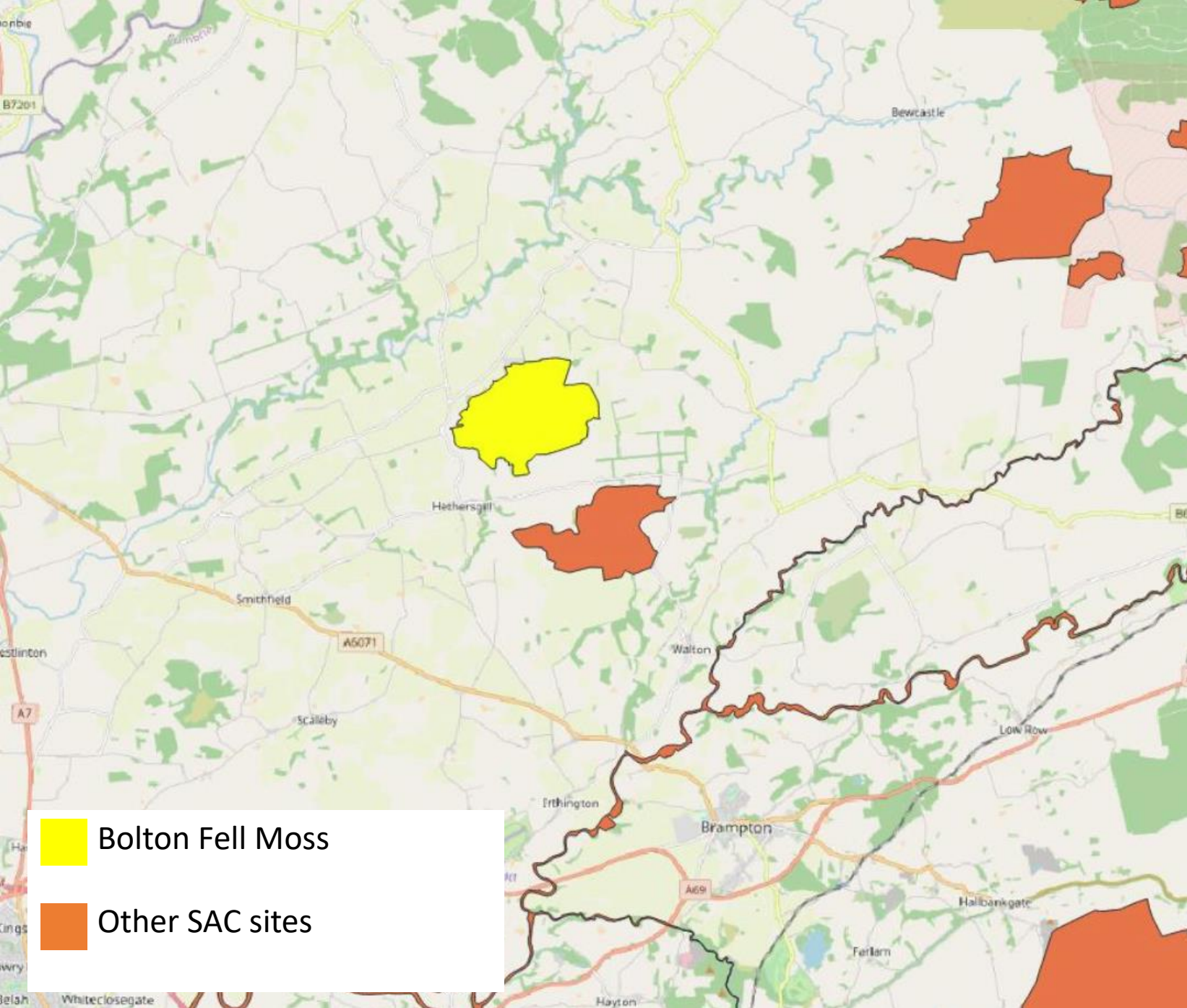


ART WP1 – Targeting Tree Planting for Ammonia Mitigation

Ed Carnell, Bill Bealey, Cristina Martin Hernandez

Targeting Tree Planting for Ammonia Mitigation

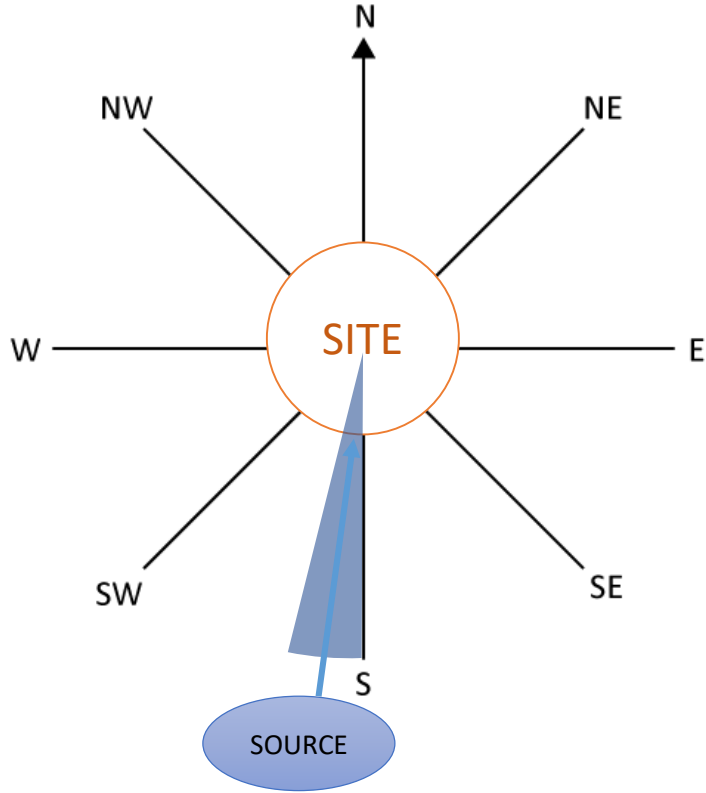
- 15:10 - 15:15 - Joining and Introduction
- 15:15 - 15:30 – How we did it and tool demo
- 15:30 - 15:35 - Walkthrough the data
- 15:35 - 15:45 - Q & A and introduce breakouts
- 15:45 - 16:15 - Breakout room
- 16:15 - 16:30 - Report back from each breakout room and wrap up



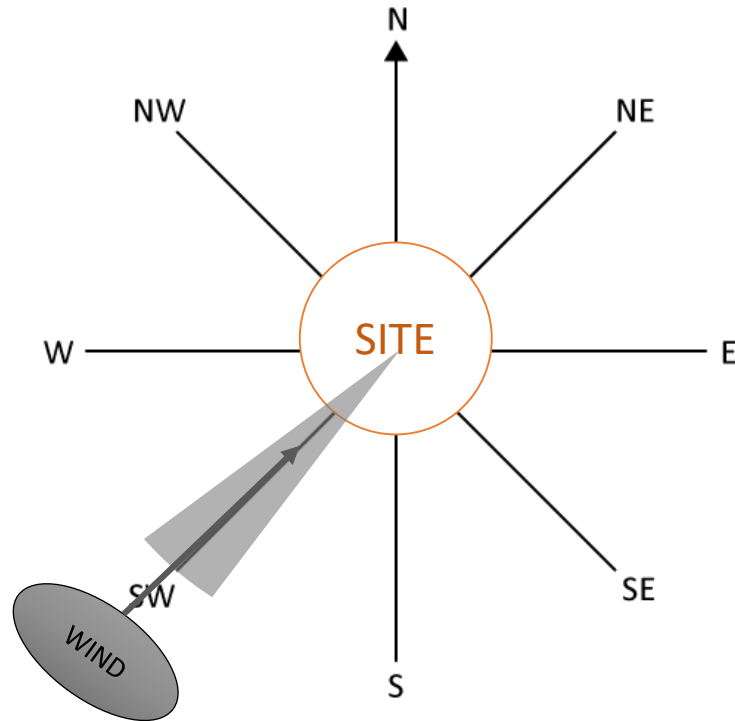
SCOPE: Target the best places to plant trees to ‘protect’ designated and semi-natural sites from ammonia.

CRITERIA:

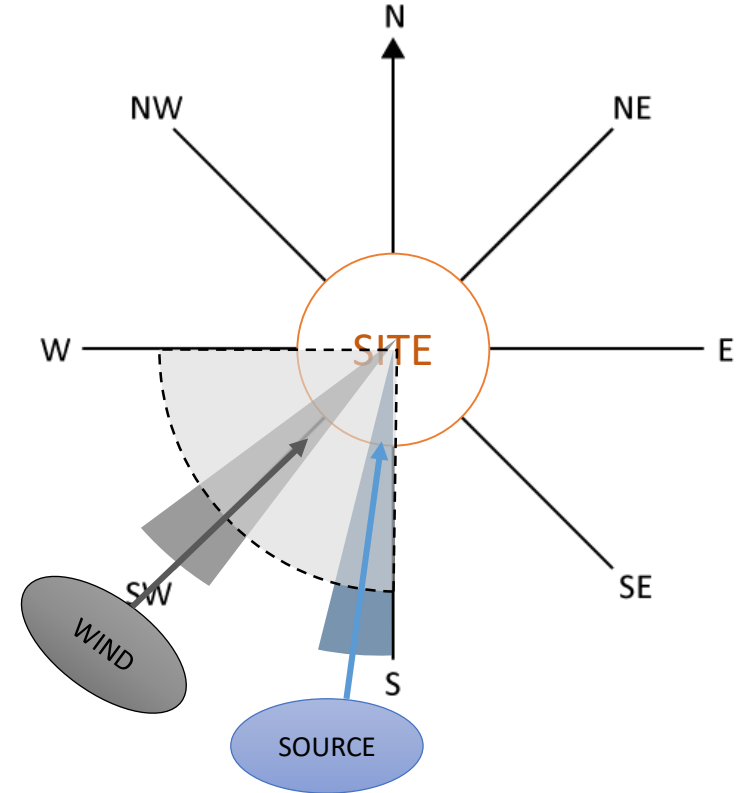
- Distance to Habitat
- Dominant Wind Direction (upwind/downwind)
- Emission Strength



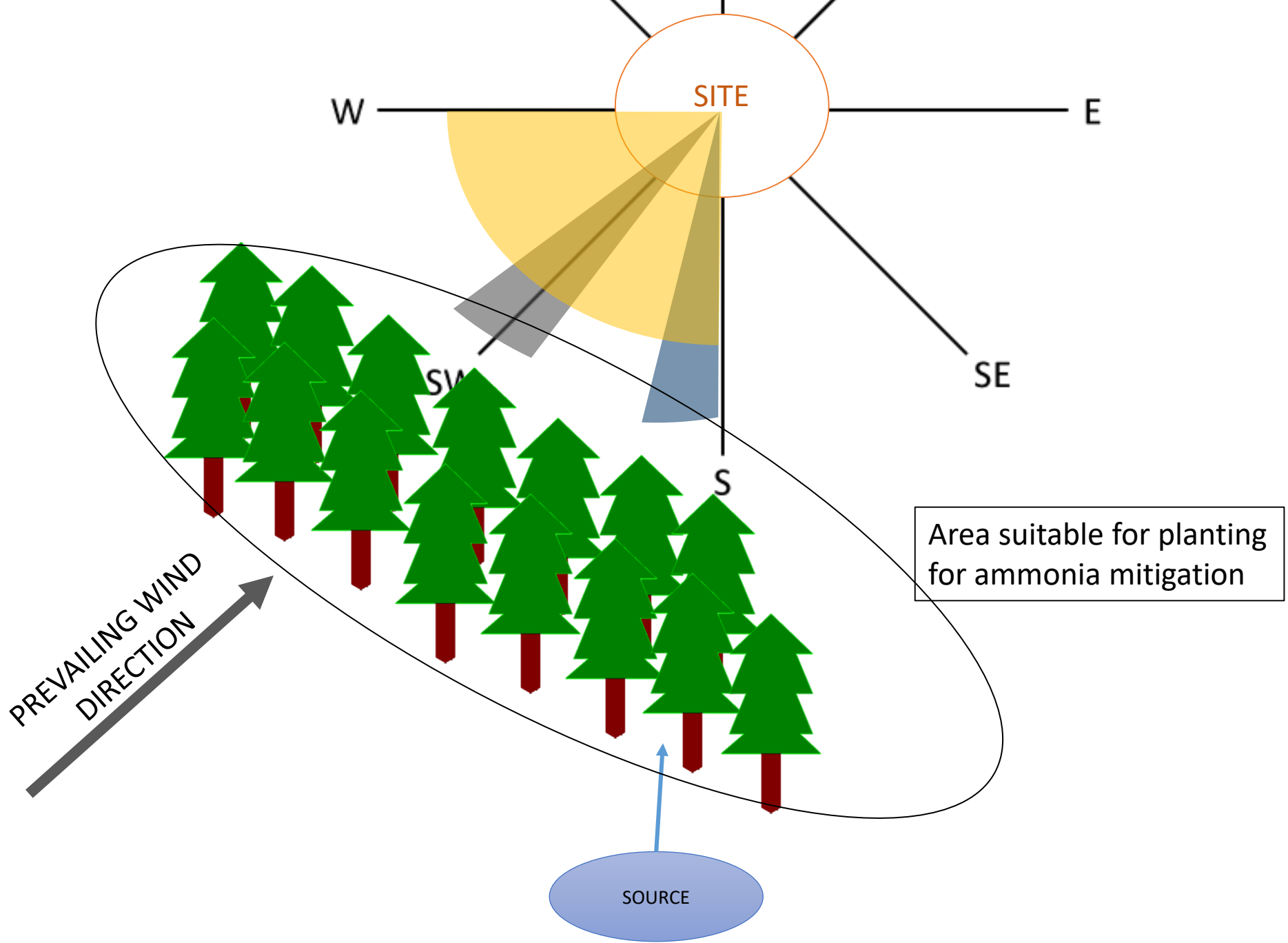
Direction from emission source to site

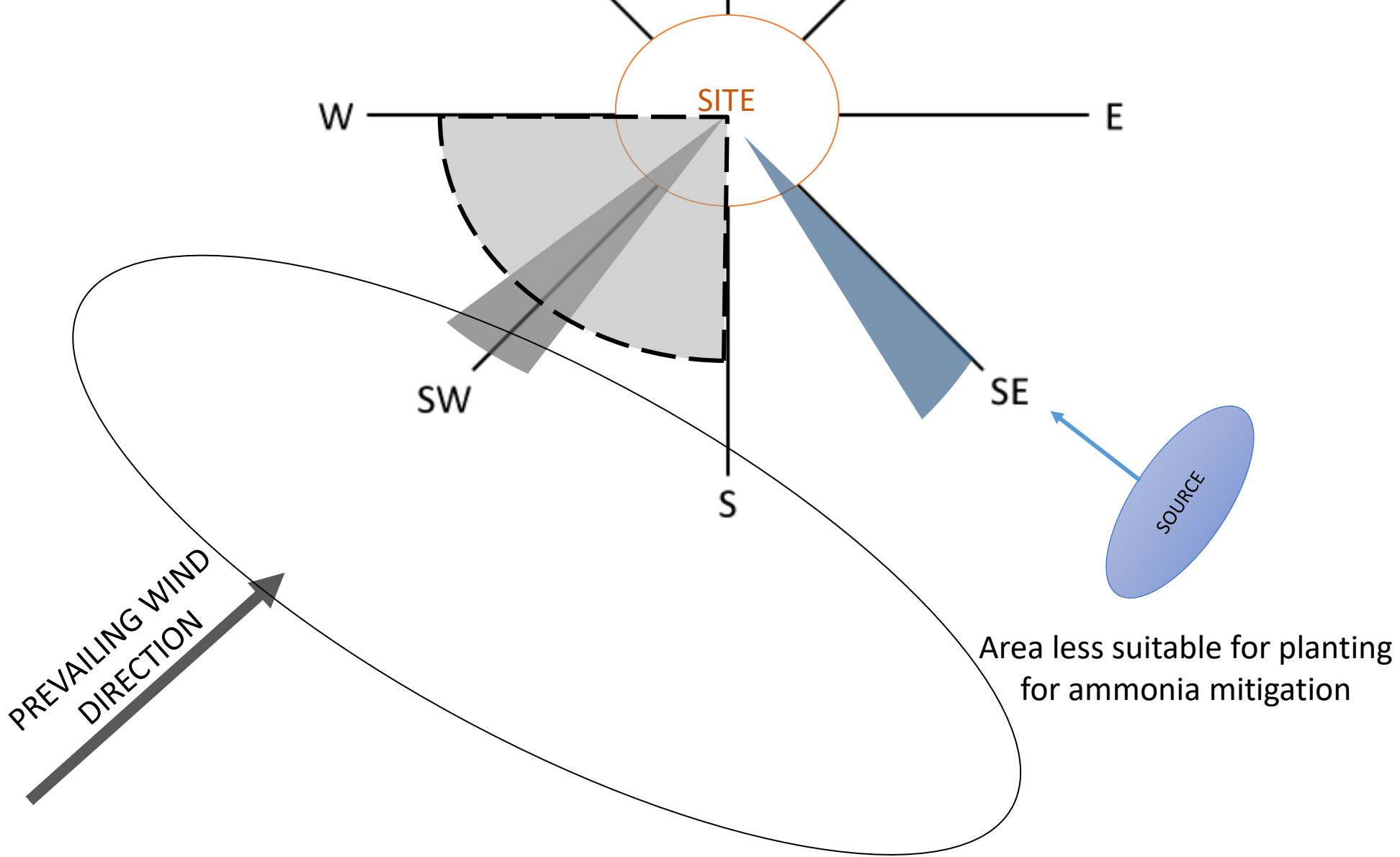


Wind direction



Threshold used to assess that a site is upwind of an emission source (within 45 degrees of the wind sector)





Distance Criteria

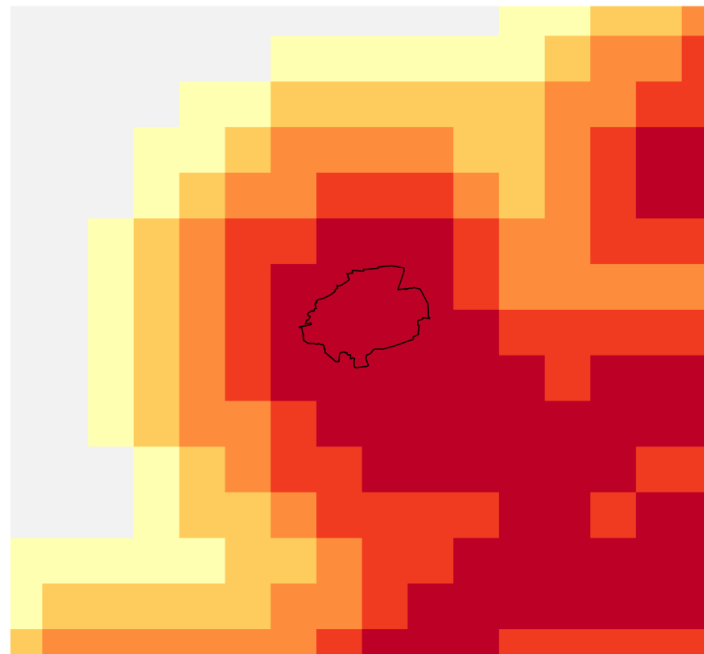
Minimum Distance to the centre of each cell to an SAC site boundary

Data used: SAC and SSSI shapefile

Raster with 1Km resolution

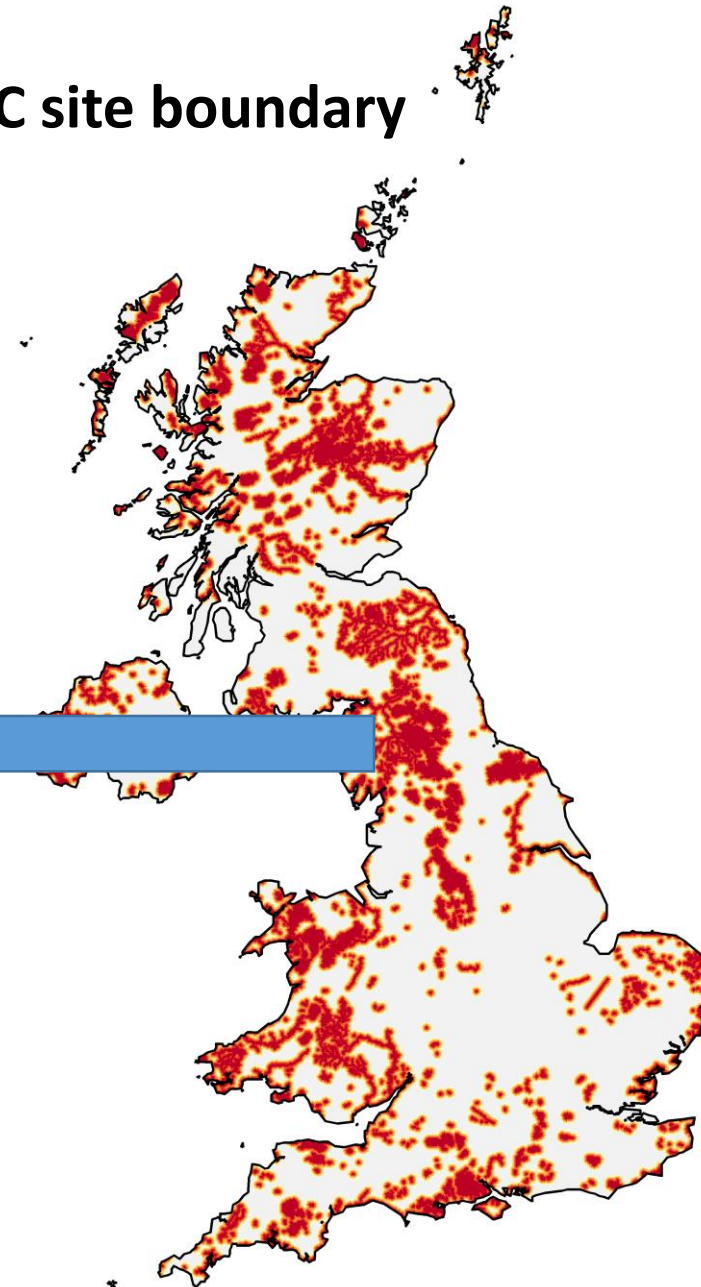
Not taking into account cells further than 5Km away from the site

Bolton Fell Moss, SAC



Distance to site (km)

- 0 - 1
- > 1 - 2
- > 2 - 3
- 3 - 4
- 4 - 5
- > 5

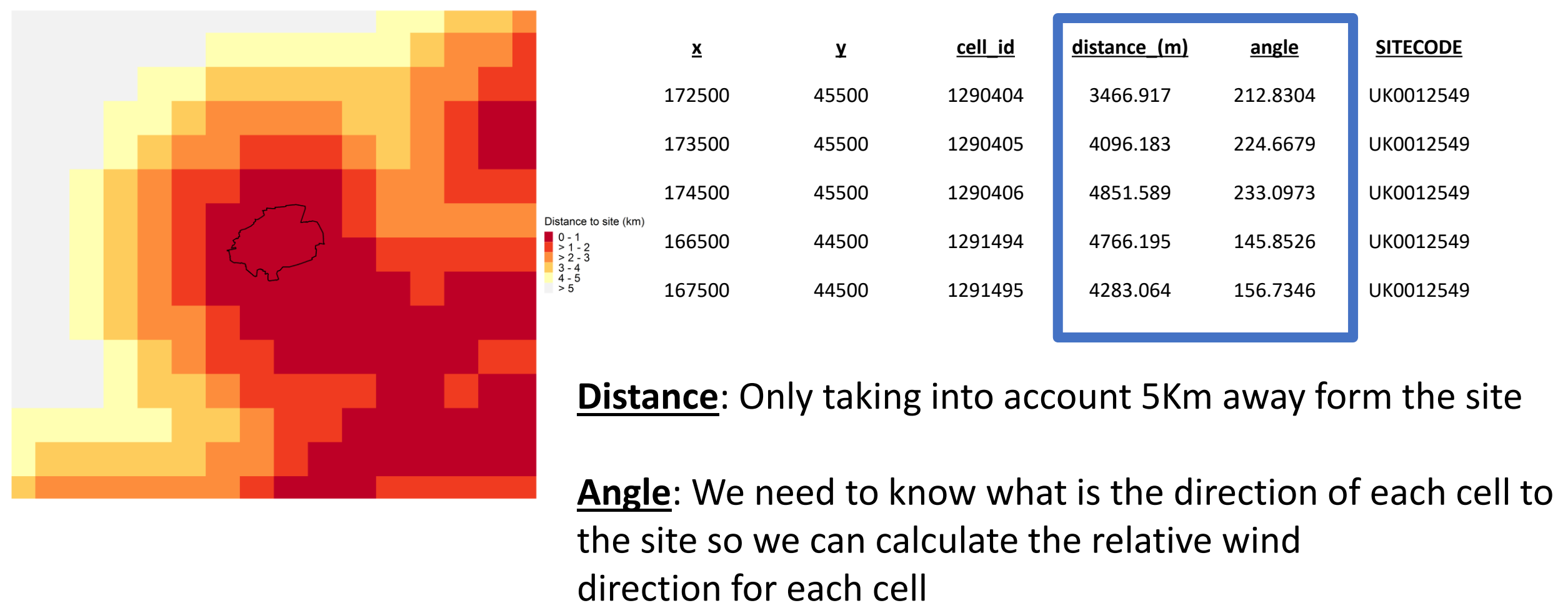


Distance to site (km)

- 0 - 1
- > 1 - 2
- > 2 - 3
- 3 - 4
- 4 - 5
- > 5

Distance Criteria

Minimum Distance to the centre of each cell to an SAC site boundary



Wind Dataset – wind direction sector

- UK meteorological high resolution data from the UK Met Office operational NWP (Numerical Weather Prediction) Unified Model (UM). (wind speed, direction, temperature, RH etc)
- A post processed regional downscaled configuration of the Unified Model, covering the UK and Ireland, is used with hourly forecast data covering the period T+0 to T+120 hours is used.
- With a resolution of approximately 0.018 degrees (2km x 2km)
- This archive currently holds data from April 2016 onwards.
- The dataset is available here:

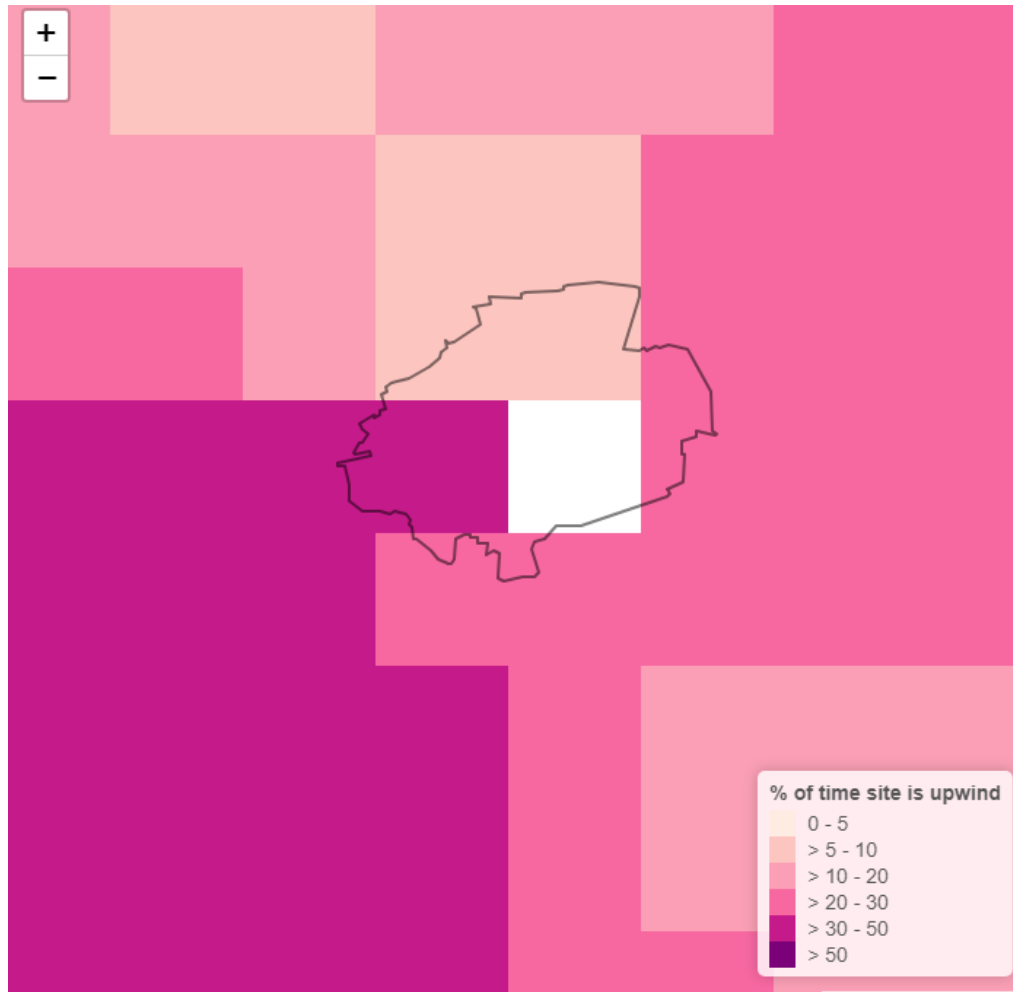
<https://catalogue.ceda.ac.uk/uuid/f47bc62786394626b665e23b658d385f>

viewable at:

<http://dap.ceda.ac.uk/thredds/catalog/badc/ukmo-nwp/data/ukv-grib/catalog.html>

Relative Wind direction for each cell

Bolton Fell Moss, SAC



Map show the % of time a cell is upwind of the site.

Each cell will get a score, ie: mostly upwind to the site high score, mostly downwind low score

High Score = good for planting to mitigate ammonia

Low Score = less good for planting to mitigate ammonia

Cells are 1Km resolution

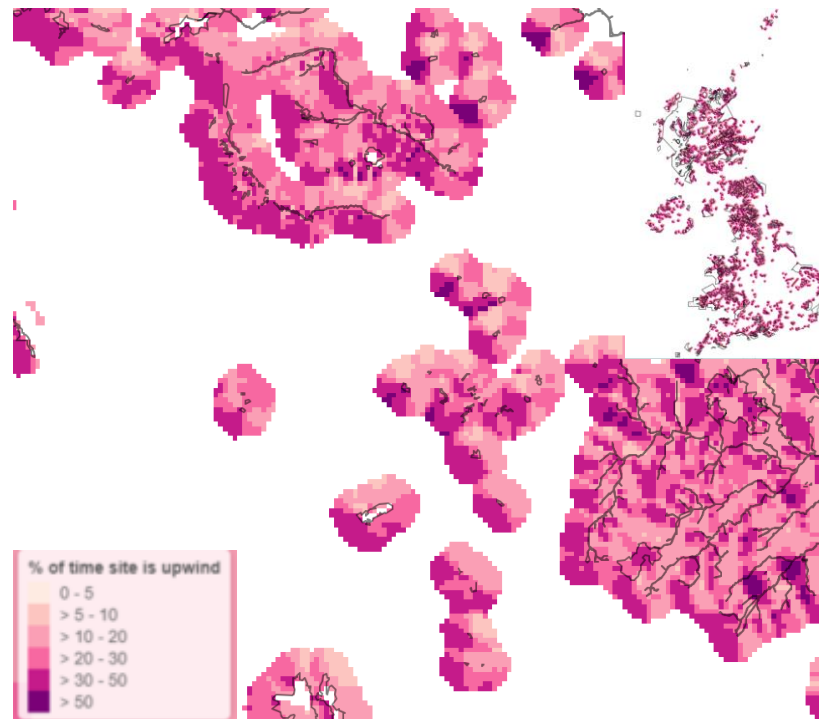
Relative Wind direction for each cell

Data used for this map:

- SAC shapefile

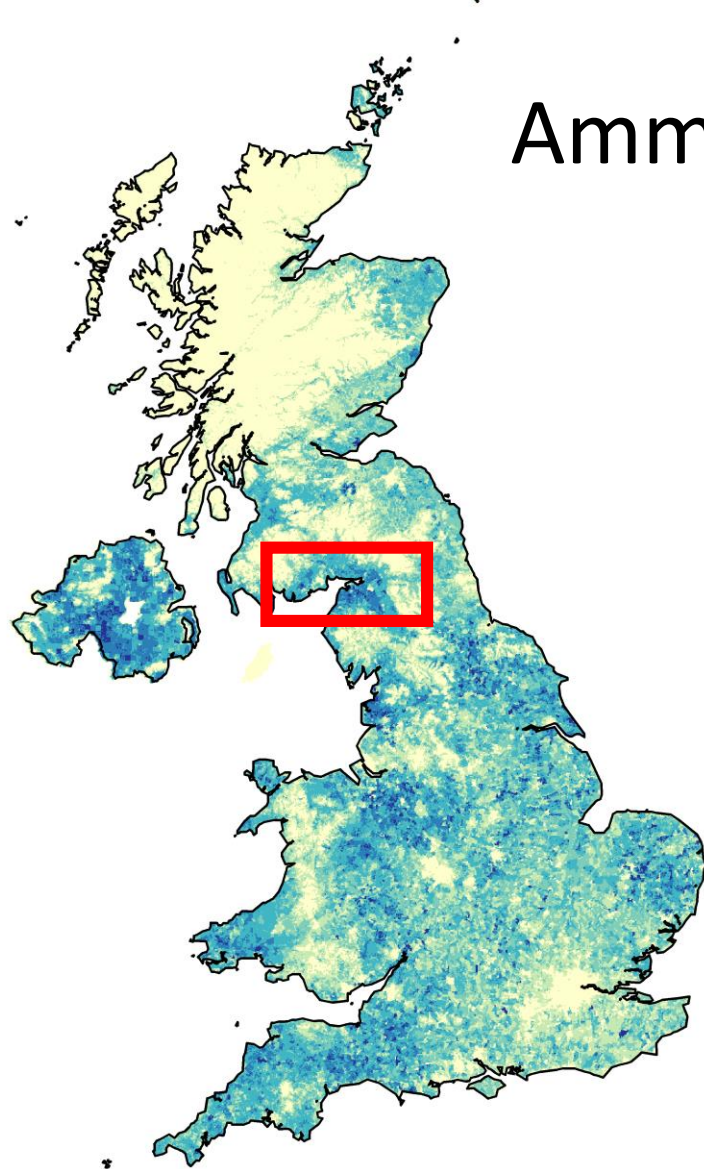
Things to consider:

- We only calculated the wind probability 5km away from the site
- We divided the wind rose in 8 sectors: N, NE, E, SE, S, SW, W, NW



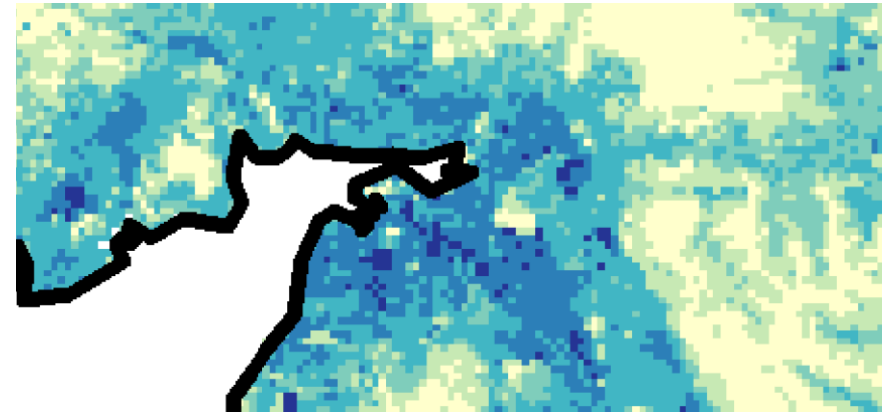
Emission Strength

Ammonia Agricultural emissions



kg NH₃ ha⁻¹ yr⁻¹

0 - 1
> 1 - 5
> 5 - 10
> 10 - 25
> 25 - 50
> 50

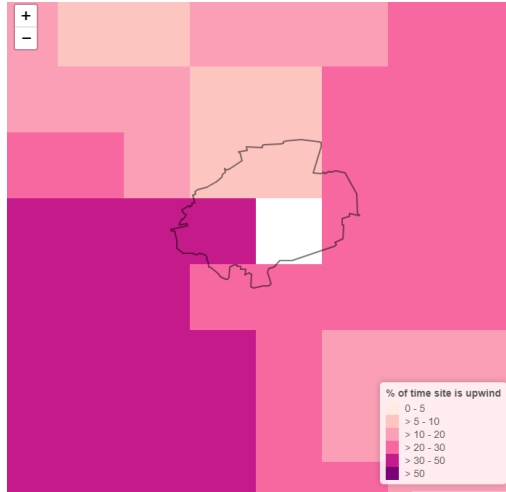


Each cell will get a score, ie: high ammonia emissions high score (more suitable for ammonia mitigation), low emissions low score

Source: <https://naei.beis.gov.uk/>

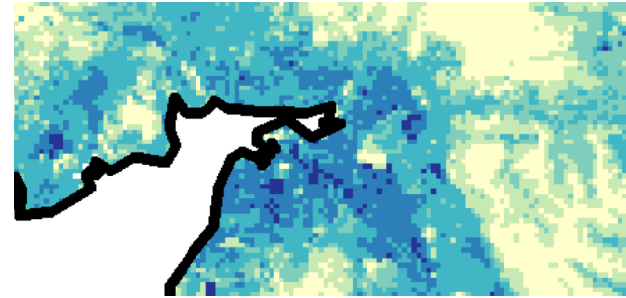
Scoring: equal weighting

Relative wind direction



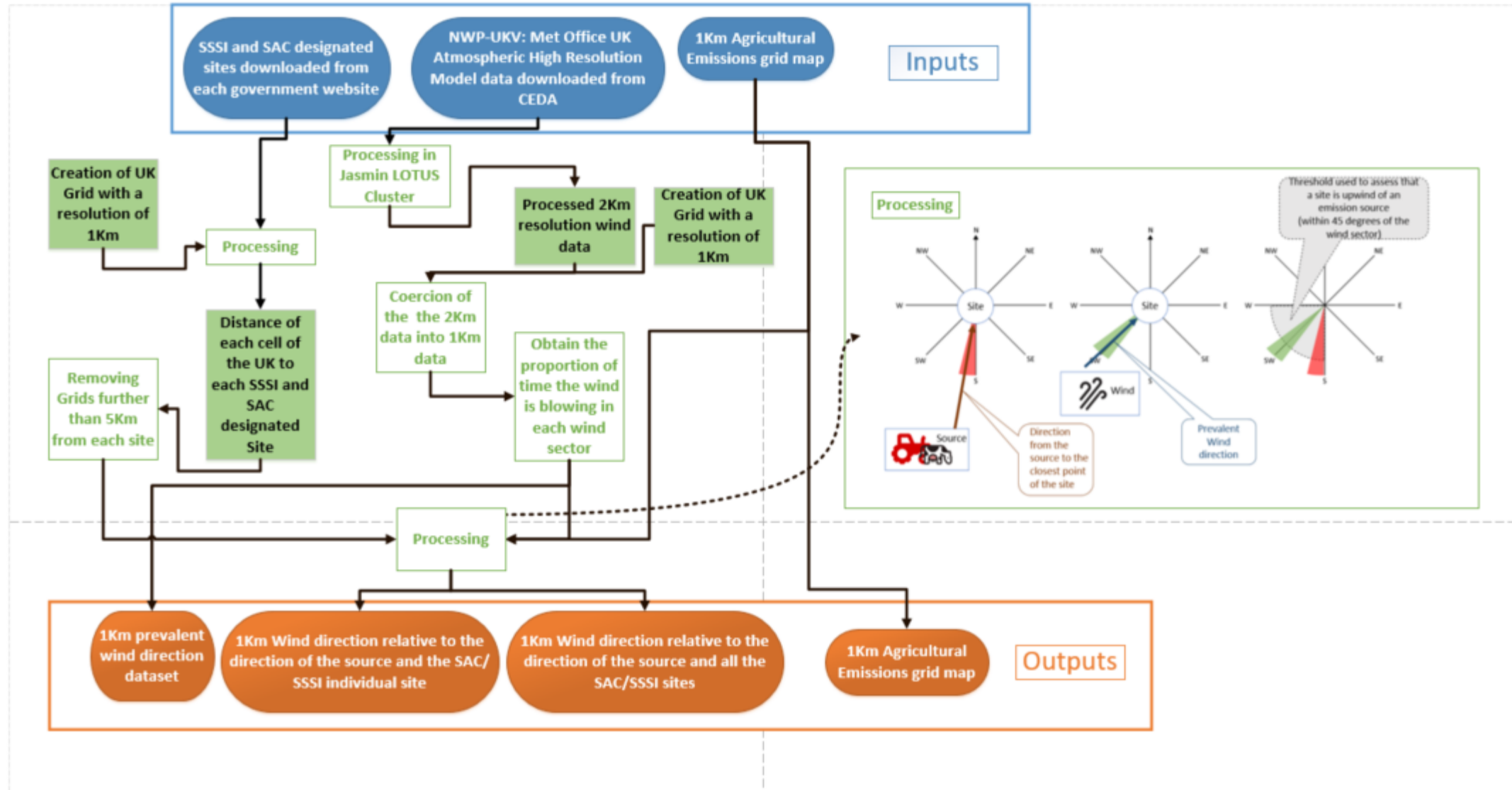
+

NH3emissions



Suitability Score

Overview of workflow



Overview: online tool

We will offer a way of identifying the most suitable areas for tree planting for mitigating ammonia: wind rose and a suitability score map for any clicked location

Species information for selected location and soil type

Table below shows the tree species for your location and soil type. Species are ranked by suitability (see 'Suitability classes' link below). It also shows the height of the tree species after 5 and 45 years. The data comes from the [Forest Research DSS tool](#) using ecological site classification scores.

[Suitability classes](#)

Common name	Latin name	Suitability	Height at 5 years	Height at 45 years
Scots pine	Pinus sylvestris	0.82	1.61	18.05
Silver birch	Betula pendula	0.8	3.87	19.38
Sessile oak	Quercus petraea	0.74	1.81	16.63
Beech	Fagus sylvatica	0.72	2.12	17.96
Douglas fir	Pseudotsuga menziesii	0.71	2.37	28.47
Western red cedar	Thuja plicata	0.66	1.88	19.81
Western hemlock	Tsuga heterophylla	0.66	1.89	19.87



Tree calculator for Ammonia Mitigation : **Alpha Version**

Enter British National Grid reference (Landranger grid or Easting,Northing)

489900,355209

Select location from map

Choose a soil type:

Podzolic brown earth

Main Canopy

Species are sorted by suitability

Choose the species of your main canopy:

Silver birch

Choose the depth of your main canopy (in metres):

20

Backstop Canopy

Species are sorted by suitability

Choose the species of your backstop canopy:

Holly

Site Characteristics

Eastings: 489900
Northings: 355209
OS Grid reference: SK899552
Soil moisture regime: Fresh
Soil nutrient regime: Poor
Site description: The site has a warm, moderately exposed and slightly dry climate. The soils are fresh moisture status and poor nutrient status. Tree species recommendations in ESC do not take account of each countries regulatory approval process, so prior to including species in a forest plan advice should be sought from relevant forestry authorities.

Percentage Ammonia recapture

As main canopy species you have selected: Silver birch
As backstop species you have selected: Holly
The grey shading represents just uncertainty due to parameters in the model used to recapture ammonia having uncertain values. There are other sources of uncertainty such as those in the tree growth model and other significant uncertainties in quantities that are inputs to the model which are not included in this uncertainty estimation. Future measurement campaigns will make it possible to compare the predictions against observational data and hence reduce uncertainties in these predictions.

