



Habitat opportunity maps – General Information

| | |
|--|---|
| Purpose | 1 |
| Outline of Methodology | 1 |
| Types of Opportunity Map..... | 2 |
| Using the Maps | 3 |
| Further Information and References | 4 |
| Data sources – use and copyright..... | 4 |
| Annex – Zonation features and weightings | 5 |

Purpose

The future sustainability of habitats requires not only that existing habitat patches are protected, but are expanded and connected across landscapes. Using existing habitats as a starting point, the opportunity maps identify areas of potential habitat creation or restoration to deliver the greatest biodiversity and ecosystem service benefits.

Opportunity maps have been created to identify opportunities to enhance the connectivity of existing habitats and improve ecosystem services by the (re)creation of three broad habitat types, namely (i) woodland, (ii) wetland (iii) heathland.

The maps assign a ranking to the whole landscape of mainland Cornwall (divided into 100 x 100 metre grid cells) in terms of suitability and potential benefits that would result from habitat creation. The maps are intended to inform strategic planning to increase semi-natural habitat cover in Cornwall and also to inform more general land use strategies.

Opportunity maps integrate multiple potential benefits of habitat creation, such as reduced habitat fragmentation and enhanced flood mitigation services, to present a single strategic map to help identify key opportunity areas.

Inherent to opportunity mapping is recognition of the dynamic and often remote effect of areas of land on one another. For example, bigger habitat patches, closer to one another, set in an intervening landscape less hostile to species movement, are likely to be more ‘functional’ in ecological terms. Similarly, the flood mitigation benefits of many semi-natural habitats will be realized distant from the habitat itself, in downstream communities and industries.

Outline of Methodology

Landscape ranking is produced using the [Zonation software](#) of spatial prioritization. The mapping methodology also draws on the methods and expertise applied in previous opportunity mapping.

The methodology involves the following steps:

- i. **Identify existing areas of the chosen habitat:** these core areas are designated to ensure they inform the ranking of all opportunity areas in terms of connectivity and aggregation.
- ii. **Identify any areas to exclude *a priori* from habitat creation:** these are inherently unsuitable for large-scale habitat restoration, including built-up areas and existing protected areas. Some of these may only be applicable to a specific habitat. Quarries and the China clay sites are generally excluded as although restoration is possible, this would involve much greater use of resources to deliver successful habitat creation.

- iii. **Identify and estimate the relative value of habitat “benefits”:** calculation involves an estimation of the potential provision of any key ecosystem services delivered by habitat creation.
- iv. **Identify ‘facilitating’ factors:** that will increase the likelihood, or increase the value, of realising habitat creation opportunities. For example, a variety of topographical factors will facilitate the successful creation of wetland areas.
- v. **Identify ‘constraining’ factors:** that are likely to reduce the likelihood of realising habitat benefits or successful creation. For example, factors such as wind exposure or the presence of deep, peaty soils are constraining factors on woodland creation. Opportunity costs (the loss of land for other uses) have generally not been included.
- vi. **Ranking of cells:** the ranking methodology begins with the conceptual assumption that the whole (non-excluded) area is converted to the new habitat and then iteratively removing the least suitable or beneficial areas until left with the existing habitat distribution. Potential benefits, facilitating and constraining factors are expressed through a positive or negative weighting that informs the ranking process. All cells not excluded *a priori* receive a rank.

The most highly ranked areas equate to those areas considered the most suitable for habitat creation or that would generate the greatest strategic benefit.

The Table 1 identifies some of the key facilitating and constraining factors used in the construction of opportunity maps.

Table 1: Key facilitating and constraining factors used in the creation of opportunity maps.

| Habitat type | Facilitating factors | Constraining factors |
|--------------|---|---|
| Woodland | Existing scrub or hedgerow habitats | Wind exposure, Soil carbon content, Non-woodland or scrub semi-natural habitats, Exposed coasts, Man-made infrastructure, Wind-farm permits, Historic monuments & World heritage areas. |
| Wetland | Topographical wetness indicator, Historic wetland locations, Soil wetness, Floodplain | Slope, Non-wetland semi-natural habitats, Man-made infrastructure. |
| Heathland | Suitable soil type, high wind exposure. | Soil fertility, Non-heathland semi-natural habitats, existing arable land assuming high level of sol inputs. |

Types of Opportunity Map

Three types of habitat opportunity maps are available:

I **Woodland, Heathland, Wetland opportunity maps**

For each of the three habitat types the respective Opportunity Map shows the most highly ranked areas, presented in a series of exclusive bands of declining suitability or potential benefit. Each band is about the same size of area as the existing habitat.

For example the three bands shown in the Woodland Opportunity map together indicate an area equal to about three times the existing woodland area that the mapping suggests is most suitable, and/or would generate the greatest benefit from woodland creation or restoration.

2 [Woodland opportunity landscape map](#)

For woodland opportunities there is an additional map product: ‘**Woodland opportunity landscape ranking**’ which provides an indicator of suitability and/or benefits for the **whole** of the ranked landscape (along with excluded areas). The map includes both highly ranked areas, included in the opportunity map, and areas receiving a lower ranking.

There are no equivalent landscape ranking maps for Wetlands and Heathlands as opportunities for the recreation of significant areas of these habitats is much more restricted and so the identification of lower ranked areas is less likely to be informative.

3. [Combined Opportunity Map](#)

The three individual Opportunity maps are *not* exclusive as some areas may be beneficial for several types of broad habitat. The Combined Opportunity map brings together the three opportunity maps to show the most highly ranked opportunity areas for each broad habitat type. Each area is assigned to only one habitat type on the basis of their rankings. The size of the opportunity areas shown correspond to an area of about the same as existing woodland and heathland habitats, and about double the area of existing wetland.

Using the Maps

It is important to recognize that the methodology by which the maps are generated affects how they should be used. Some of the key limitations affecting all such opportunity maps are given below:

- ✔ Maps identify opportunity areas at a county-wide level where habitat creation is likely to deliver multiple benefits. The size of each opportunity area is derived from the existing habitat cover and is the result of prioritizing areas in terms of suitability and benefits.
- ❗ The mapping is not suitable for assessing priority areas for small-scale habitat restoration of under a hectare.
- ❗ An area that does not feature among the most highly ranked cells **does not imply** that habitat creation or restoration will deliver no service benefits or biodiversity value. Many lower ranked areas might deliver significant local benefits.
- ❗ The maps are indicative *not* prescriptive - not all the factors affecting the potential benefits of a site or its suitability for habitat restoration are included in the analysis. **On-the-ground assessment of sites is essential** for determining suitability and desirability of any habitat creation scheme.
- ❗ The maps prioritize geographical areas and opportunity options rather than defining rigid designations or limits to opportunities.
- Opportunity maps do not consider the benefits of alternative land uses or provide a cost-benefit analysis.
- The three individual habitats opportunity maps are **not exclusive** as some areas may be beneficial for multiple types of broad habitat. For example, river valleys may be suitable for both woodland and wetland creation.
- Each broad habitat type includes a very wide variety of potential habitat types within it. For example wetland might mean saltmarsh, grazing marsh, bog or mire to name but a few. The potential ranking assumes that the choice of habitat type and method of creation (whether fostering ‘natural’ succession or more ‘active’ methods of creation) will be tailored to local conditions.

- Cell rankings are dependent upon maintaining existing habitat cover. The dependence is evident when considering the habitat connectivity. The creation of a habitat 'corridor' is only meaningful if existing habitats are maintained.
- Rankings are assigned on the basis of existing land cover and factors affecting the demand for delivery of ecosystem services.
- Rankings are assigned uniquely on an estimate of potential ecosystem service and biodiversity gains under mature habitat.
- Higher rankings generally reflect areas that deliver multiple benefits.
- Habitats can persist in areas the mapping would consider 'unsuitable' areas, such as the dwarf oak woodland which persists along the exposed coastland of Dizzard Point. Such areas would nonetheless be challenging areas for attempting to create new woodland.

Further Information and References

For further information about habitat creation and restoration opportunities in Cornwall please consult Cornwall Council's [Grow Nature website](#).

Broadmeadow S, Thomas H, Nisbet T. 2014. *Opportunity mapping for woodland creation to reduce diffuse water pollution and flood risk in England and Wales*. Forest Research March 2014. Forest Research, Surrey, 41pp.

Broadmeadow S, Thomas H, Nisbet T. 2012. *Midlands Woodland for Water Project. Phase 1: opportunity mapping final report*. Forest Research March 2013. Forest Research, Surrey, 101pp.

Moilanen A, Pouzols FM, Meller L, Veitch V, Arponen A, Leppanen J, Kujala H 2014 Zonation - Spatial conservation planning methods and software. Version 4. User Manual. University of Helsinki, Helsinki.

Data sources – use and copyright

Data used in the creation of the habitat opportunity and related maps on Lagas are listed [here](#).

Annex – Zonation features and weightings

Table AI: Features and weightings used in Zonation mapping of existing nature network and habitat opportunities organised by category. For each feature the type of data and the primary publisher of key underlying data is provided (see [here](#)). For each category of features, the maximum observed weighted cell value is provided. Core, excluded areas and connectivity method also given.

| Features | Type of data | Weightings | | | | Source data | Notes |
|----------------------------------|-------------------|-------------------------|----------|-----------------------------|-----------|-----------------|--|
| | | Existing Nature Network | Woodland | Opportunity mapping Wetland | Heathland | | |
| Habitat Cover | Max cell values: | 30 | | | | | |
| Acid grassland | % cover | 15 | -10 | -5 | 0 | Land cover data | Includes grass moorland |
| Arable | % cover | 0 | 0 | 0 | -5 | Land cover data | |
| Bracken | % cover | 10 | 0 | 0 | 20 | Land cover data | |
| Builtup / Artificial Surfaces | % cover | -10 | -10 | -10 | -20 | Land cover data | |
| Coniferous woodland | % cover | 15 | 10 | 0 | 5 | Land cover data | |
| Deciduous woodland | % cover | 20 | 10 | -5 | -10 | Land cover data | Includes orchards |
| Felled woodland | % cover | 15 | 10 | 0 | 0 | Land cover data | |
| Heathland | % cover | 20 | -10 | -5 | 20 | Land cover data | |
| Improved grassland | % cover | 0 | 0 | 0 | 0 | Land cover data | |
| Inland rock | % cover | 10 | -20 | -20 | 10 | Land cover data | |
| Maritime rock | % cover | 15 | -20 | -20 | 0 | Land cover data | |
| Maritime sediment | % cover | 15 | -20 | 10 | -20 | Land cover data | |
| Mudflats | % cover | 20 | -20 | 10 | -20 | Land cover data | |
| Saltmarsh | % cover | 25 | -20 | 10 | -20 | Land cover data | |
| Sanddunes | % cover | 20 | -20 | 10 | 0 | Land cover data | |
| Scrub | % cover | 15 | 0 | 0 | 0 | Land cover data | Includes some low density woodland |
| Seminatural grassland | % cover | 10 | 0 | 0 | 0 | Land cover data | Low weighting reflects low data reliability. |
| Water | % cover | 10 | 0 | -5 | 0 | Land cover data | |
| Wet grassland | % cover | 20 | -20 | 10 | -20 | Land cover data | Includes grazing marsh & purple moor grass |
| Wetland | % cover | 20 | -20 | 10 | -20 | Land cover data | |
| Other habitat features | Max cell values: | 23 | | | | | |
| Builtup Greenness* | %cover x quality | 10 | 0 | 0 | | Land cover data | Quality derived from NDVI |
| Hedgerows | %cover | 5 | 10* | 0 | -10 | ERCCIS | *Woodland opp uses hedges >5m tall |
| Old trees | Number | 5 | 10 | -10 | -5 | WT | |
| Headwaters | % cover | 5 | 0 | 0 | 0 | NE | |
| River ecological quality | % cover x quality | 20 | 0 | 5 | 0 | EA/NE | |
| Open Rivers | % cover | 0 | 0 | 0 | -5 | OS | |
| Historic habitats | Max cell values: | 0 | 0 | 30 | 30 | | |
| Wetland | %cover | 0 | | 30 | 0 | EA | |
| Heathland | %cover | 0 | | 0 | 30 | RSPB | |
| Biodiversity designations | Max cell values: | 70/40 | | | | | |
| Ancient woodlands | %cover | 10 | 0 | -10 | -20 | NE | |
| High level stewardship | %cover | 5 | 5 | 0 | 0 | NE | |
| Plantlife designated area | %cover | 20 | -10 | -10 | -10 | PL | |
| RSPB reserve | %cover | 30 | -40 | -20 | -20 | RSPB | |
| County wildlife site | %cover | 20 | -20 | -20 | -20 | ERCCIS | Where not under statutory protection |
| Wildlife Trust Reserve | %cover | 25 | -20 | -20 | -20 | ERCCIS | Where not under statutory protection |
| Non-dominant priority habitats | %cover | 5 | -5 | -5 | 0 | NE | |
| Statutory protected area | %cover | 50 | excluded | | | NE | SSSI, SPA, SAC, national or local na |
| BAP Priority habitat | %cover | 10 | -10 | -10 | -10 | NE | |
| Other designations | Max cell values: | | | | | | |
| Moorline | %cover | 0 | -30 | 0 | 0 | NE | |
| Agricultural grade 1 | %cover | 0 | 0 | 0 | -20 | NE | |
| Agricultural grade 2 | %cover | 0 | 0 | 0 | -10 | NE | |
| Agricultural grade 3 | %cover | 0 | 0 | 0 | 0 | NE | |
| Agricultural grade 4 | %cover | 0 | 0 | 0 | 0 | NE | |

| Features | Type of data | Weightings | | | | Source data | Notes |
|---|------------------|-------------------------|--|--|--|-------------|-------|
| | | Existing Nature Network | Woodland | Opportunity mapping Wetland | Heathland | | |
| Agricultural grade 5 | %cover | 0 | 0 | 0 | 0 | NE | |
| Windfarm permission | %cover | 0 | -30 | 0 | 5 | CC | |
| Heritage | Max cell values: | | | | | | |
| World Heritage Area | %cover | 0 | -10 | 0 | 0 | HE | |
| Battlefield | %cover | 0 | -20 | 0 | 0 | HE | |
| Scheduled Monument | %cover | 0 | -20 | -20 | 0 | HE | |
| Land features / designations | Max cell values: | | | | | | |
| A roads | Y/N | 0 | 0 | 0 | 0 | OS | |
| B roads | Y/N | 0 | 0 | 0 | 0 | OS | |
| Dual carriageway roads | Y/N | 0 | 0 | 0 | 0 | OS | |
| Railways | Y/N | 0 | -10 | 0 | 0 | OS | |
| Parks and Gardens | %cover | 0 | 0 | 0 | -10 | HE | |
| Golf courses | %cover | 0 | -10 | 0 | 5 | OS | |
| Playing field | %cover | 0 | -10 | -10 | -20 | OS | |
| Topography & landform | Max cell values: | | | | | | |
| Topographical wetness | Range 0- | 0 | 0 | 40 | 0 | OS | |
| Wind exposure | Range 0- | 0 | -40 | 0 | 3 | UoE | |
| Exposed coastland | Y/N | 0 | -30 | 0 | 0 | OS | |
| Elevation | Range in metres | 0 | 0 | 0 | 0 | OS | |
| Elevation over 250m | Range in metres | 0 | 0 | 0 | -30 | OS | |
| Predicted erosion loss | Y/N | 0 | -20 | 0 | -10 | EA | |
| Floodplain | Y/N | 0 | 0 | 10 | -10 | EA | |
| Predicted loss to sea | Y/N | 0 | -30 | 10 | -20 | EA | |
| Slope | Range in degrees | 0 | 0 | -40 | 0 | OS | |
| Soil properties | Max cell values: | | | | | | |
| Contaminated land | Y/N | -5 | -30 | 0 | -10 | CC | |
| Suitable for Heathland | Classes 0-3 | 0 | 0 | 0 | 30 | NSRI | |
| Soil wetness | Classes 0-4 | 0 | 0 | 30 | 0 | NSRI | |
| High carbon soils | Classes 0-1 | 0 | -20 | 0 | 0 | NSRI | |
| Sandy soils | Classes 0-1 | 0 | -20 | -20 | 0 | NSRI | |
| Ecosystem Services | Max cell values: | 36 | | | 0 | | |
| Carbon stock | 0-100 | 10 | 0 | 0 | 0 | See method | |
| Flood Mitigation | 0-100 | 20 | 10 | 5 | 0 | See method | |
| Water pollution mitigation | Max cell values: | 10 | | | 0 | See method | |
| • All waters | 0-100 | 2 | 2 | 2 | 0 | See method | |
| • Aquaculture waters | 0-100 | 2 | 2 | 2 | 0 | See method | |
| • Bathing waters | 0-100 | 2 | 1 | 1 | 0 | See method | |
| • Drinking waters | 0-100 | 4 | 3 | 3 | 0 | See method | |
| Soil loss mitigation | 0-100 | 5 | 5 | 5 | 0 | See method | |
| Pollination | 0-100 | 5 | -5 | 0 | 0 | See method | |
| Air pollution mitigation | 0-100 | 5 | 3 | 0 | 0 | See method | |
| Core areas | None | | Woodland cover >30% | Wetland or associated habitat cover >50% | Heathland cover>50% | | |
| Excluded areas | None | | Unsuitable landcover >75% or statutory protected area | Unsuitable landcover >75% or statutory protected area | Unsuitable landcover >75% or statutory protected area | | |
| Unsuitable landcover defined as: | NA | | Inland rock, builtup, water, maritime habitats, statutory protected area | Inland or maritime rock, builtup, statutory protected area | Inland rock, builtup, water, maritime habitats, statutory protected area | | |
| Connectivity parameters | | Matrix connectivity | Boundary linear penalty | Boundary linear penalty | Boundary linear penalty | | |