Don HHSS: case study on habitat connectivity

Introduction: Mapping was undertaken for the Don Catchment Rivers Trust (DCRT) Hidden Heritage Secret Streams (HHSS) to identify areas of risk / problems (hotspot maps) and inform opportunity mapping for natural flood management (NFM). By combining open-source datasets representing the three main aims of the HHSS NFM interventions of reducing diffuse pollution, slowing the flow and increasing the ecological landscape connectivity, opportunities are able to be prioritised. This document serves as a worked example for looking at habitat connectivity, further information can be downloaded from the main report.

Method: Habitat connectivity has been mapped using Linkage Mapper[1]. An underlying resistance map, related to land use, and target habitats are used to assess connectivity. Local wildlife sites have been used as target habitats in this work. The plugin assesses connectivity using the resistance raster and distance between target habitats. More information, including a step by step method can be downloaded the GIS method report.

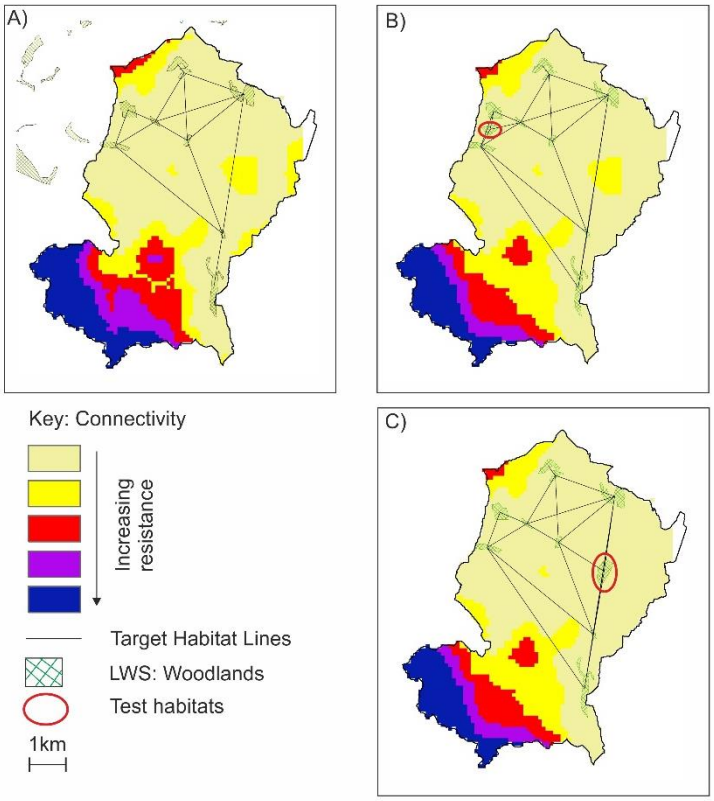

Figure 1 - Habitat connectivity hotspot mapping in Lower Rother; A) original and; B), C) with new potential habitat (red circle)

Hotspot maps: Hotspot maps for habitat connectivity show areas of resistance from low (beige) to high (blue). Within the context of habitat connectivity and natural flood management, connecting the areas of lower resistance will ensure that any planting for the purposes of flood management is also likely to be effective as part of a habitat network. Connecting areas across higher resistance is more challenging, as the likelihood of species reaching the habitat is decreased. However, there may also be circumstances where such habitat provides 'stepping stones' between areas that would otherwise be poorly connected. Habitat connectivity is an iterative process and the model can be re-run with chosen interventions to understand how connectivity varies with potential new habitat pockets. The connecting lines show potential connections between target habitat pockets.

How to interpret the hotspot mapping:

Figure 1A shows opportunity mapping for a sub-catchment and shows the existing pockets of woodland target habitats. The south west corner of the sub-catchment has the highest resistance – this is due to the underlying land use (urban) and distance from the nearby habitat pockets. The majority of the catchment has very low (beige) to low (yellow) resistance; this indicates that woodland planting in this area is likely to be effectively connected to other woodland target habitats. Figure 1B shows a potential new habitat pocket (red circle); this has been placed between two adjacent target habitats in an area of low resistance. The addition of this new habitat pocket does not change the surrounding resistance, as the resistance is already low. Placing an intervention here will increase the chance of a good uptake of the new habitat ecologically, as it is closely located to similar habitat. Figure 1C also shows the addition of a new habitat pocket, in an area of slightly higher resistance (yellow), the addition of this new habitat has changed the resistance by breaking up the area of slightly higher resistance (yellow); creating a new habitat node to connect. If a new habitat is planted in this location, the higher resistance area (yellow) is removed. The surrounding land use of this new target habitat contains areas of agriculture, mineral extraction sites and industrial / commercial businesses, and although planting new trees here will improve connectivity, it may not function as effectively due to the underlying land use.

[1] Further information on linkage mapper

Due to the frequency of target habitats, related to woodlands, in the study catchment, each sub-catchment needed to be processed separately in order for Linkage Mapper to run. This is a disadvantage when looking at connectivity across the whole study area. In order to improve the assessment of connectivity across the entire study area, a 1km buffer was used around each sub-catchment. The buffer ensures that nearby target habitats in surrounding sub-catchments are included in the modelling. Figure 2 shows the output of a sub-catchment when using a buffer. Although, the distribution of resistance does not change, by including neighbouring habitat pockets, the potential areas that could influence a wider landscape connectivity can be identified and preferentially targeted.

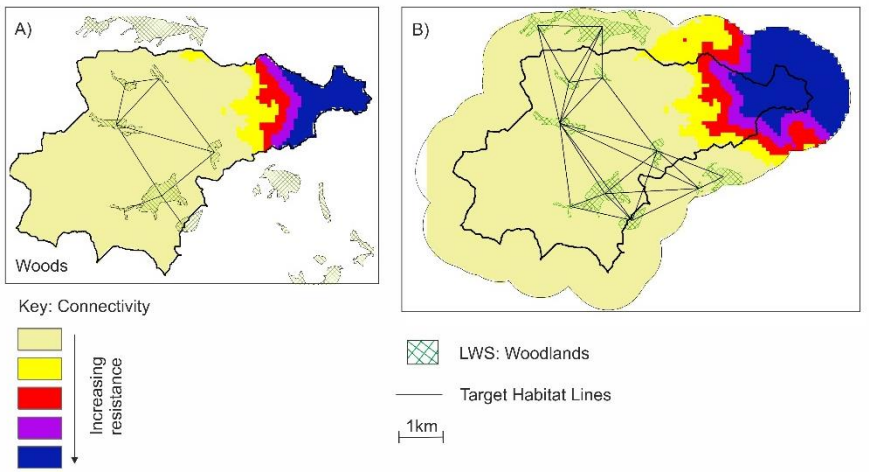

Figure 2 - Habitat hotspot map for River Hipper, A) normal and B) showing a 1km buffer around the sub-catchment modelled.

Opportunity mapping: Woodland planting could be used to connect several target habitats in this sub-catchment. Connectivity is a continuous scale – trees can be planted in areas that are not conducive to woodlands (e.g., urban fabric) or can be planted near to existing woodlands. In order for connectivity to be successful, the new target habitats needs to function ecologically, and attract species from surrounding areas; increasing the biodiversity of the region.

Figure 3 shows the opportunity mapping for the sub-catchment. Many of the opportunities have been placed to slow the flow or reduce diffuse pollution, however these options can have multiple benefits which can also increase connectivity. For example, the tree planting in the north-east of the sub-catchment, will connect two existing pockets of habitat. It is important to note that different species may be needed for increasing habitat connectivity than the species that would be planted for slowing the flow or decreasing diffuse pollution.

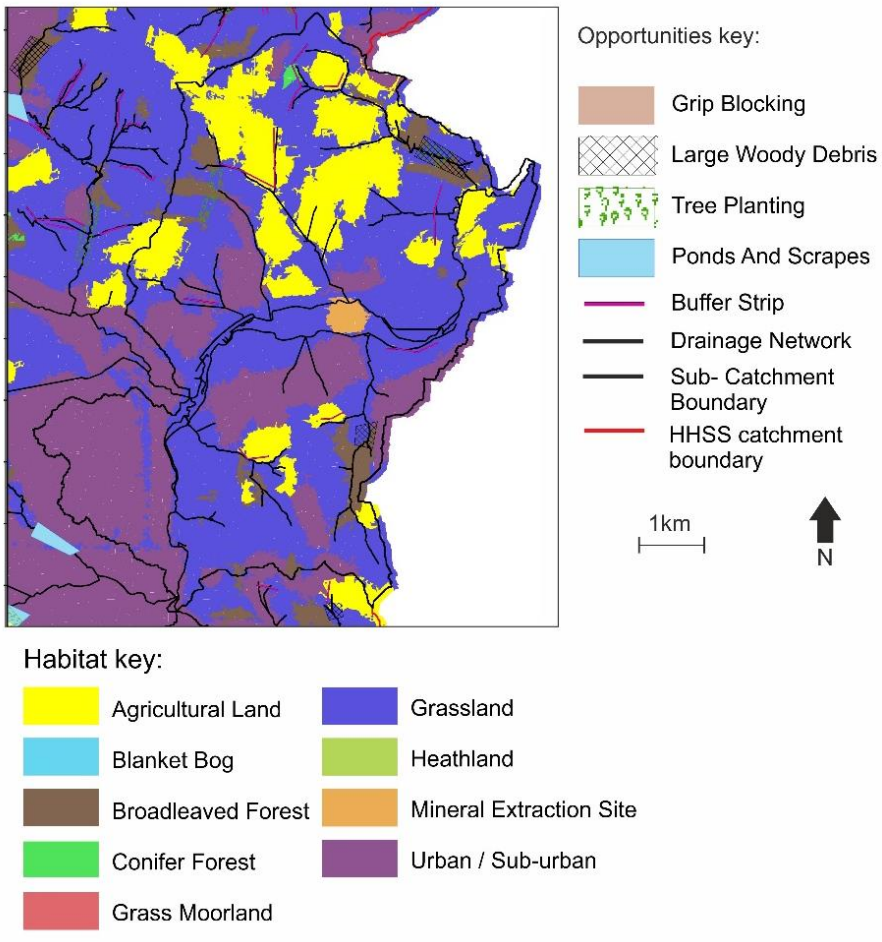

Figure 3 - Opportunity mapping for Lower Rother.