Condatis Case study – Woodland Protected Areas in Wales

Jonathan Rothwell, James Latham and Jenny Hodgson, 2014

Protected Areas are the primary mechanism for biodiversity conservation in Wales, as they are around the world. The main statutory types, (e.g. the Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC)) cover around 12% of Wales' land surface. Despite this relatively high cover, the series has evolved over decades, with sites usually selected and designated independently of each other and without consideration of ecological interactions between them. Under climate change, species will need to adjust their ranges to stay within their climatic envelopes and potentially move across the landscape and between Protected Areas. There is therefore now a need to refine the Protected Areas and better integrate them within wider environmental management so that they form functional series within the landscape. This requires understanding of the existing connectivity between Protected Areas, so that habitat creation and restoration to support them and develop resilience can be planned.

Condatis provides an innovative new method for exploring connectivity and species movement between sites, and the identification of areas to target for its improvement. Its potential was explored using pairs of woodland Protected Areas in different parts of Wales to look at long-distance species movement along likely axes of climatic change; the results could help indicate nationally important areas of species movement or 'flow'.

- Pair 1. The Wye Valley Woodlands SAC in extreme south-east Wales, and the Meirionnydd Oakwoods SAC in north-western Wales. Both are extensive woodland areas recognised as some of the most important areas for woodland biodiversity in Britain. The sites lie on an axis from southeast to northwest, a well recognised climatic gradient.

- Pair 2. The North Pembrokeshire Woodlands SAC in southwest Wales and the Alyn Valley Woods SAC in northeast Wales. Again, both are internationally important woodland areas and the southwest to northeast axis provides a complement to pair 1.

We used a trial version no. 0.3.79 of the software. The model was set up using landcover data derived from the Phase 1 Habitat Survey of Wales as 1km square cells, each coded with the area of broadleaved woodland present within it. This polygon data was subsequently rasterised within ArcGIS, maintaining the 1km square cell size for both the habitat layer and the source / target layers ready for import into *Condatis*. With the necessary raster data loaded successfully into *Condatis,* the dispersal distance was set at 1km to represent a wide range of relatively mobile woodland species that might be able to colonise the end points across the wider landscape within a few decades. All other processing values were left at their defaults for this exercise, with the resulting flow calculations taking approximately 5 minutes per scenario to complete.

The results for 'flow' are shown in the figures below. The model suggests a complex pattern of species movement. For both pairs, the strongest flow occurs in quite discrete strips of land often coinciding with river corridors or valleys between upland massifs, notably along the Upper Wye, the Usk and Lower Dyfi, and spilling around the central spine of upland Wales. It is interesting that many of the same areas are picked out by both scenarios, despite them being based on different geographic axes. This could be a useful result, as it suggests there may be critical areas for species movement within which action could be targeted, regardless of the details of their start and end points. It is notable that these areas also often correspond to

the routes of main roads, e.g. the A470 and A487, which hints at underlying influences of landform on habitat distribution, drainage, and the movement of both human and non-human species!

In addition to these main patterns, multiple pathways of increased flow were picked up throughout much of Wales: Pair 1 suggests movement along the western seaboard and well as through northeast Wales, well north of target Meirionnydd Oakwoods; Pair 2 suggests some movement of species through parts of southeast Wales, well away from the obvious south-west to north-east line. This is interesting, because although there may be clear priority areas, a much wider proportion of the woodland resource is also involved, highlighting the importance of action to improve the extent and condition of the woodland resource throughout Wales.

These results are provisional, and based on broad assumptions about the long distance dispersal of species; they also do not take into account factors such as future land use change or altitude. Nonetheless, the very clear patterns of flow generated and the congruence of high flow areas for different scenarios are intriguing, and hint at underlying ecological patterns and the ability to make robust spatial plans for biodiversity action. There is much scope for future work with *Condatis* to investigate the movement of species between sites and to help guide habitat management, restoration and expansion to help to build ecological resilience to climate change.

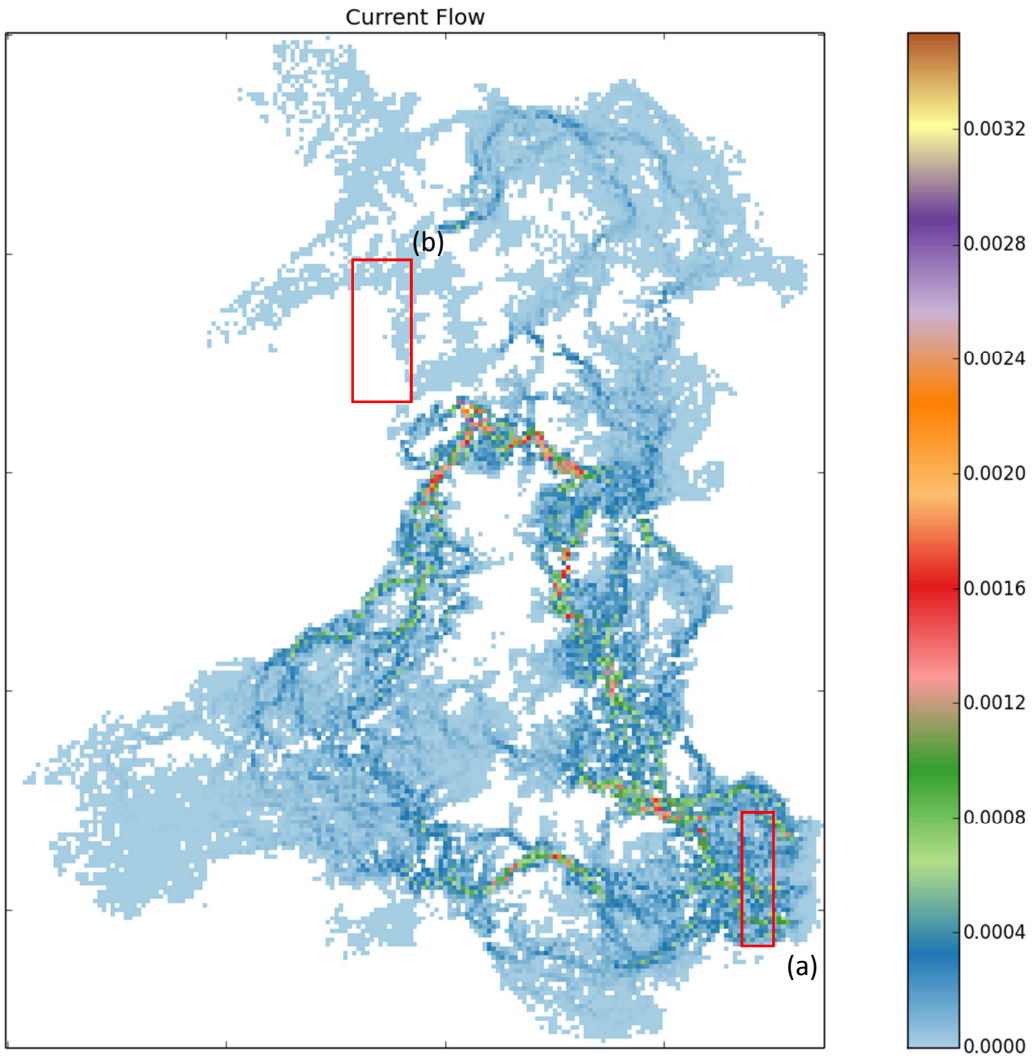

Figure 1: Flow for the scenario Pair 1: Wye Valley Woodlands SAC (a) to Meirionnydd Oakwoods SAC (b).

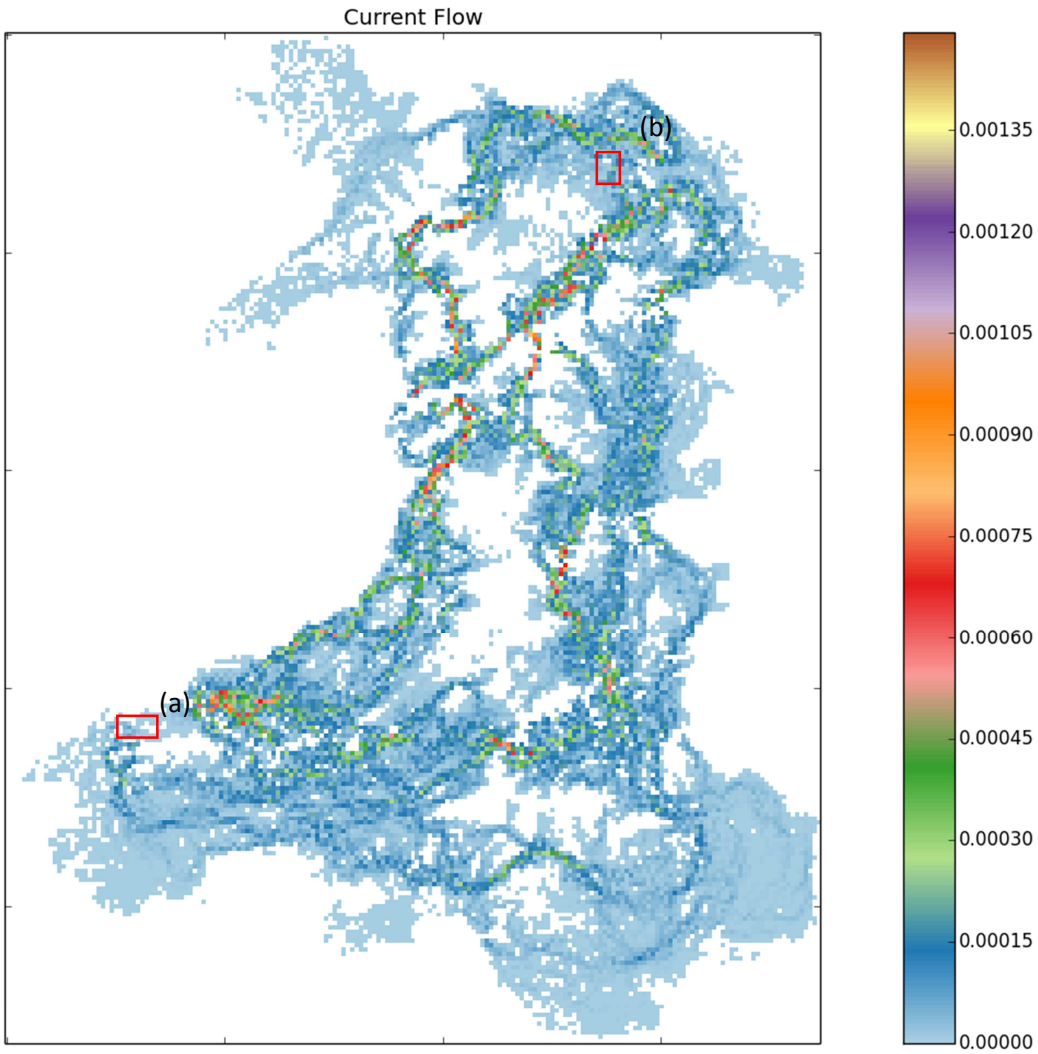

Figure 2: Flow for the scenario Pair 2: North Pembrokeshire Woodlands SAC (a) to Alyn Valley Woods SAC (b)

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