## Supplementary Material

Table 1: Selected catchment descriptors and landscape metrics: definition, explanation and derivation.

| Descriptor/ Metric | Definition | Explanation | Parameters |
|---|---|---|---|
| **FEH catchment descriptors** | | | |
| **Area** | | Catchment drainage area ($km^2$) | A = Area of catchment |
| **SAAR** | $\frac{\sum_{i=1961}^{1990} P_i}{30}$ | Standard-period Average Annual Rainfall (mm) rainfall for the period 1961-1990 in Great Britain and Northern Ireland | P = Precipitation (annual total) |
| **FARL** | $FARL = \prod_{i\epsilon} \alpha_i$<br>where:<br>$\alpha = \left(1 - \sqrt{r}\right)^w$<br>$r = \frac{water\ surface\ area}{subcatchment\ area}$<br>$w = \frac{subcatchment\ area}{catchment\ area}$ | Index of flood attenuation from rivers and lakes. The overall *FARL* index has a value close to one when a catchment has low attenuation from water bodies, and as attenuation effects become more important the index decreases. | A = effect of individual water body<br>r = relative size of water body to upstream catchment<br>w = weighting reflecting importance of water body |
| **BFIHOST** | Estimate of base flow index (BFI) assigned from catchment area weighted 1km gridded HOST classes | Base flow index from Hydrology of Soil Types (HOST) Boorman et al. (1995) | |

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| **URBEXT** | $URBEXT = Urban + 0.5\,Suburban$ | FEH index of fractional urban extent | *Urban* and *Suburban* are Land Cover Mapping (LCM) classes for urbanised surfaces |
| **PROPWET** | $\frac{\sum_{i=1961}^{1990} \text{No. days SMD} > 6\text{mm}}{\sum_{i=1961}^{1990} \text{No. days}}$ | Index of proportion of time that soils are wet (%) | SMD = soil moisture deficit (as calculated on last day of month and linearly interpolated) |
| **DPLBAR** | Mean distance of all 10m DEM grids to catchment outlet | Mean drainage path length | NEXTmap Digital Elevation Model (10m) |
| **DPSBAR** | Mean slope between all 10m DEM grids - based on steepest route – within catchment | Mean drainage path slope | NEXTmap Digital Elevation Model (10m) |
| **Class based landscape metrics** | | | |
| **Contiguity Index** | $CONTIG = \frac{\left[\frac{\sum_{r=1}^{z} c_{ijr}}{a_{ij}}\right]}{v-1}$ | Assesses the spatial connectedness, or contiguity, of cells within a grid-cell patch to provide an index of patch boundary configuration and thus patch shape | $c_{ijr}$ = contiguity value for pixel r in patch ij.<br>V = sum of the values in a 3-by-3 cell template (13 in this case).<br>$A_{ij}$ = area of patch ij in terms of number of cells. |
| **Largest Patch Index** | $LPI = \frac{\max_{j=1}^{a}(a_{ij})}{A}(100)$ | *Largest patch index* at the class level quantifies the percentage of total landscape area comprised by the largest patch. As such, it is a simple measure of dominance. | $a_{ij}$ = area ($m^2$) of patch ij.<br>A = total landscape area ($m^2$). |
| **Clumpiness index** | Given:<br>$G_i = \left(\frac{g_{ii}}{(\sum_{i=1}^{m} g_{ii}) - mine_i}\right)$ | The proportional deviation of the proportion of like adjacencies involving the corresponding class from that | $g_{ii}$ = number of like adjacencies (joins) between pixels of patch type (class) I based on the *double-count* method. |

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| | $CLUMPY = \left[\frac{G_i - P_i}{P_i}\ for\ G_i < P_i \& P_i < 5, e; else\ \frac{G_i - P_i}{1 - P_i}\right]$ | expected under a spatially random distribution. | $G_{ik}$ = number of adjacencies (joins) between pixels of patch types (classes) I and k based on the *double-count* method.<br>Min-$e_i$ = minimum perimeter (in number of cell surfaces) of patch type (class) I for a maximally clumped class.<br>$P_i$ = proportion of the landscape occupied by patch type (class) i. |
| **Cohesion** | $COHESION = \left[1 - \frac{\sum_{j=1}^{n} p_{ij}}{\sum_{j=1}^{n} p\ ij\sqrt{a_{ij}}}\right]\left[1 - \frac{1}{\sqrt{A}}\right]^{1}(100)$ | *Patch cohesion index* measures the physical connectedness of the corresponding patch type. | $p_{ij}$ = perimeter of patch ij in terms of number of cell surfaces<br>$a_{ij}$ = area of patch ij in terms of number of cells.<br>A = total number of cells in the landscape. |
| **Landscape metrics** | | | |
| **Contagion Index** | $CONTAG = 1 + \sum\sum[q_{ij}ln(q_{ij})]/2ln(2)$ | Assesses the extent to which patch types are aggregated or clumped as a percentage of the maximum possible; characterised by high dispersion and interspersion. | $P_i$ =proportion of the landscape occupied by patch type (class) i.<br>$g_{ik}$ =number of adjacencies (joins) between pixels of patch types (classes) i and k based on the *double-count* method.<br>m =number of patch types (classes) present in the landscape, including the landscape border if present. |
| **PX** | $PX = \sum A_k/mdo_k$ | Proximity Index (PX) accounts for hydrological distance and connectivity of all suburban and urban patches relative to catchment outlet | $A_k$ = area of patch *k*,<br>$mdo_k$ = mean distance to the outlet of patch *k* |