

# Ref Generate

In the end it was not possible to run all three group of stakeholders in each priority landscape, apart from the Somerset Levels, and we ended up only being able to run the activities with 2 of the groups above in three of the landscape

Table 1: Stakeholder rules generated during a workshop for the Broads group 1 (conservation-ists). See Table 2 for full citations

Strategies	Guideline	Reference	Implementation
better	Target areas with existing farmer cluster	NA	<b>**NOT USED**</b> Going to leave this one for now. Very few fields within the Waveney farming cluster are actually within the priority landscape.
bigger/ more	Target areas with silty soils	(NSRI 2022)	All wet loamy soils are defined as silty (see R code for full list of soil types included). Silty Soils given value of 1 and all others value of 0.
bigger/ more	Target areas surrounded by less woodland	(Marston et al. 2022)	Use UKCEH to determine woodland pixels (deciduous/conifer). Then use the focal function with a 1.025 km square focal window to smooth the woodland raster. Take inverse values of smoothed raster so areas with no trees = 1 and area with the most trees in a 1.025km box = 0.
bigger/ more	Target areas that link up existing populations	New data set (see methods)	Use least cost path analysis. The resistance surface as the following values (opportunity lowland grassland = 5, opportunity arable = 3, all other habitat 1. I then calculate the least cost paths between the centroid of all waders sites in the landscapes. Then I calculate the number of least cost paths that pass through a 2km raster of the priority landscape and scale so the pixels with the most number of paths have a value of 1. Finally I turn this 2km raster back to a 25m raster to smooth it.
bigger/ more	Target land that is near future water storage reservoirs	NA	<b>**NOT USED**</b> Hard to map out where water storage will be in the future. Could potentially go anywhere so does not make certain areas more of a priority than others. Also could not find any data that would map out where water storage reservoirs would go.
bigger/ more	Target fields with more ditches	NA	<b>**NOT USED**</b> Most fields in the Norfolk Broads that are suitable in our scenarios are already surrounded by ditches so it does not make sense to have this in as a preference. Also Can't find a data set that maps out all the ditches in the Broads
bigger/ more	Target areas where landowner in winter only AES for water birds on grassland	(Natural England 2024c); (Rural Payments Agency 2024)	I identified land parcels that had either wintering waterbird specific CSS or ESS and then rasterized these. The codes used as "winter waterbird" are GS10/11 for CS and HK10/12/14 for ES. Winter AES field value = 1; all other areas = 0

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Strategies	Guideline	Reference	Implementation
bigger/ more	Target river catchments with more water in the future	(Environment Agency 2024a)	Using a map Andrea Kelly sent that was produced by EA I created a shapefile. Pixels that were red on the map were given a value of 0 (no water for abstraction), yellow given 0.5 (restrictions on water) and green given 1 as water was available
bigger/ more	Avoid areas with other important species	NA	<b>**NOT USED**</b> This has been excluded as it refers to other important species that rely on none-wet grassland habitat, e.g. fen, reedbeds. These habitats, which are quite common in the North of the Broads, have largely been excluded by the priority habitat maks which is included below. Therefore think it would be almost a repeat of a rule already used.
all	Target sites in larger areas of continuous wet grassland	New data set (see methods)	Took my lowland wet grassland raster that I created using BWWM fields and NE priority habitat inventory. Calculated the proportion of pixels that were lowland wet grassland surrounding each pixel within a 1.025km buffer. Higher values are given to pixels that are surrounded by more lowland wet grassland.
all	Target areas within small hydro units	New data set	I have calculated the size of each hydro unit. For the units that have two pumps (other units have one pump) multiply the unit size by 2. Then I rasterized the units using the adjusted areas as pixel values. Finally I took the inverse pixel values, so that the unit with the a smallest adjusted area has a value of 1 and largest adjusted area = 0
all	Target hydro units with natural variation in topograpahy	(Environment Agency 2022a)	For each hydrological unit calualte the standard deviation in heights. Then rasterize the standard deviations and the pixles with the largest standard devaition values have a value of 1 and the least variation a value of 0.
all	Target hydro units with a single pump	NA	<b>**NOT USED**</b> I have removed this rule and accomodated it above in the rule called "Target areas within small hydro units"
all	Target hydro units with fewer landowners	(Rural Payments Agency 2024)	Using the RPA anonimised customer data set I calculated the number of unique customers within each hydrological unit. I calculated the density of landowners based off the size of the hydro unit. Finally I inversley scaled the density values so that the unit with the lowest denifty of landowners is given a value of 1.
all	Target lowest lying fields	(Environment Agency 2022a)	For each hyrdo unit extract all elevation values, calualte the quantile value for each pixel elevation and the values at quantile = 0.0, i.e. lowest land, receive a grading of 1 and the highest pixels in each hydro units are graded 0. All pixels not in a hydro unit are given a value of 0.
arable conversion	Target arable reversion in isolated patches within grassland	New data set (see methods)	Use lowland wet grassland raster I created using BWWM fields and NE priority habitat inventory. Calculated the proportion of pixels that were lowland wet grassland surrounding each pixel within a 1.025km buffer. Higher values are given to pixels that are surrounded by more lowland wet grassland. Halve this value for final count as very similar to targetting arable adjacent to grassland.
arable conversion	Target arable reversion near existing wader sites	New data set	Using the breeding wader sites boundaries that I created identify any pixels that are within 1km of a breeding wader sites. Pixels within or immediately on the boundary of wader sites have a value of 1 and pixels 500m have a value of 0.5 and pixels greater then 1km away have a value of 0
arable conversion	Target areas that were originally grassland	(Rowland et al. 2020); (Fuller et al. 2022); (Morton et al. 2014)	Using the UKCEH landcover data sets for 2000 and 1990 try and find fields that used to be grassland. If a field was grassland in both years it was given a value of 1, on only one of the two year = 0.5 and in neither year a vlaue of 0.
all	Avoid scheduled monuments	(Historic England 2024)	All pixels that overlap a sheduled monument polygon (+ 20m buffer) by more than 50% are masked out.

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Strategies	Guideline	Reference	Implementation
all	Maks out urban areas	(Marston et al. 2022)	All pixels in the UKCEH habitat data that are assigned as urban/suburban or a coastal habitat are turned into masks. As the UKCEH 25m raster is the base for all masks this is simply selecting certain pixels.
all	Avoid priority habitats	(Natural England 2024a)	All pixels that overlap a none lowland wet grassland priority habitat polygon by more than 50% are assigned as a masked pixel. See code for full list of priority habitats used as masks.

Table 2: Stakeholder rules generated during a workshop for the Broads group 1 (conservation-ists)

Reference	Dataset References
(Borrelli et al. 2017)	Borrelli, P., Lugato, E., Montanarella, L., & Panagos, P. (2017). A New Assessment of Soil Loss Due to Wind Erosion in European Agricultural Soils Using a Quantitative Spatially Distributed Modelling Approach. <i>Land Degradation &amp; Development</i> , 28: 335–344, DOI: 10.1002/ldr.2588, DOI: 10.1002/ldr.2588
(Day & Smith 2018)	Day, B., & Smith, G. S. (2018). The Outdoor Recreation Valuation (ORVal) tool: Technical report, January 2018. Report to the Department of Food and Rural Affairs.
(Environment Agency 2013a)	Environmental Agency. (2013). North Kent & Swale Abstraction Licensing Strategy February 2013. Date Accessed: 01-07-2024. URL: <a href="https://www.gov.uk/government/publications/north-kent-and-swale-catchment-abstraction-licensing-strategy">https://www.gov.uk/government/publications/north-kent-and-swale-catchment-abstraction-licensing-strategy</a>
(Environment Agency 2013b)	Environmental Agency. (2013). Medway Abstraction licensing strategy February 2013. Date Accessed: 01-07-2024. URL: <a href="https://www.gov.uk/government/publications/medway-catchment-abstraction-licensing-strategy">https://www.gov.uk/government/publications/medway-catchment-abstraction-licensing-strategy</a>
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(Environment Agency 2024b)	Environment Agency. (2024). Permitted Waste Sites - Authorised Landfill Site Boundaries. Date Accessed: 01-07-2024. URL: <a href="https://www.data.gov.uk/dataset/ad695596-d71d-4cbb-8e32-99108371c0ee/permitted-waste-sites-authorised-landfill-site-boundaries">https://www.data.gov.uk/dataset/ad695596-d71d-4cbb-8e32-99108371c0ee/permitted-waste-sites-authorised-landfill-site-boundaries</a>
(Fuller et al. 2022)	Fuller, R.M.; Smith, G.M.; Sanderson J.M.; Hill, R.A.; Thomson, A.G.; Cox, R.; Brown, N.J.; Clarke, R.T.; Rothery, P.; Gerard, F.F. (2002). Land Cover Map 2000 (25m raster, GB). NERC Environmental Information Data Centre. <a href="https://doi.org/10.5285/f802edfc-86b7-4ab9-b8fa-87e9135237c9">https://doi.org/10.5285/f802edfc-86b7-4ab9-b8fa-87e9135237c9</a>
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(Marston et al. 2022)	Marston, C.; Rowland, C.S.; O’Neil, A.W.; Morton, R.D. (2022). Land Cover Map 2021 (25m rasterised land parcels, GB). NERC EDS Environmental Information Data Centre. <a href="https://doi.org/10.5285/a1f85307-cad7-4e32-a445-84410efdfa70">https://doi.org/10.5285/a1f85307-cad7-4e32-a445-84410efdfa70</a>
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(Natural England 2020a)	Natural England. (2020). Habitat Networks (England) - Lowland Fen. Date Accessed: 28-08-2024. URL: <a href="https://environment.data.gov.uk/dataset/1c85a398-653a-4a21-9923-f5d09adfea3a">https://environment.data.gov.uk/dataset/1c85a398-653a-4a21-9923-f5d09adfea3a</a>
(Natural England 2020b)	Natural England. (2020). Habitat Networks (England) - Reedbed. Date Accessed: 28-08-2024. URL: <a href="https://environment.data.gov.uk/dataset/4b93c91b-3c7f-4ad2-9fe7-ad93e920b1ad">https://environment.data.gov.uk/dataset/4b93c91b-3c7f-4ad2-9fe7-ad93e920b1ad</a> ;
(Natural England 2020c)	Natural England. (2020). Habitat Networks (England) - Lowland Raised Bog. Date Accessed: 28/08-2024. URL: <a href="https://environment.data.gov.uk/dataset/c8244a2d-6e53-499a-8419-b41aae88a90e">https://environment.data.gov.uk/dataset/c8244a2d-6e53-499a-8419-b41aae88a90e</a>
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Reference	Dataset References
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