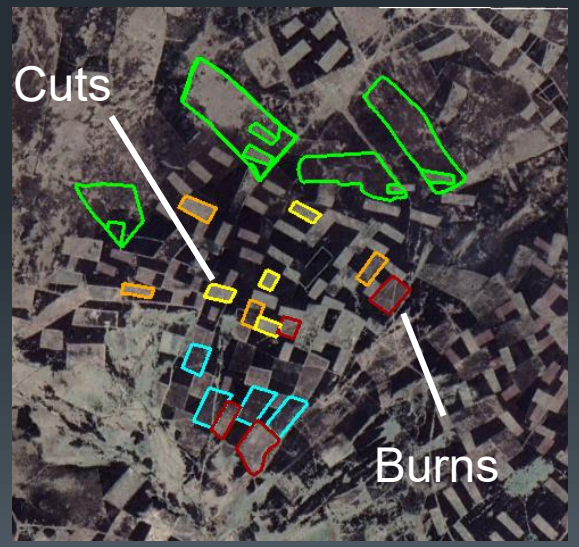
Vacuum sampling

Timescales – surveying through time

To assess impact of different management techniques and wildfires in each of the different areas over time, using a combination of SENTINEL satellite and aerial imagery

20+ years post management → **10 years post management** → **5 years post management** → **0 years post management**





Compare variability in biodiversity and carbon fluxes across these timescales

Results so far

Data collected so far (2 years into the project)

Soil heating

248 loggers (992 thermocouple readings)
Across 8 sites

Carbon fluxes

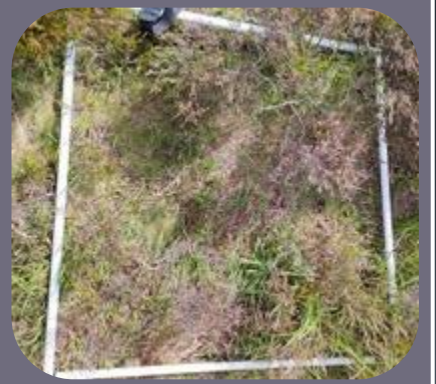
- ~180 Summer flux measurements
- 246 soil cores for charcoal and carbon analysis

Biodiversity sampling

Passive Acoustic Monitoring

41 erected so far for recordings for bat and bird monitoring

Plant Communities

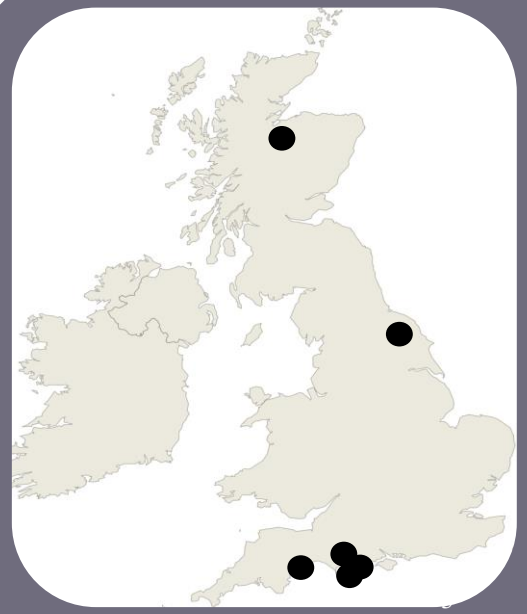


410 quadrats surveyed

Insect biomass

410 samples collected – now being categorized in lab

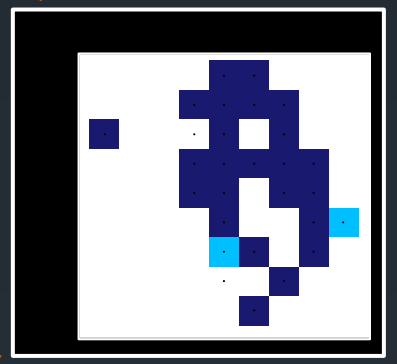
Do management burns deliver significant heat into the soil?



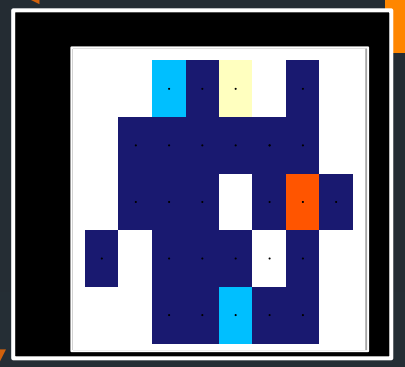
8 controlled burns

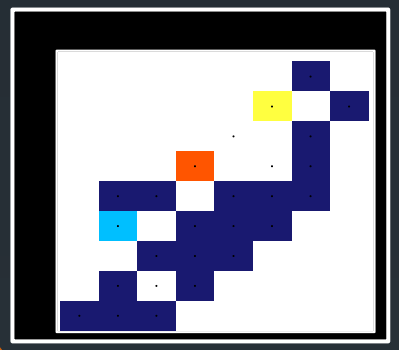
Thermocouples

North York Moors 1



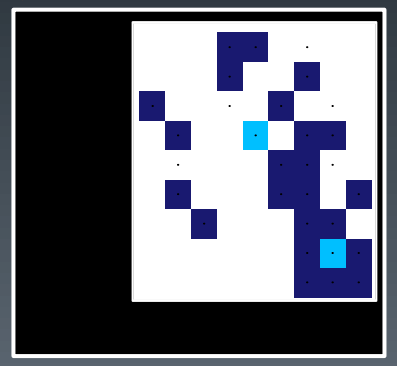
North York Moors 2



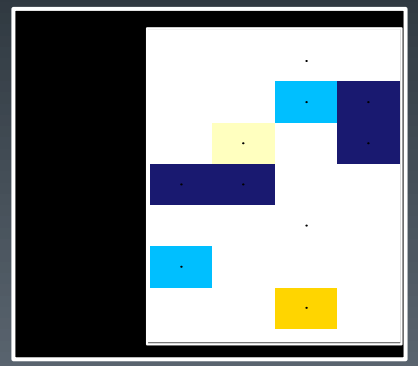


Cawdor Burn 4

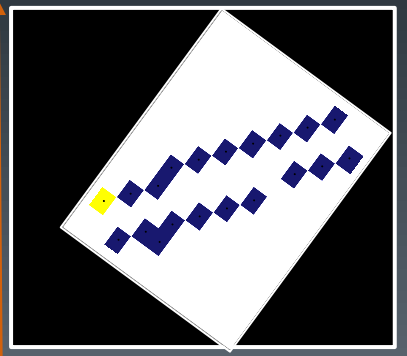
Rempstone, Dorset



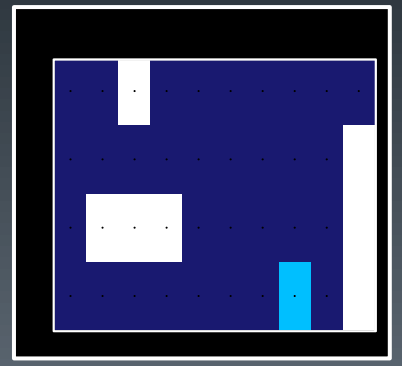
Corfe Common, Dorset



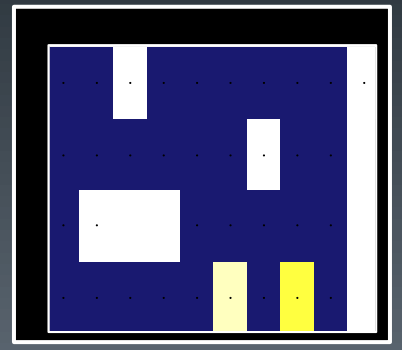
Cawdor Burn 1

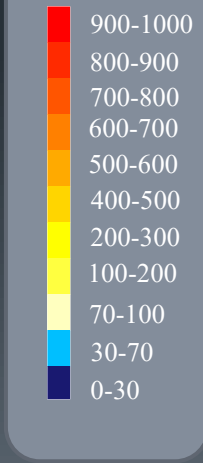


Cawdor Burn 2



Cawdor Burn 3





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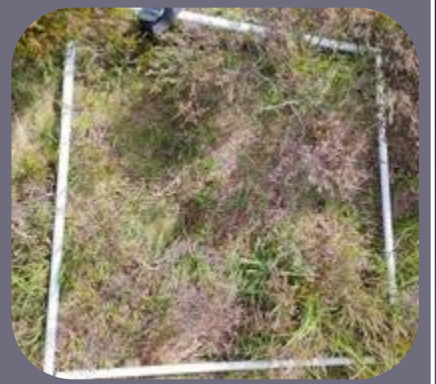

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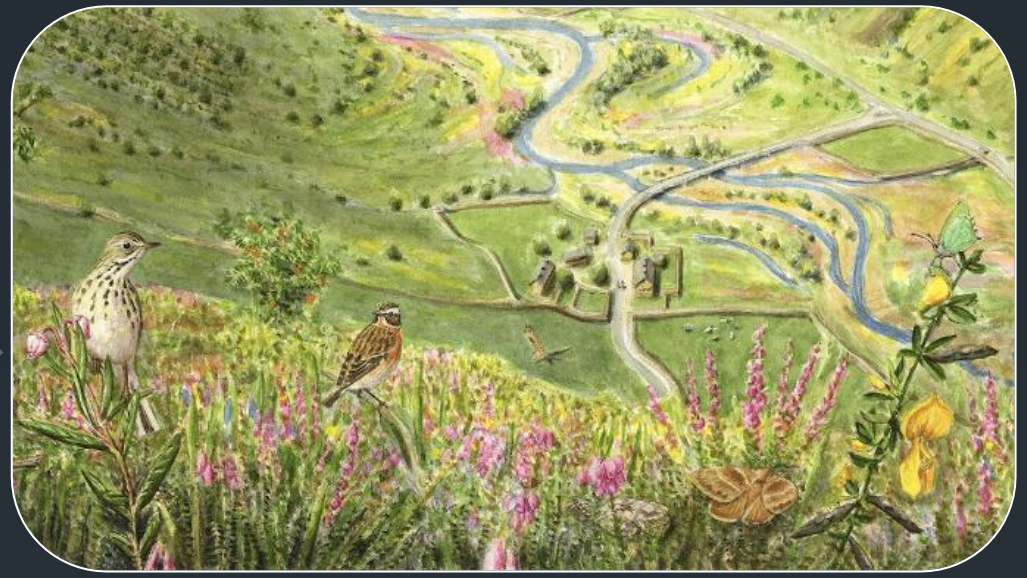
How can we use this plot-scale data to then assess the landscape scale biodiversity and carbon effects?



Landscape Scale Ecological modelling

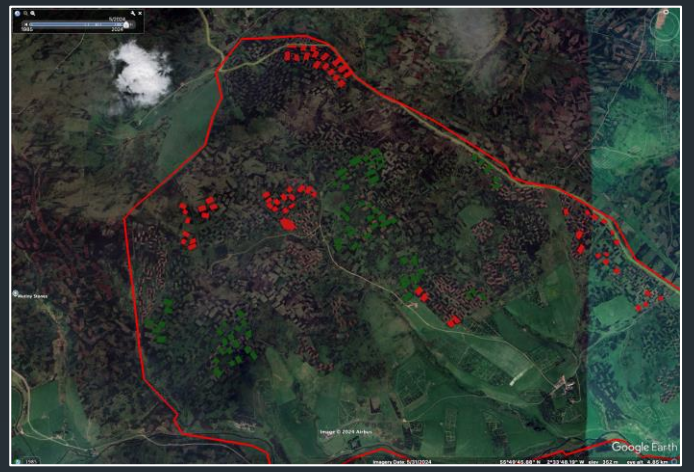
Wildfire spread and behaviour modelling across landscape

Carbon modelling

Develop accredited training

Modelling of landscape scale biodiversity and species use

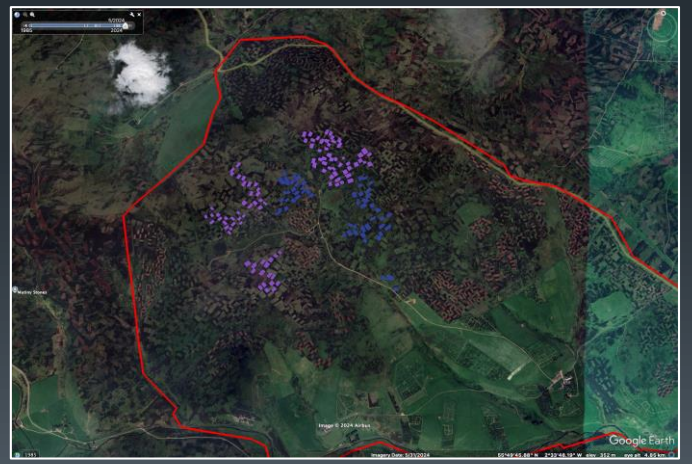
~20+ years ago



~15 years ago

~10 years ago

~5 years ago



0 years ago

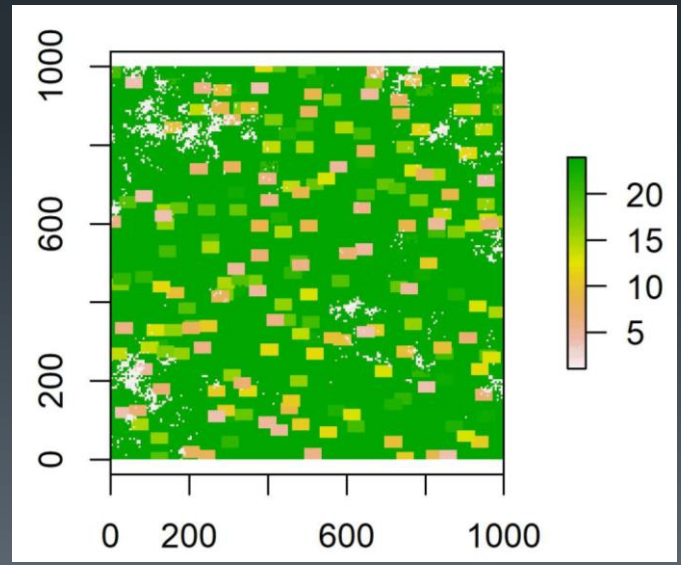
Real Landscape

Patch cause burn vs cut

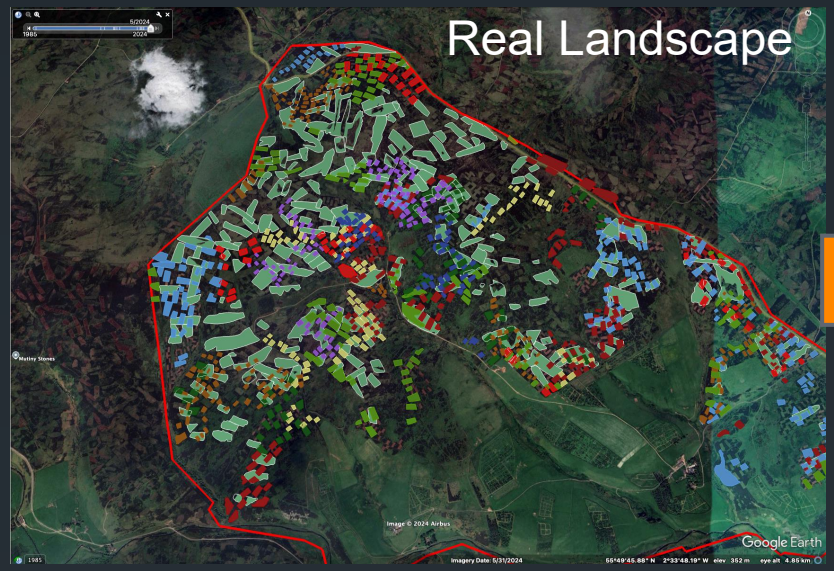
Patch size?

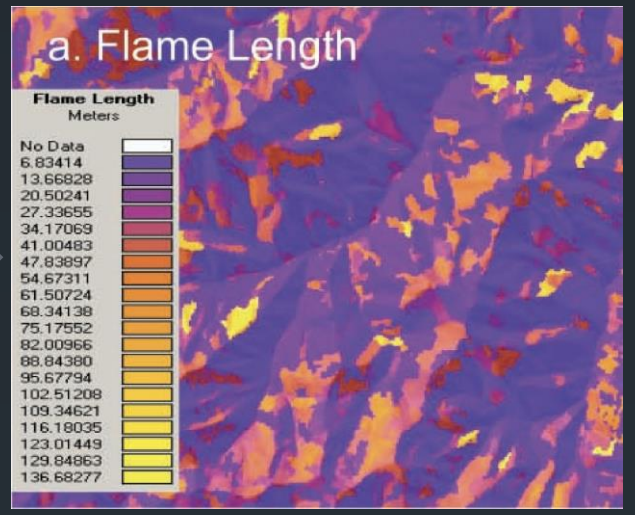
Vegetation type

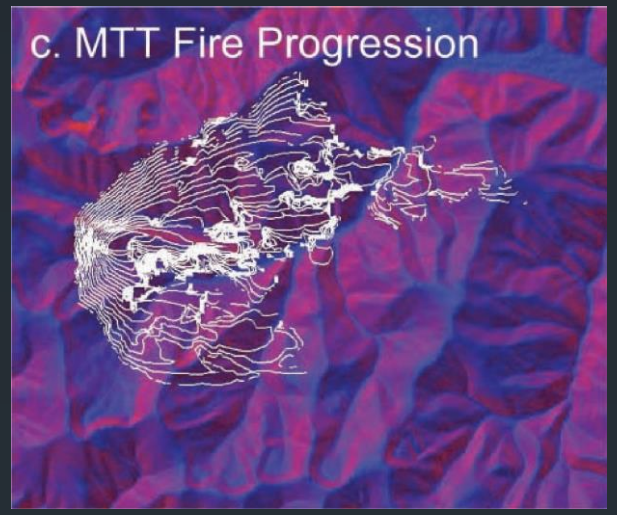
Model Landscape



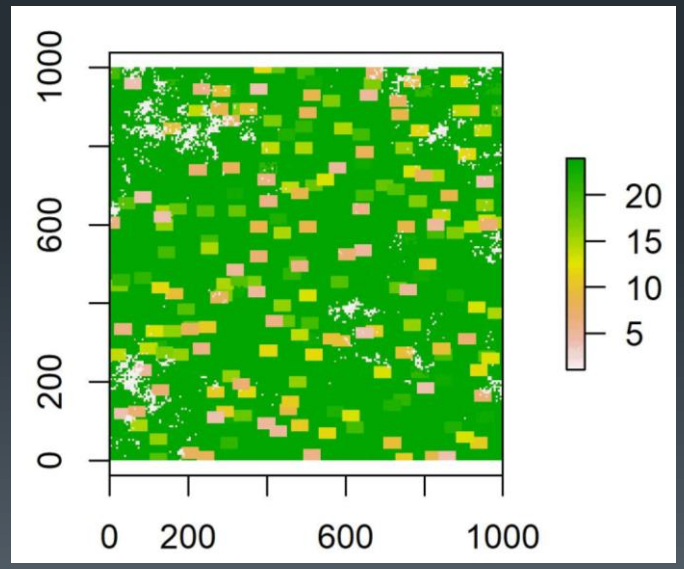
Management frequency e.g. 5 years vs 10 year

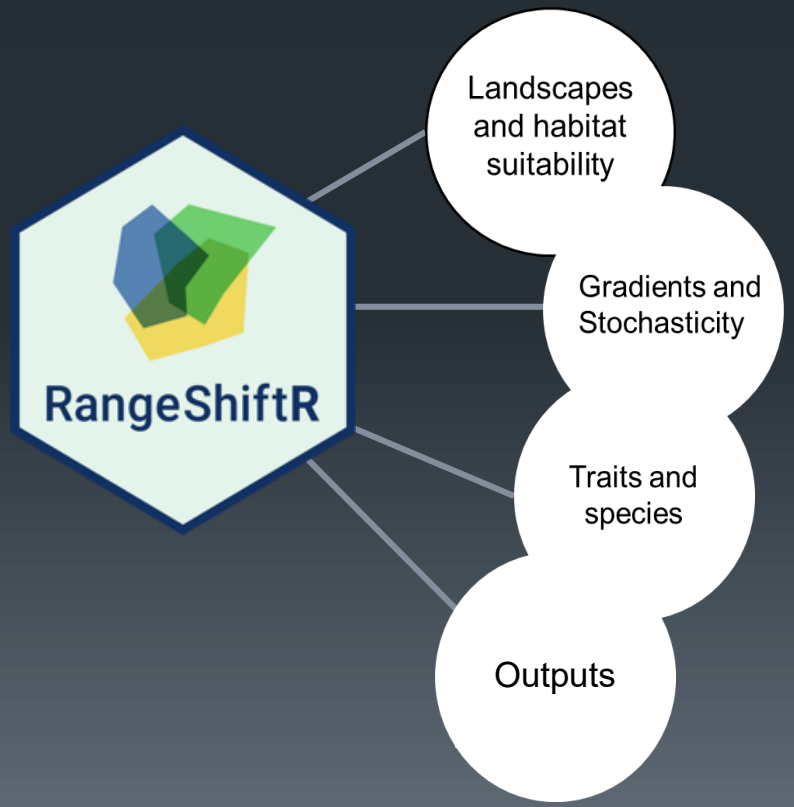






Model Landscape





Predict e.g. if landscape left unmanaged for 10 years – would this benefit bird/insect biodiversity but also considering increase in wildfire risk

Carbon modelling

Adaptations

New Plant Functional types
- Vegetation height
- Leaf area
- Crown area

JULES
Joint UK Land Environment Simulator

Outputs

- JULES CHESS UK:
- Carbon fluxes (C-combustion, smouldering in wildfire)
- Charcoal abundance in soils
- Soil Carbon losses (e.g. wildfire)

Total carbon stocks for management vs wildfire and working towards net zero agendas

The IDEAL UK Fire Project

Determining the environmental costs and benefits of widely applied management tools on: carbon balance and habitat quality and biodiversity.

Translating information into accredited land management training

Development of site management plans to achieve desired landscape carbon and biodiversity benefits at the same time as mitigating wildfire risk

Any further Questions?

Please come and ask the IDEAL UK Fire project team here today:

Nick Kettridge
University of Birmingham

Claire Belcher
University of Exeter

Stefan Doerr
Swansea University

Andreas Heinemeyer
University of York