Forest Research

WOODLAND OPPORTUNITY MAPPING

A CASE STUDY IN THE CAIRNGORMS NATIONAL PARK

Stefania Pizzirani
Forest Research
Northern Research Station
Edinburgh

Cairngorms NATIONAL PARK

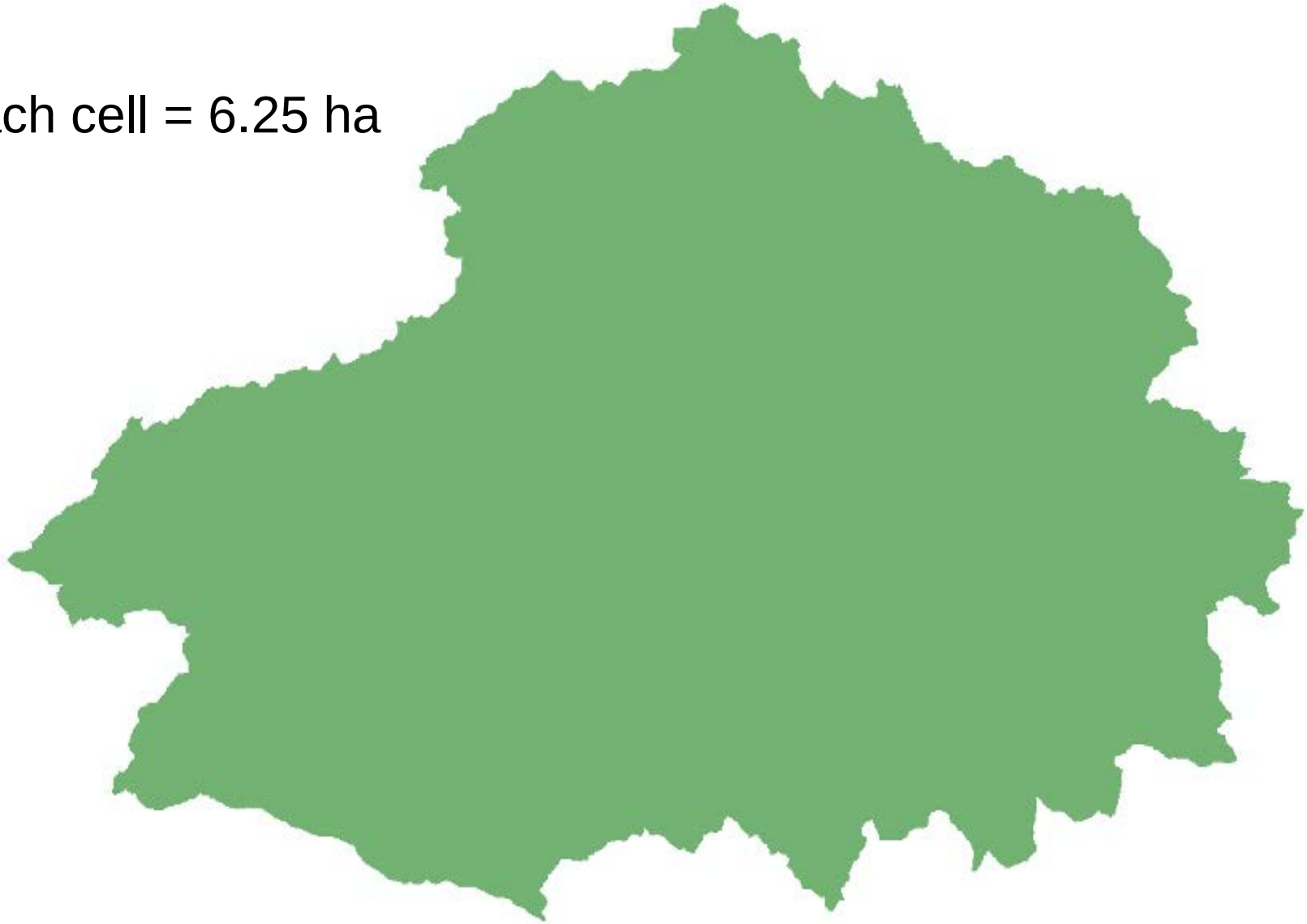
Northern Periphery Programme 2007-2013

Background

- Explored two woodland expansion scenarios: timber production focus and biodiversity focus
- Used Ecological Site Classification (ESC) model to create grid of species suitability across Cairngorms National Park (CNP)
- Attempted to stay consistent with as many CNPA objectives as possible in each scenario (e.g. native species)
- Used various spatial and site specific data to extract the most suitable areas for each scenario
- Aimed to achieve between 5-10% woodland expansion

First step: create a grid over the CNP
73,448 cells (250m x 250m grid)

Each cell = 6.25 ha



Second step: Combine data into one database

Species suitability

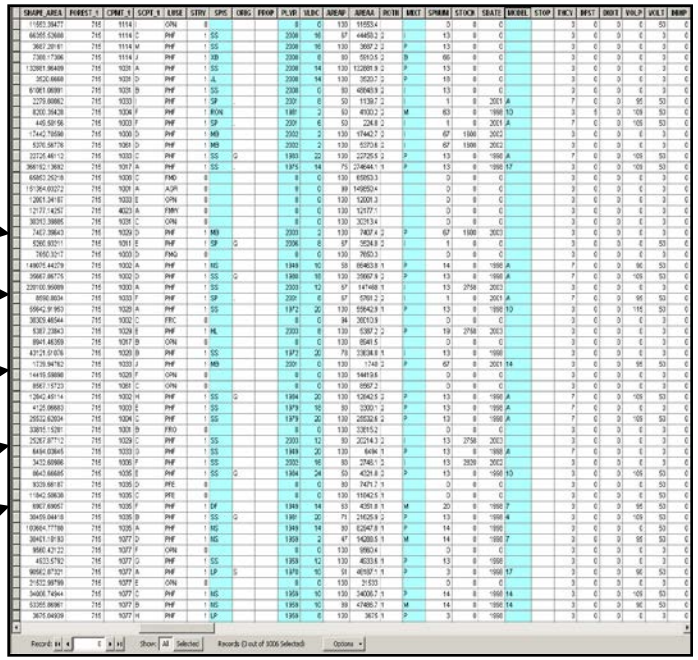
Soil data

Temperature data

Moisture data

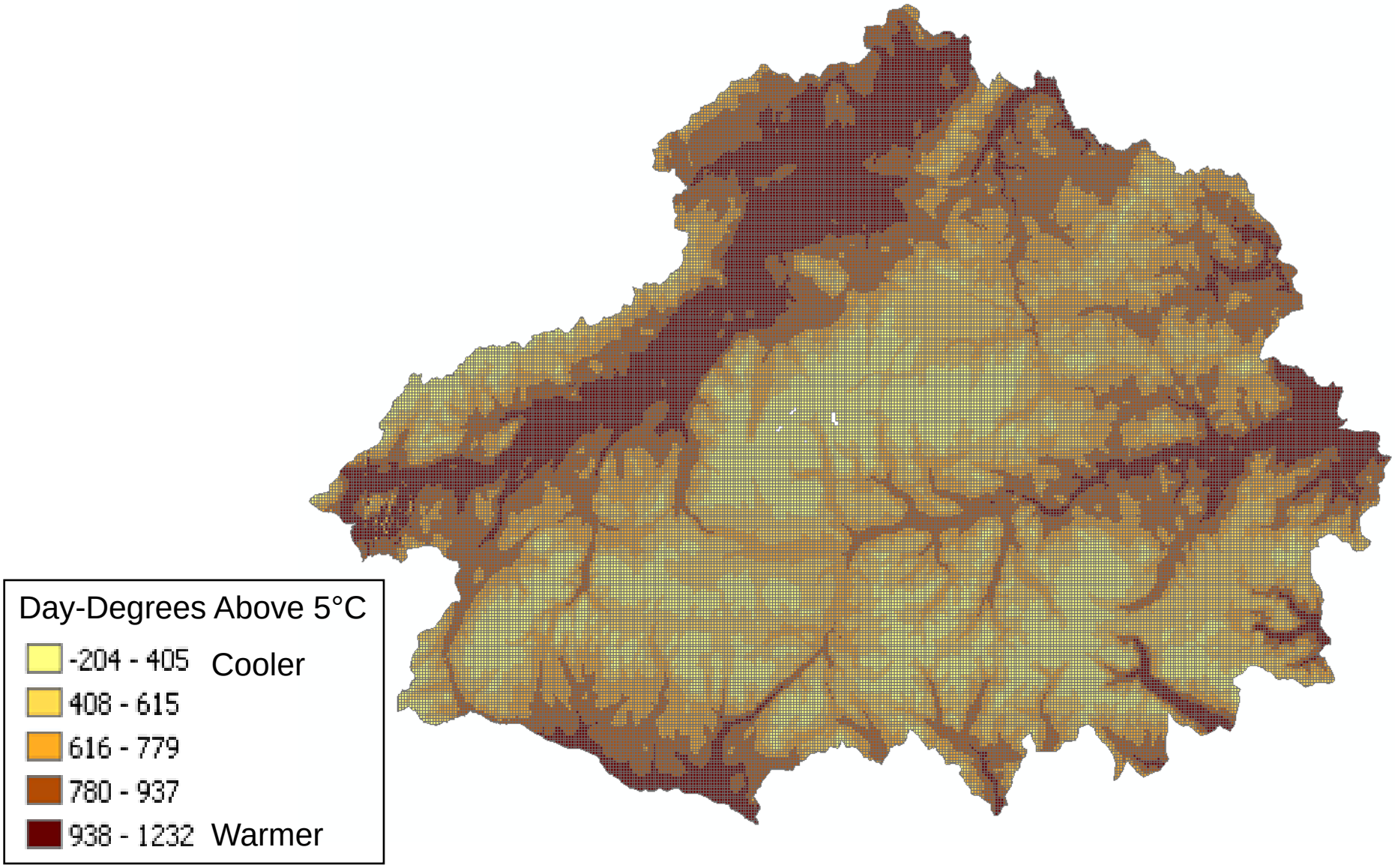
Windiness data

Geological data



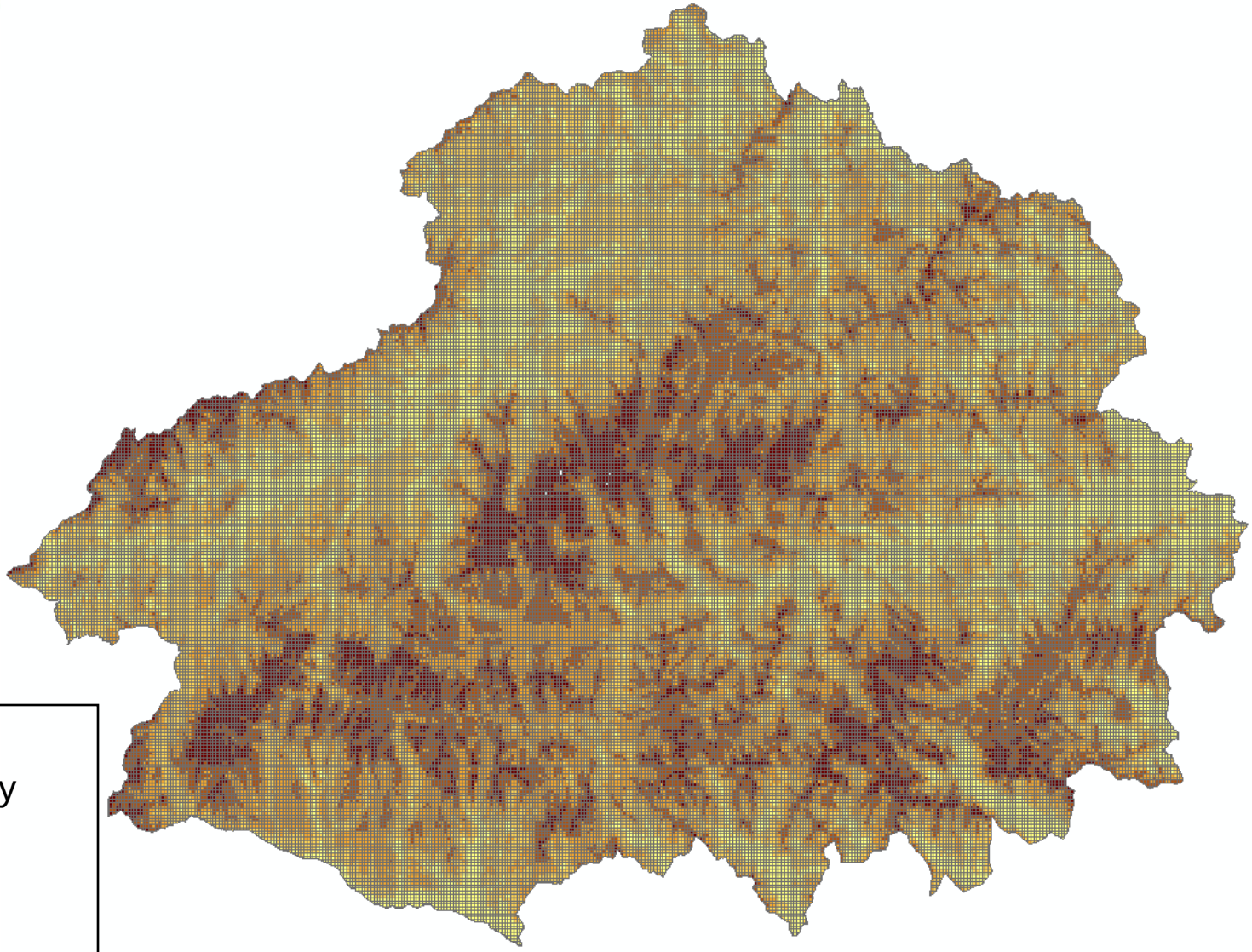
Forest Research

Accumulated Temperature



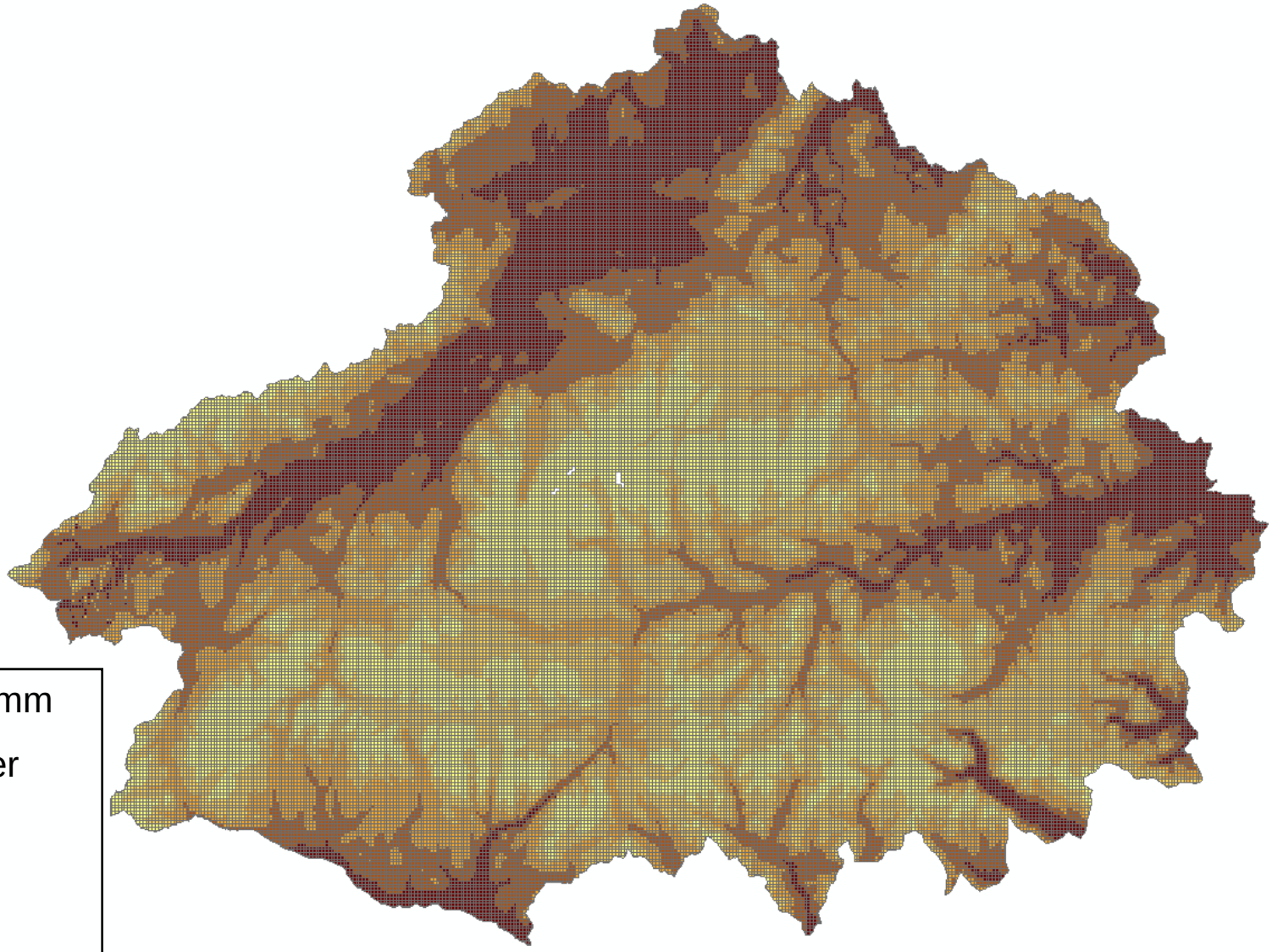
Forest Research

DAMS – Windiness



Forest Research

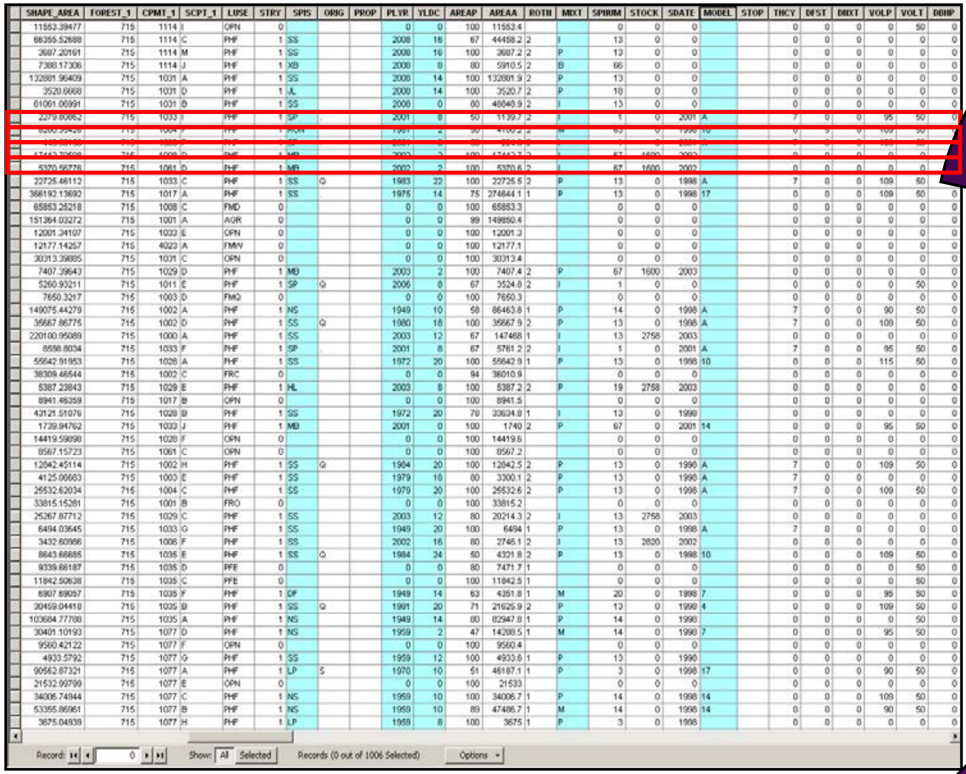
Moisture Deficit



Moisture Deficit in mm

-180 - -51	Wetter
-50 - -7	
-6 - 26	
27 - 58	
59 - 112	Drier

Third step: Run database through ESC model

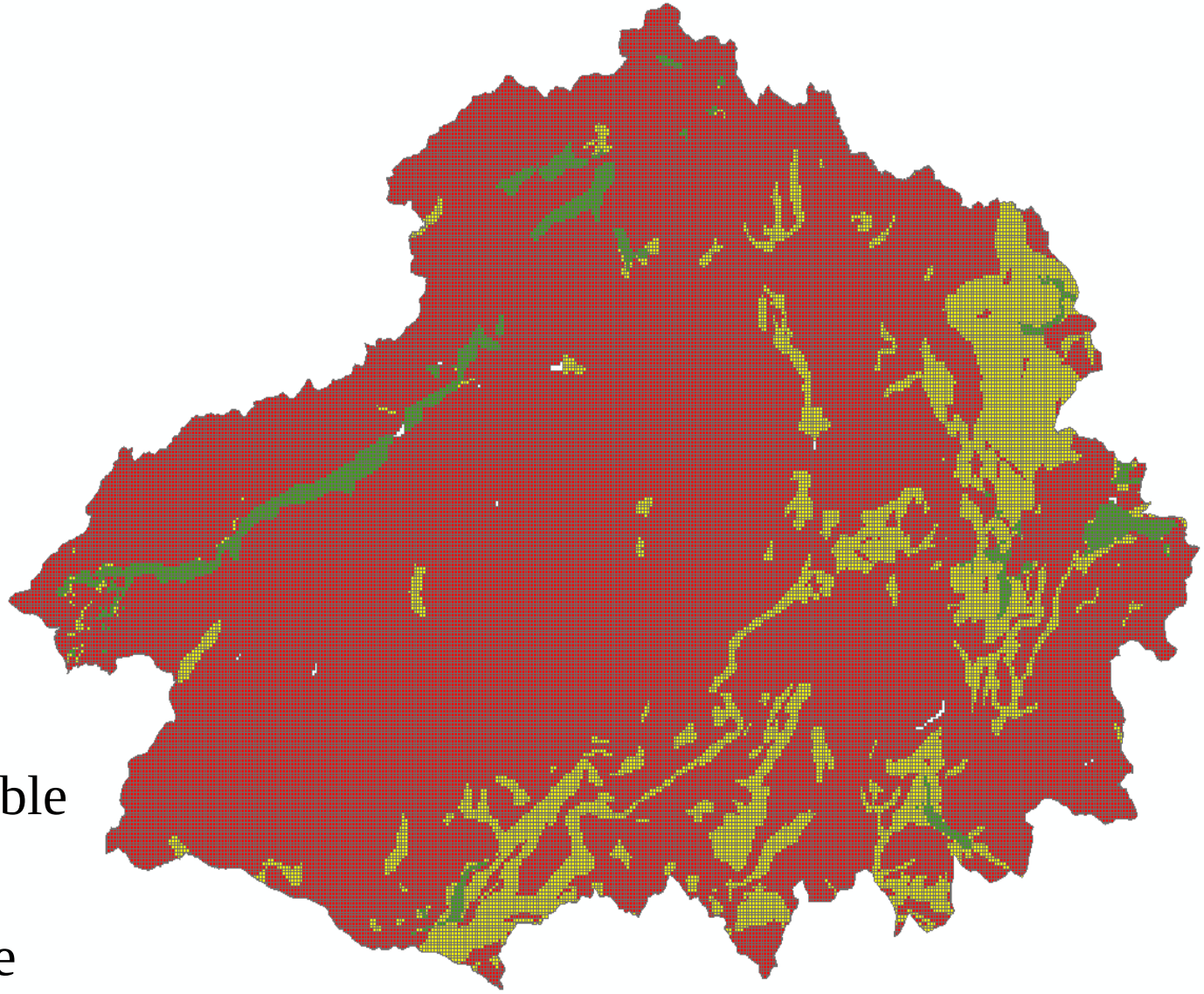


Batch mode processing

Results for each row (i.e. management unit) are recorded in the original database

Forest Research

Sitka spruce suitability



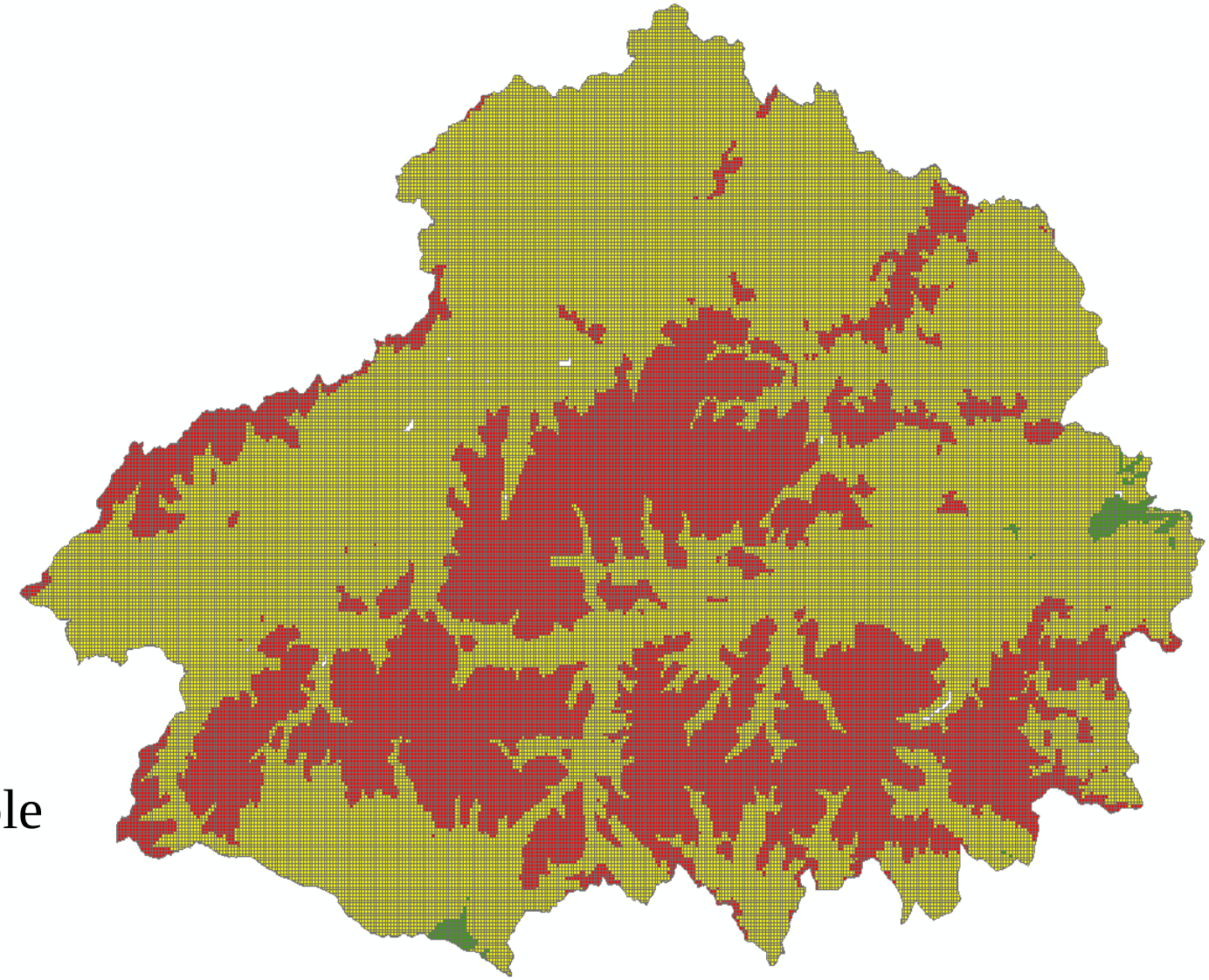
1 Very suitable

2 Suitable

3 Unsuitable

Forest Research

Scots pine suitability

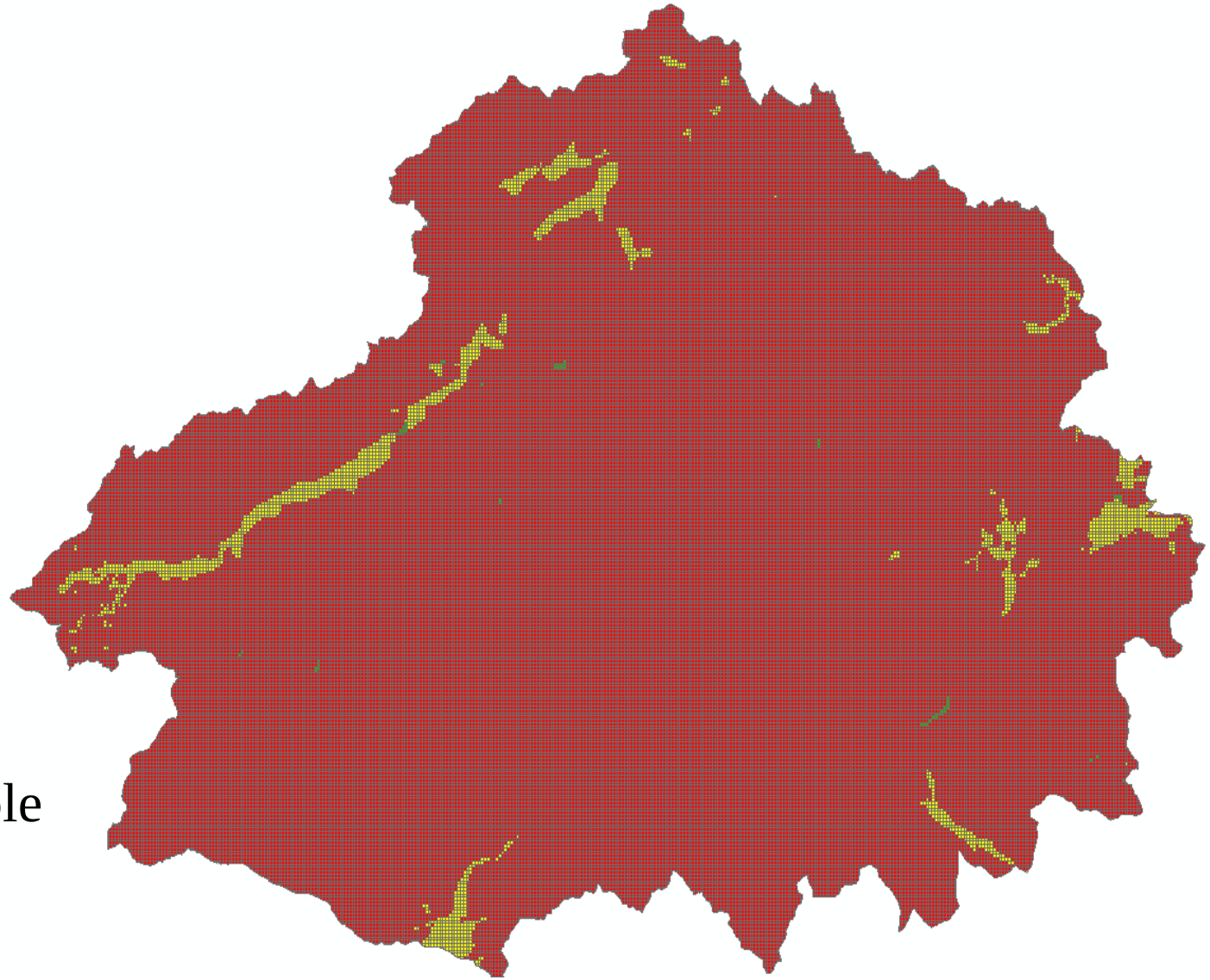


1 Very suitable

2 Suitable

3 Unsuitable

Oak suitability



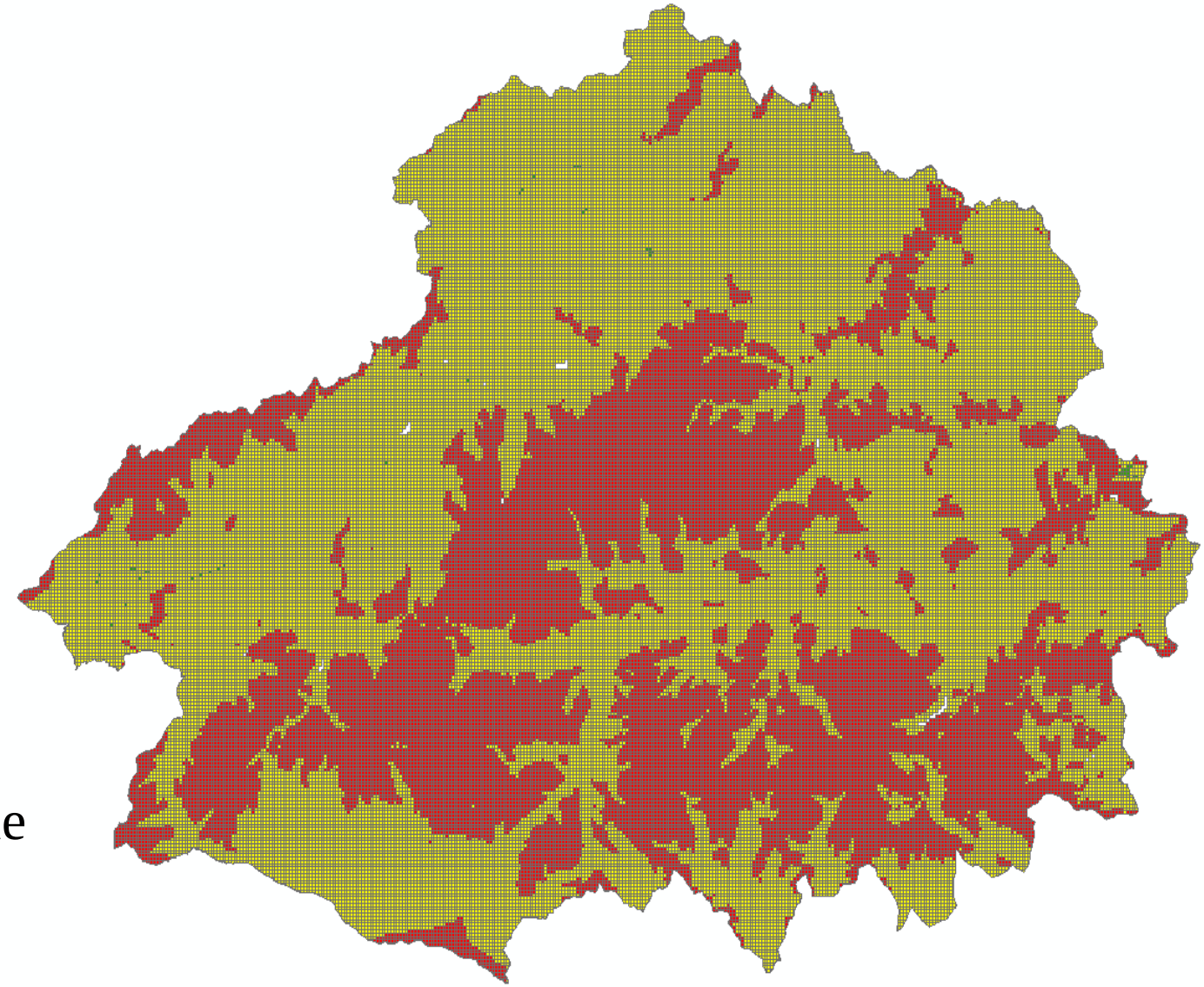
1 Very suitable

2 Suitable

3 Unsuitable

Forest Research

Downy birch suitability

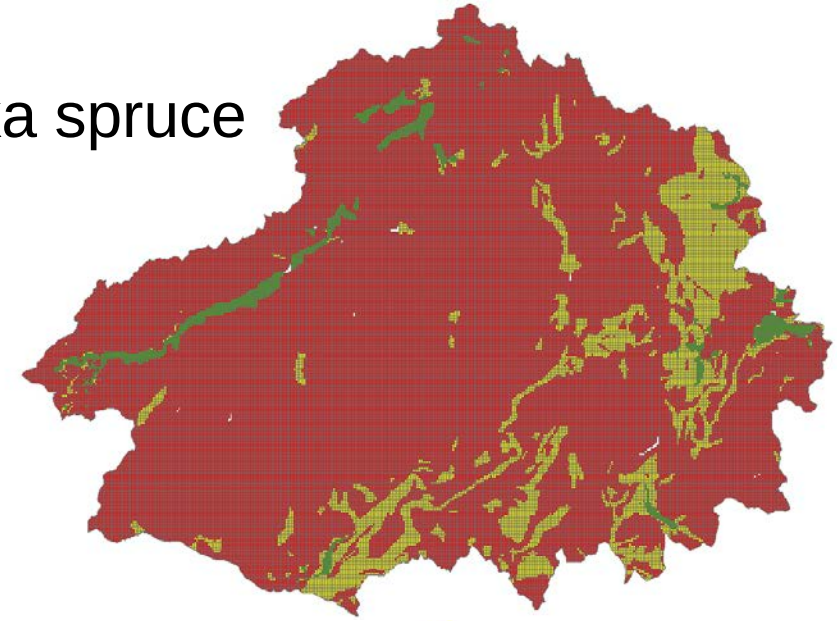


1 Very suitable

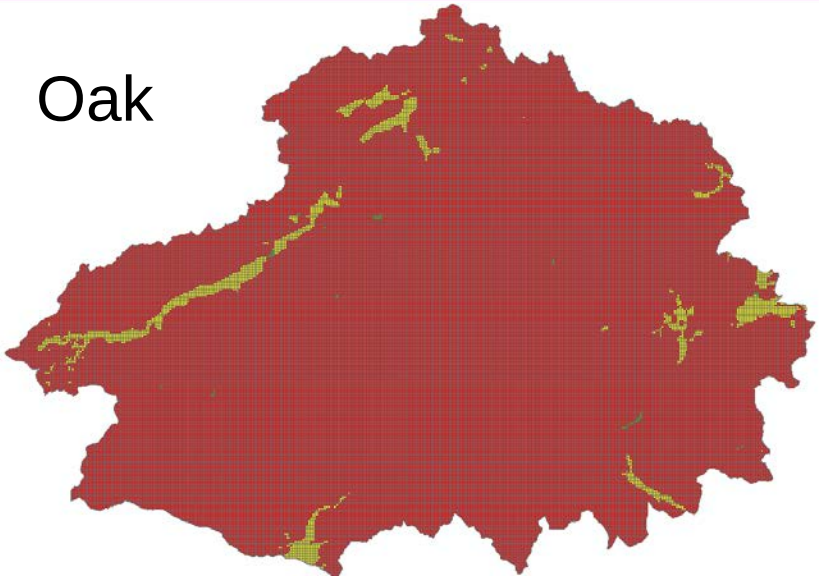
2 Suitable

3 Unsuitable

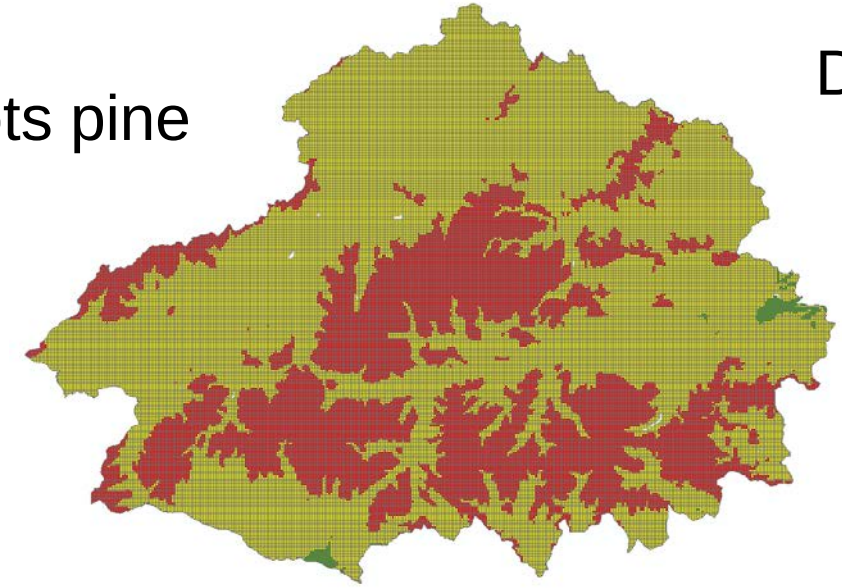
Sitka spruce



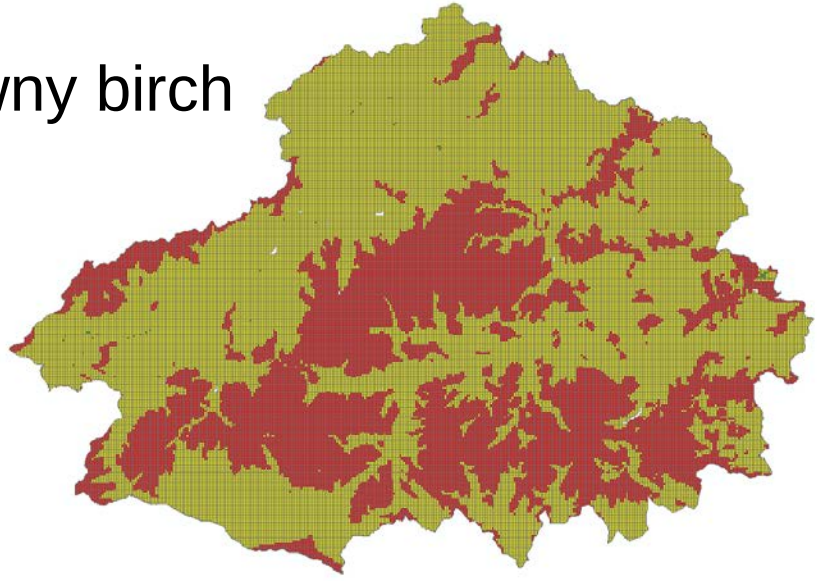
Oak



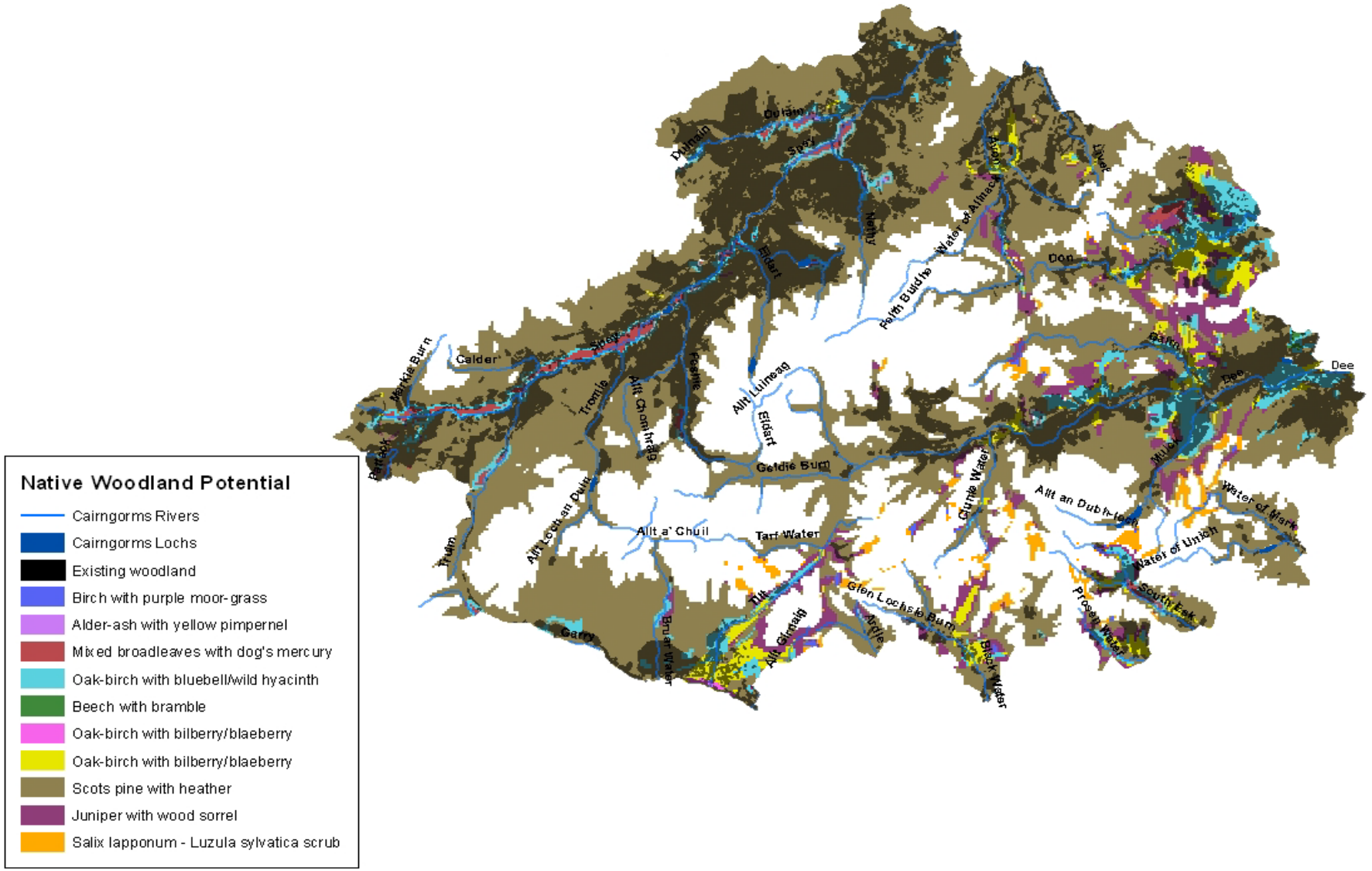
Scots pine



Downy birch



Native Woodland suitability

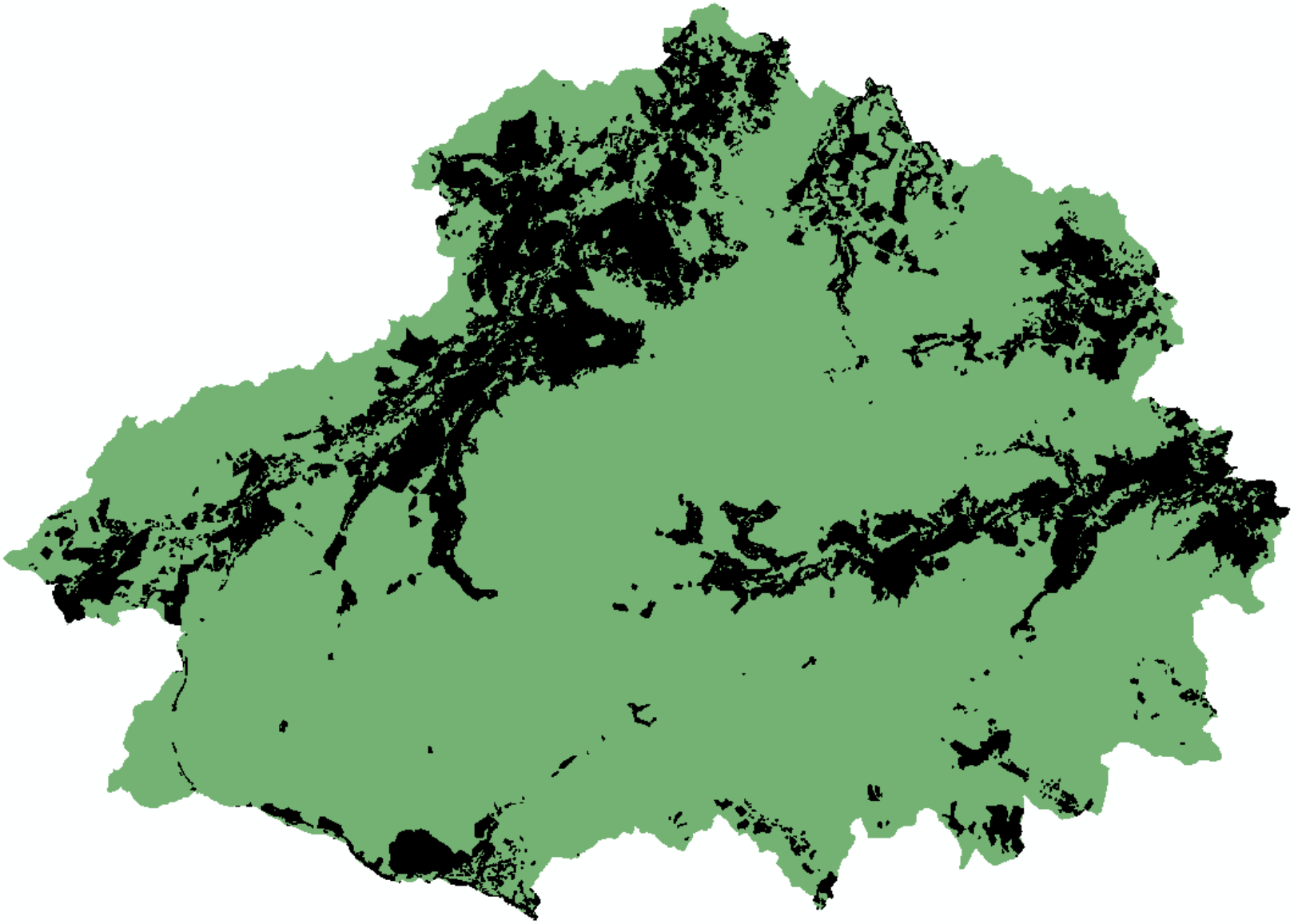


Targeting areas for specific types of woodland expansion

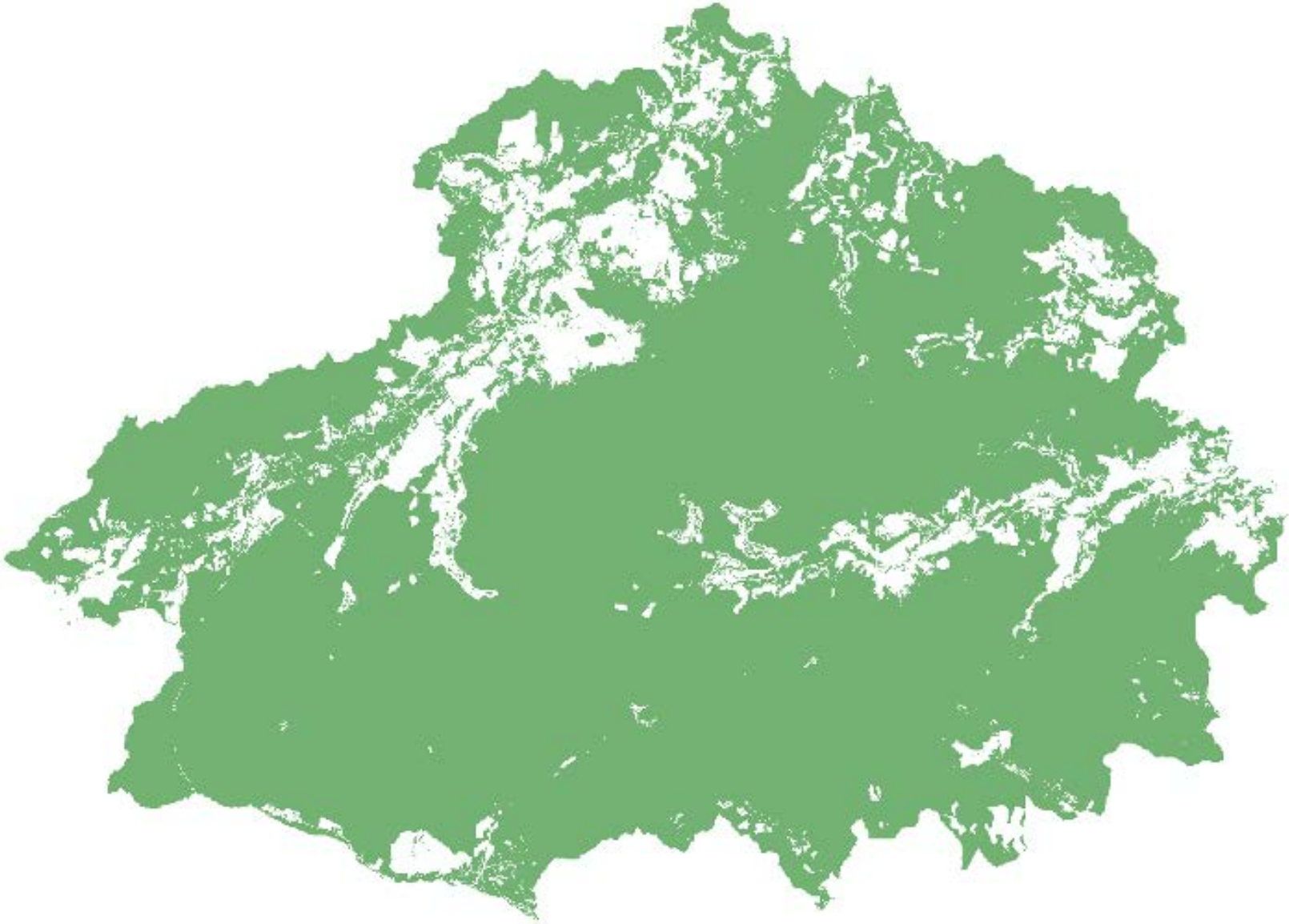
Spatial data considered in the timber production and biodiversity woodland expansion examples:

- Existing woodland
- Protected land in the National Park (e.g. arable land, improved grassland)
- Grassland networks
- Fen, marsh and swamp networks
- Sites of Special Scientific Interest (SSSIs)
- Special Protected Areas
- Special Areas of Conservation
- Slope over 30% (in the timber production scenario)
- Road network
- Tree species suitability and growth rate

Current existing woodland

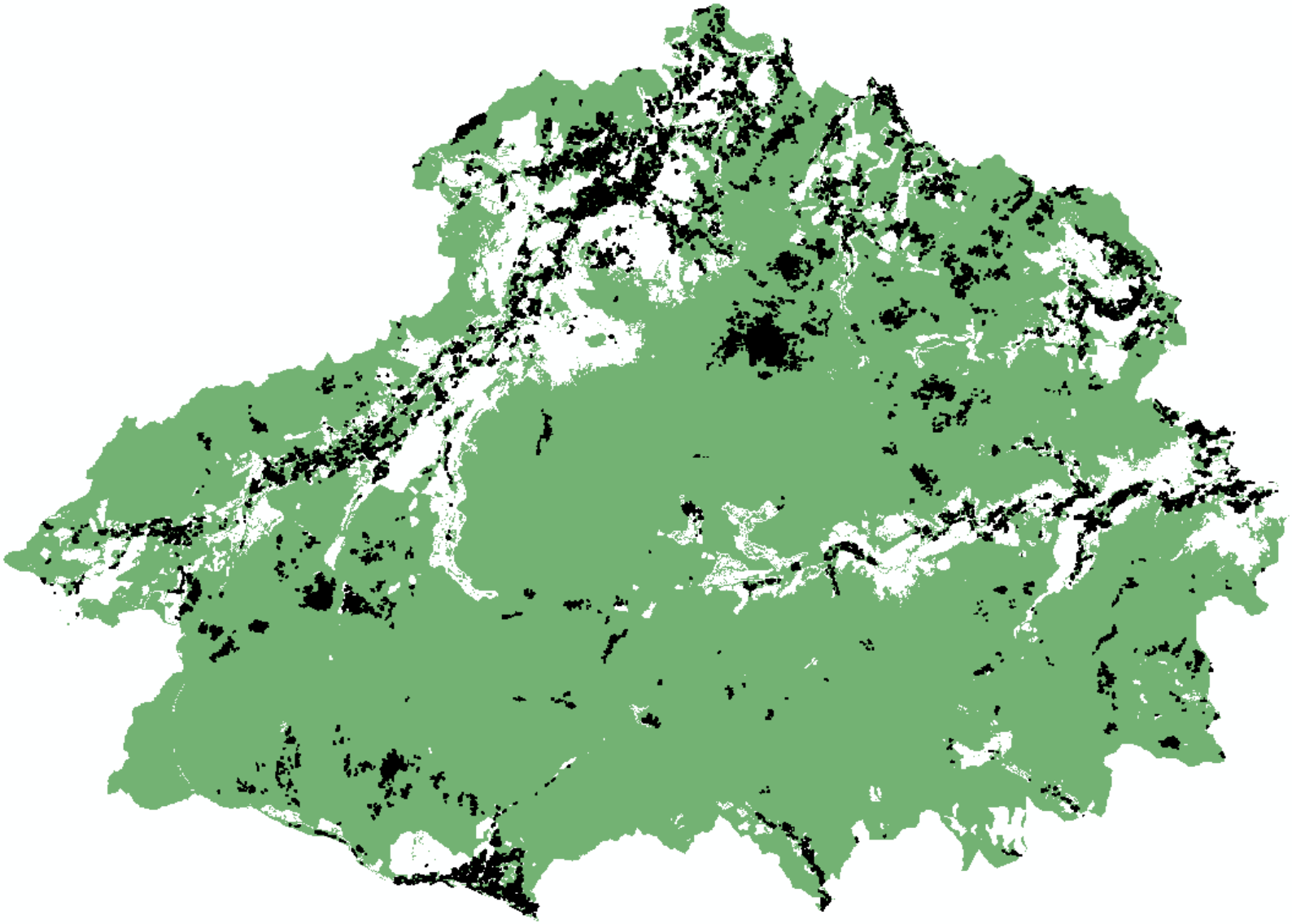


CNP less existing woodland 69,269 cells left



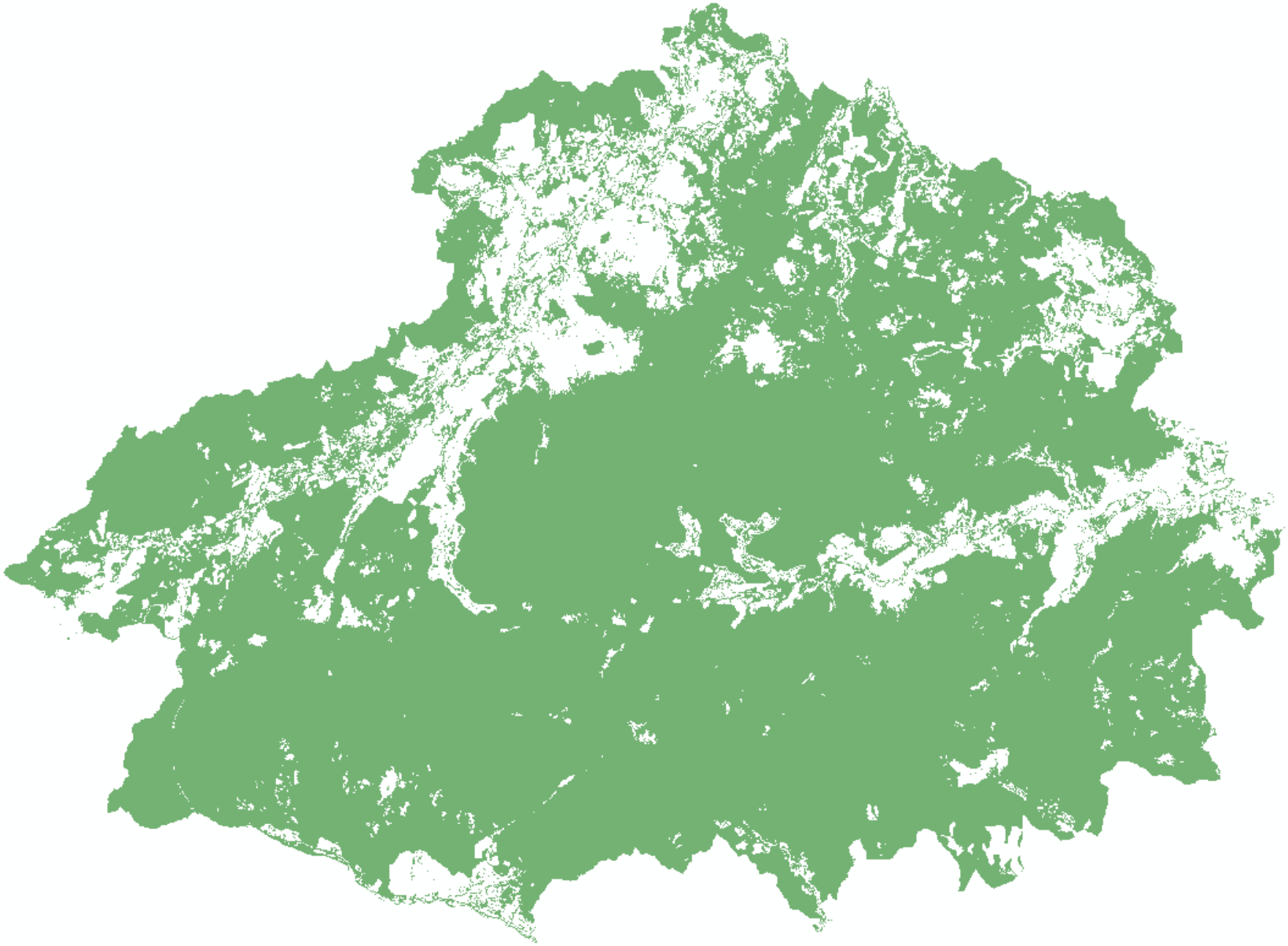
Forest Research

Areas to be excluded: Bog, Arable, Improved grassland



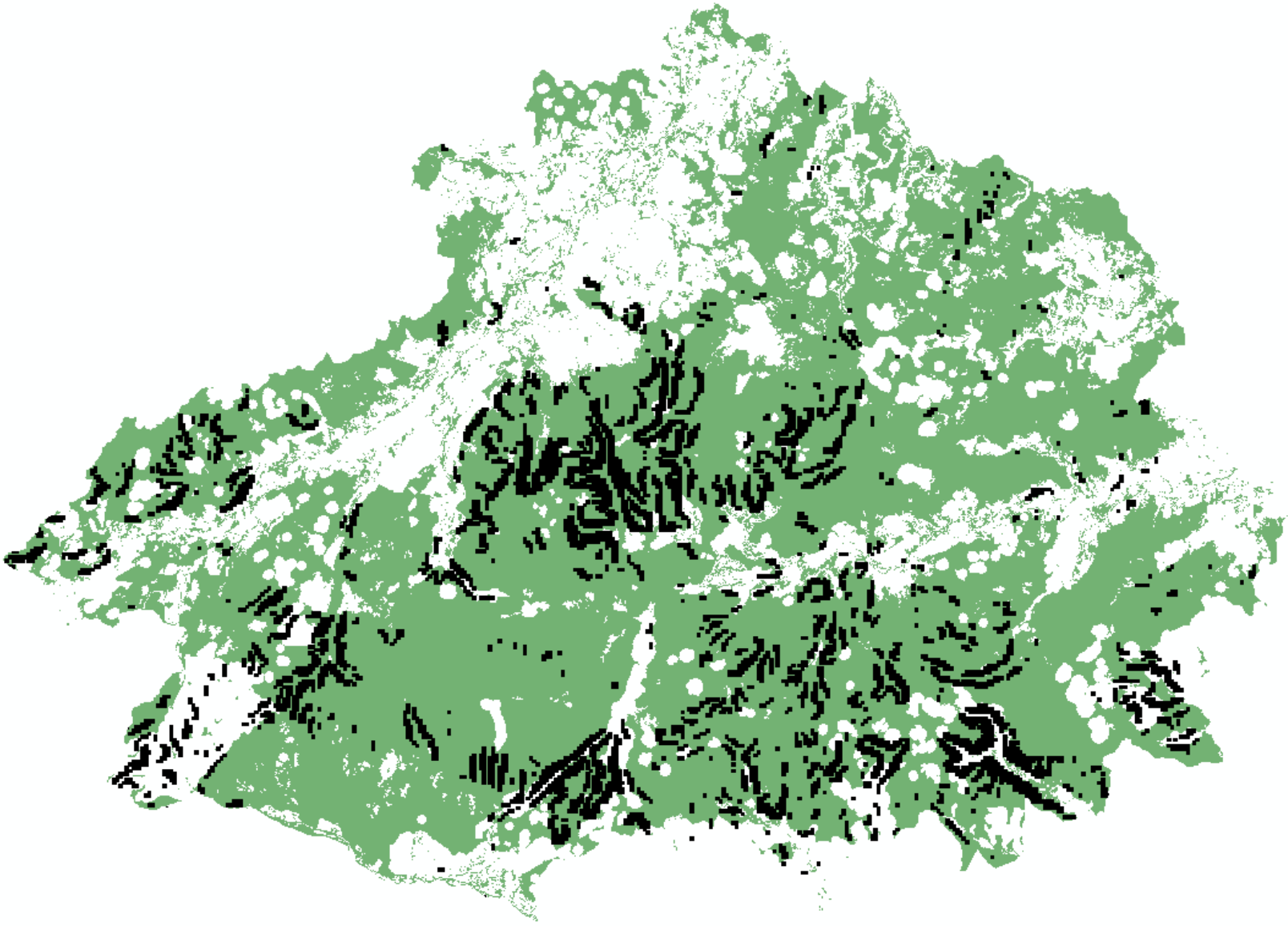
Forest Research

CNP less existing woodland and protected land cover
68,803 cells left



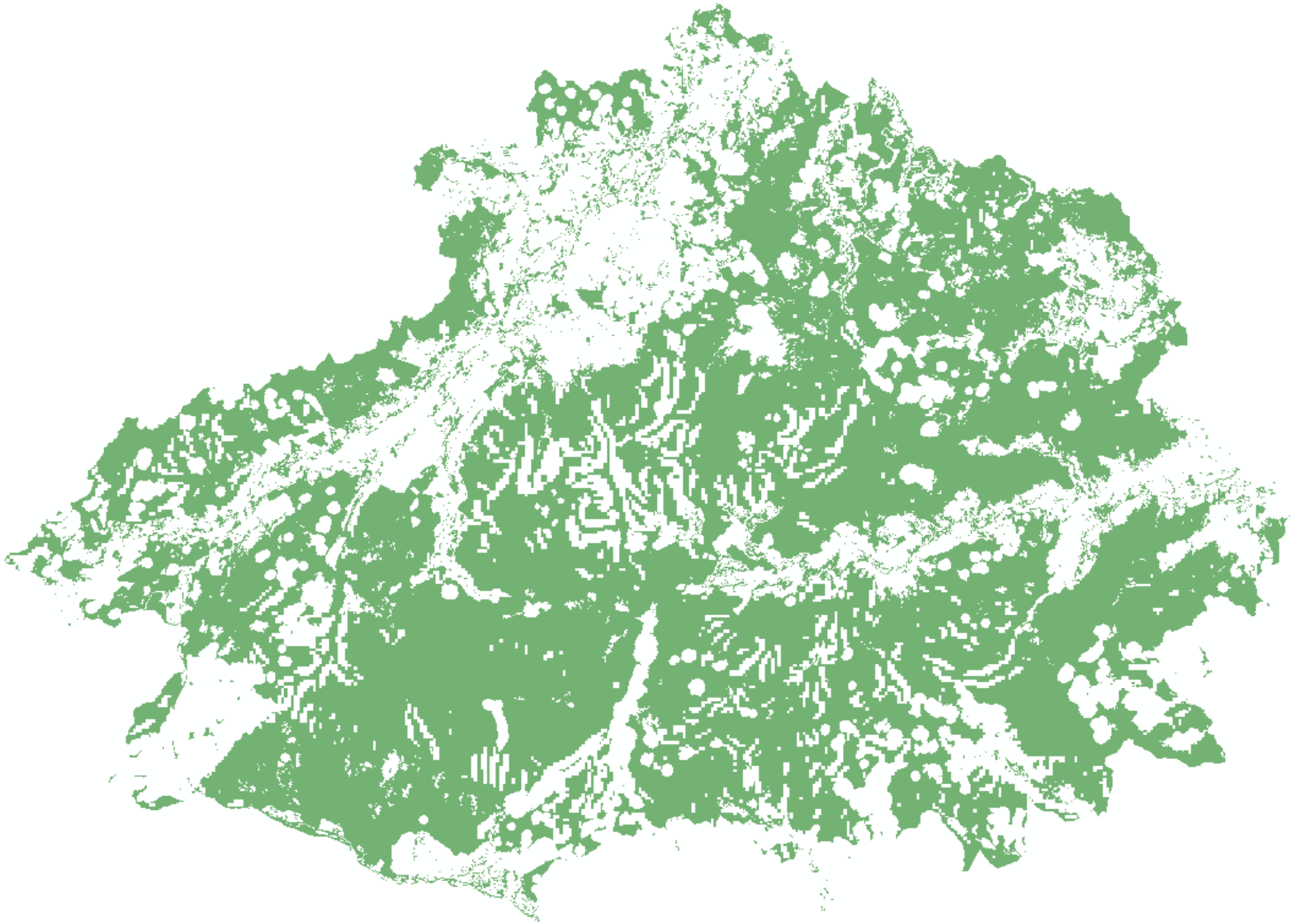
Forest Research

Slope 30 percent grade and over



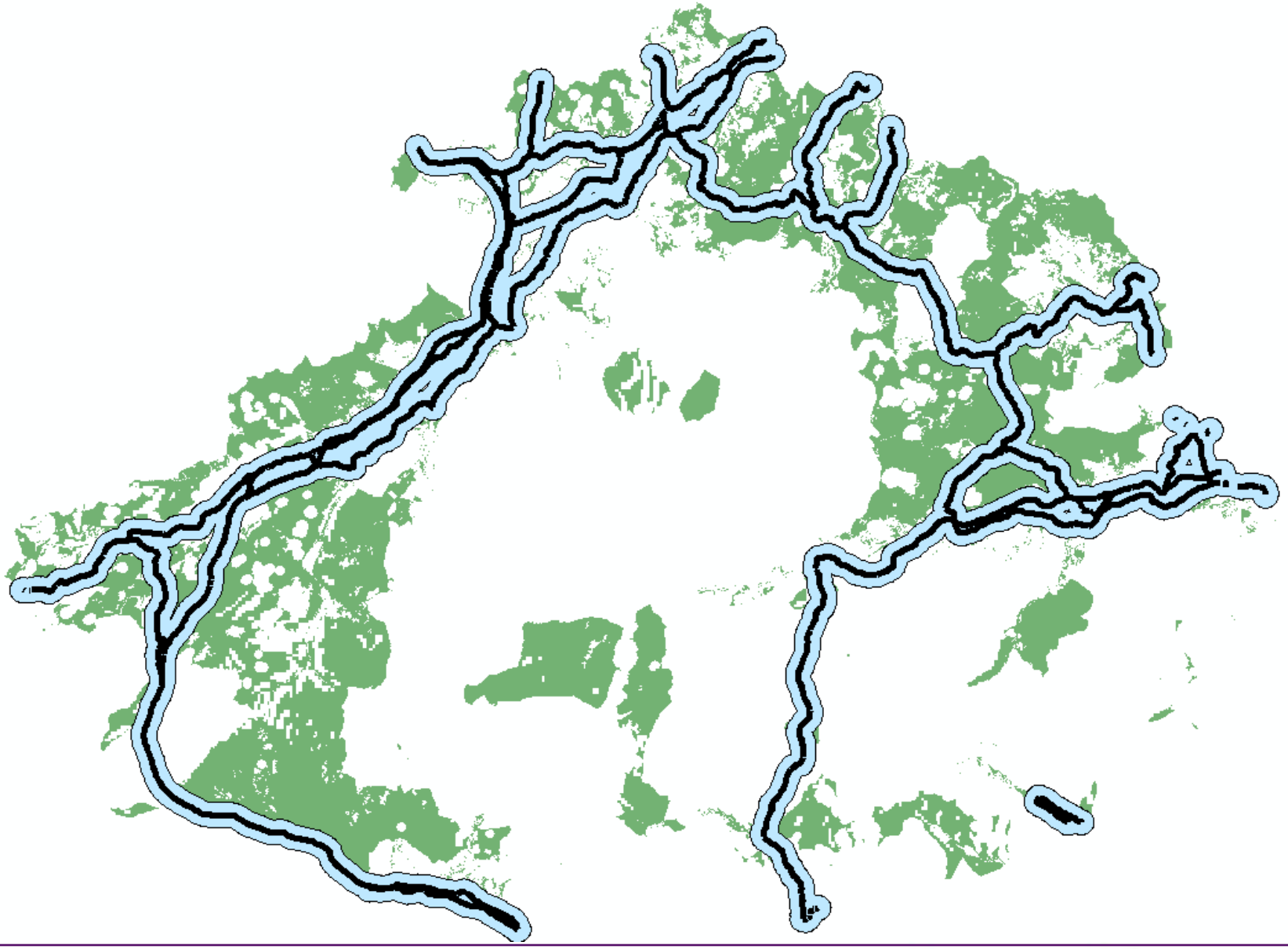
Forest Research

CNP less existing woodland, protected land cover, grassland networks, fen / marsh / swamp networks and slope over 30 percent
56,256 cells left



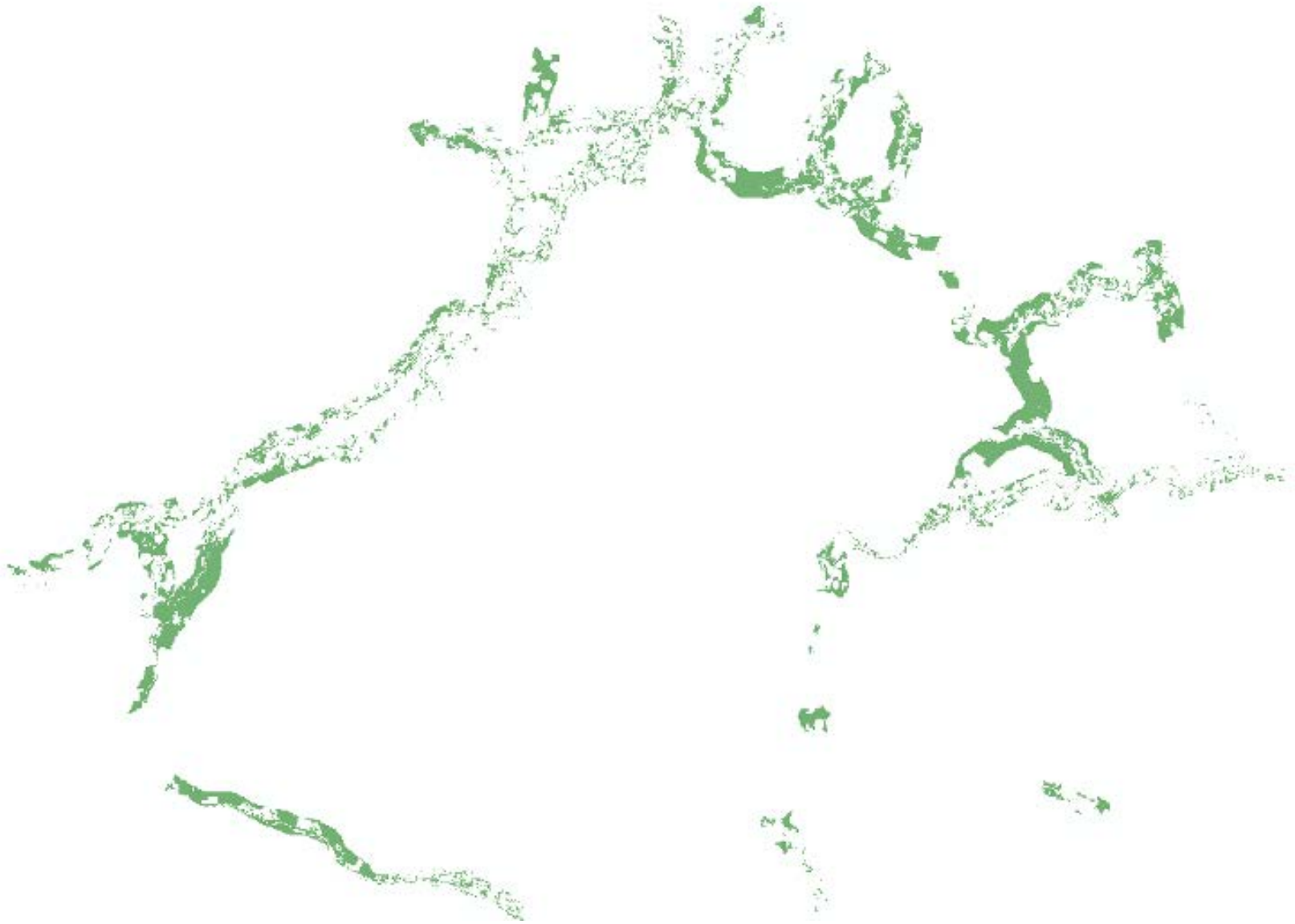
Forest Research

A and B roads with 1km buffer



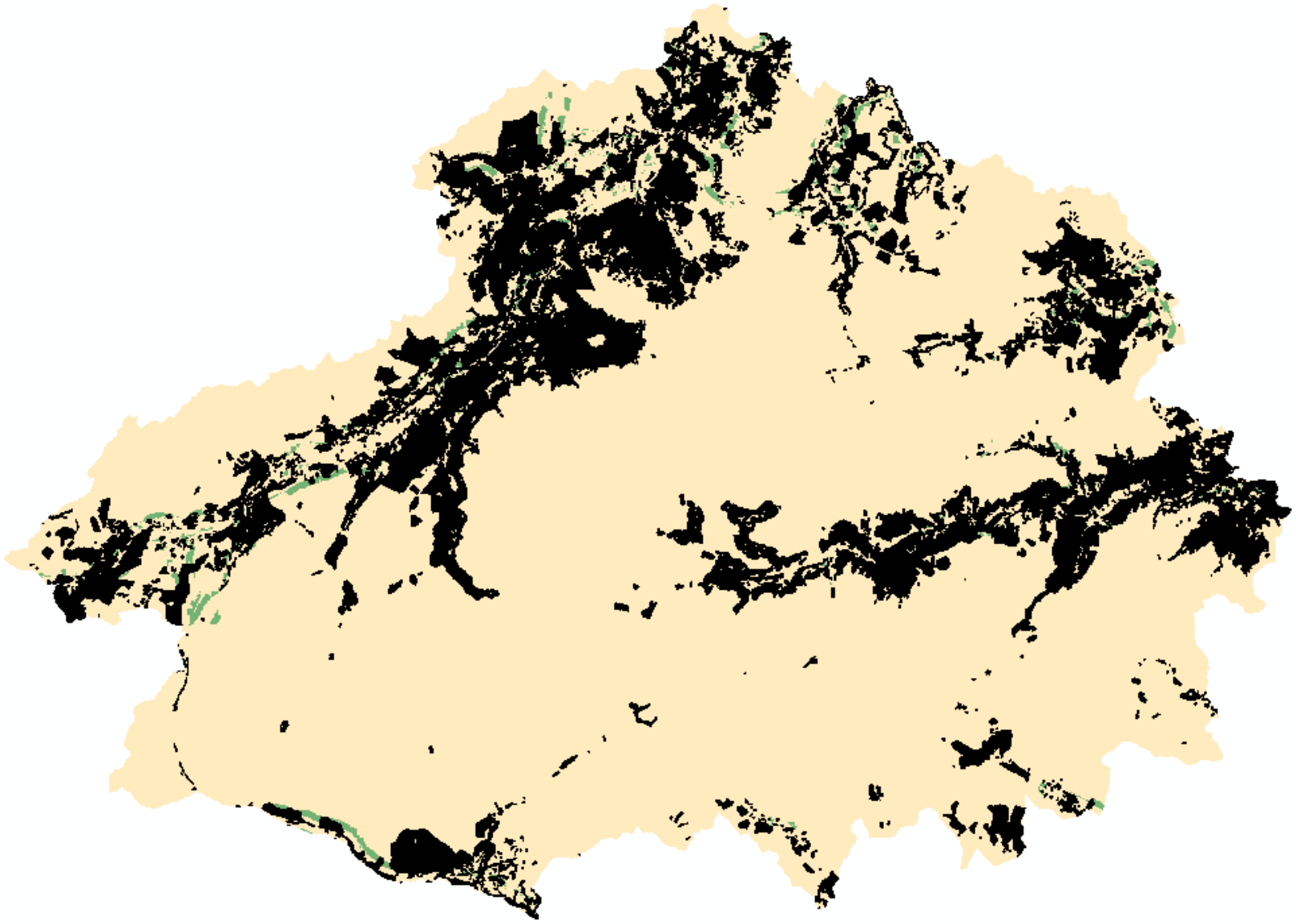
Forest Research

CNP less existing woodland, protected land cover, grassland networks, fen / marsh / swamp networks, slope over 30 percent, SSSIs, SPAs, SACs and within 1km of an A or B road
9,393 cells left



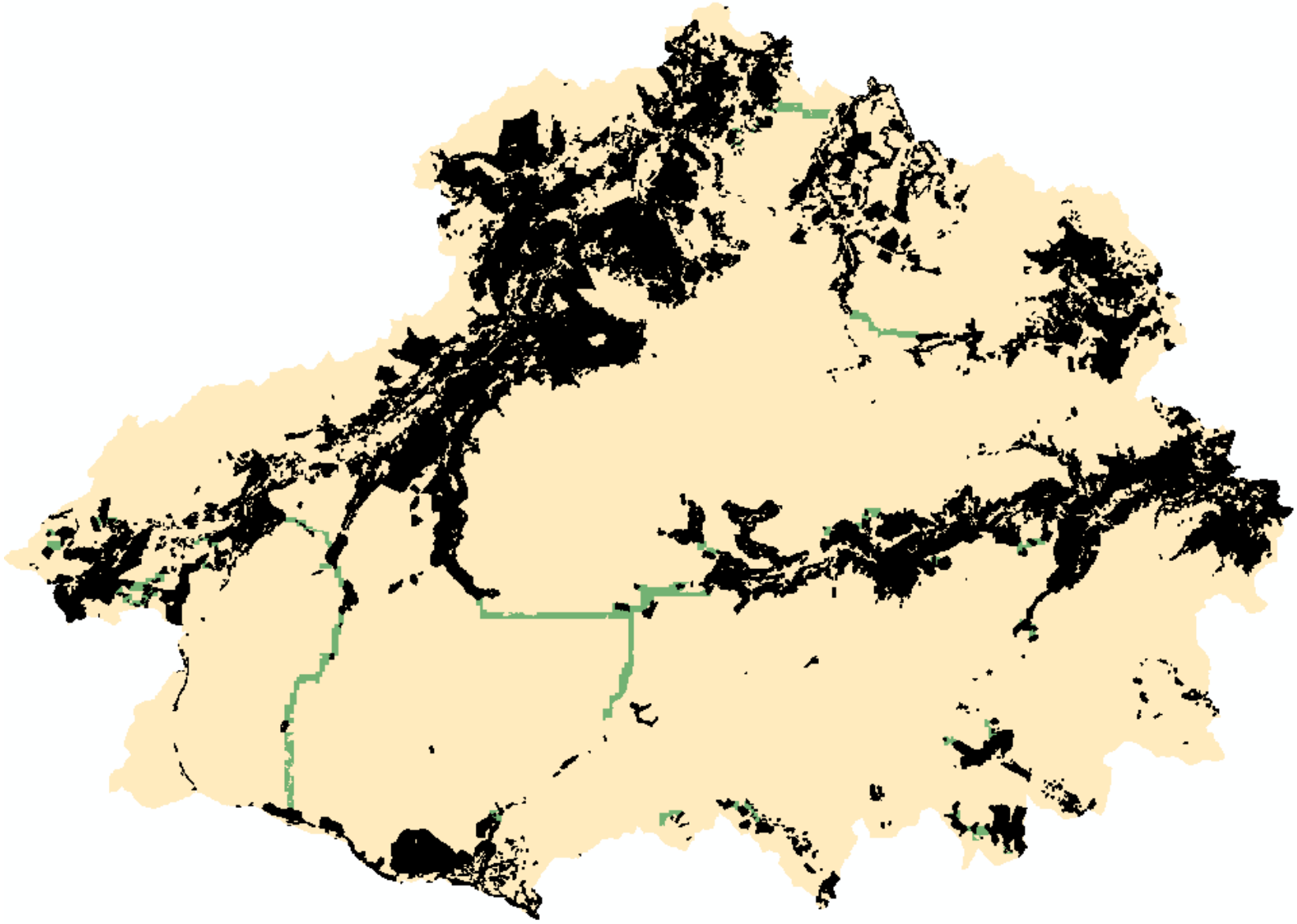
Forest Research

Final area for timber production scenario with existing woodland (in black)



Forest Research

Final area for biodiversity scenario with existing woodland (in black)



Example of indicator results at the end of the growing phase

Biodiversity Woodland Expansion Scenario (managed as a 'Nature Reserve')

- Value of standing tree at end of 100-year rotation: £27.26/m^3
- Total production cost: £1.10/m^3 per year
- Employment: 0.001 FTE/ha per rotation
- GHG emissions (machinery): 0.96 kg CO2 eq/ha per year
- CO2 sequestered (total rotation): 4,442 kg CO2 eq/ha per year

Timber production Woodland Expansion Scenario

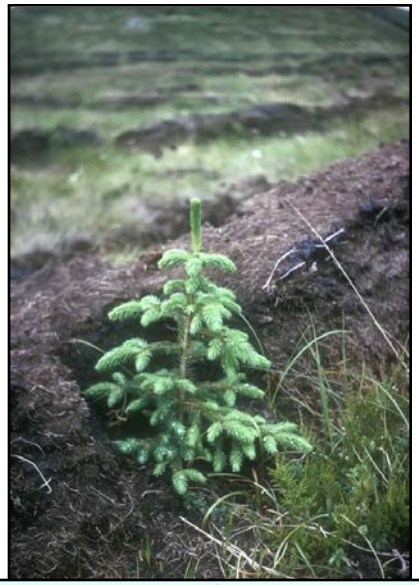
- Value of standing tree at end of 75-year rotation: £29.74/m^3
- Total production cost: £18.13/m^3 per year
- Employment: 0.255 FTE/ha per rotation
- GHG emissions (machinery): 11.4 kg CO2 eq/ ha per year
- CO2 sequestered (total rotation): 3,053 kg CO2 eq/ha per year

Fragmentation: Number of woodland polygons

- Assume one polygon is one connected woodland
- The more polygons, the more fragmented pieces of woodland
- Original existing woodland: 2833
- Timber production scenario: 3089
- Biodiversity scenario: 2756

Ability to ‘grow’ potential woodland and test it’s resilience using other models

Species suitability

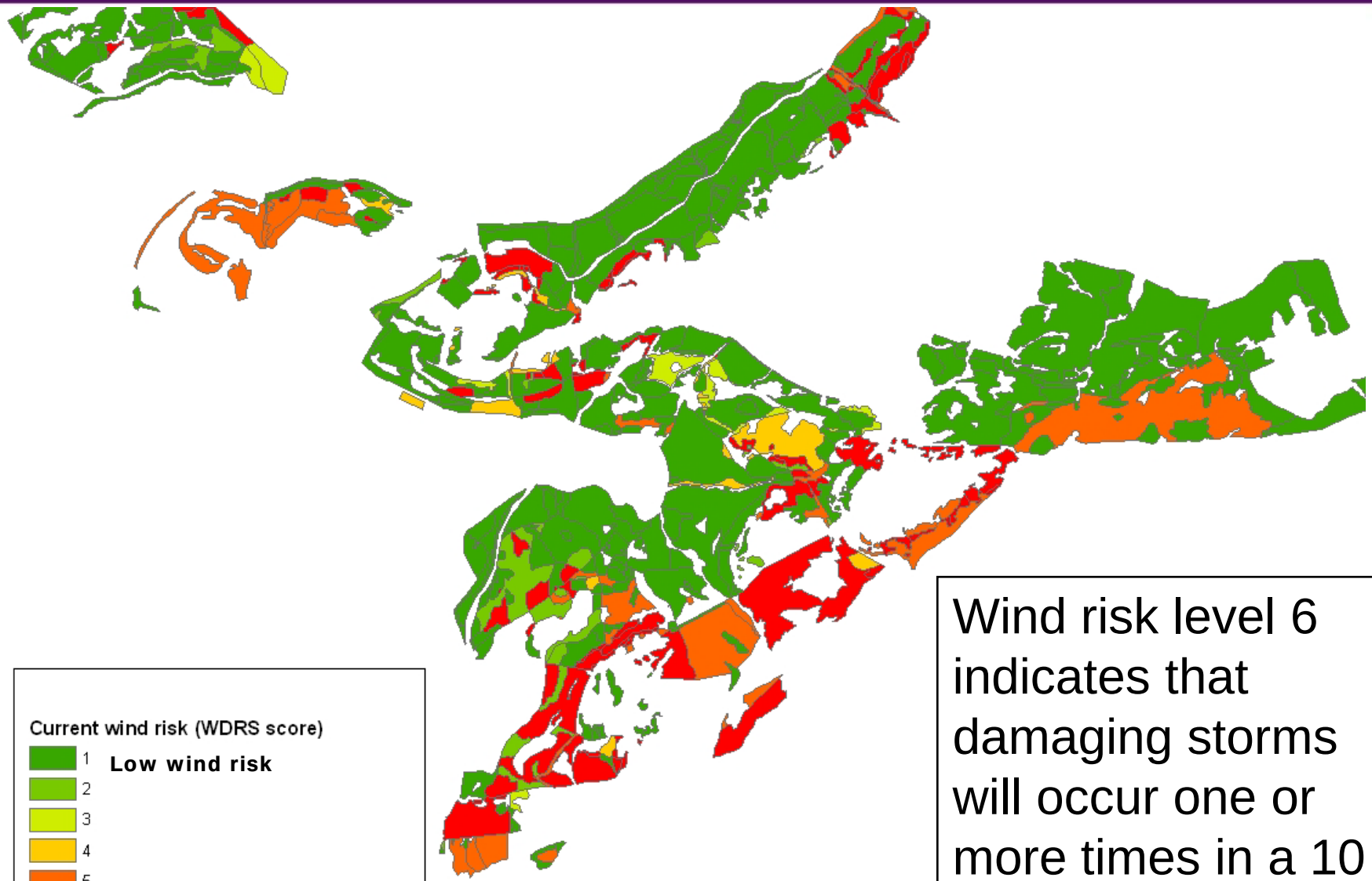


Timber quality

Wind risk

Forest Research

Wind Risk – Firm edges



Wind risk level 6 indicates that damaging storms will occur one or more times in a 10 year period

Next Steps and Conclusions

- The rules and thresholds for various spatial data can be adapted to suit any scenario or objective
- This process allows CNPA to
  - assess the impacts of woodland expansion and bioenergy scenarios
  - map the suitability of sites for expansion or conversion
  - fine-tune policy targets, and support decisions with evidence
  - develop a spatial plan that balances the multiple objectives of forest landscapes
- This process also provides a common language and framework to engage with stakeholders which
  - brings stakeholders together to contribute to Park planning
  - ensures planning is informed by local knowledge, values and expectations
- Hypothetical forests can be modelled into the future to assess the effects of climate change (wetter/drier soils), wind risk, etc.

Thank you!