

## Appendix 5 - Landscape Metric Calculation

Area-weighted mean was calculated for each metric that used distribution statistics. The following equations display how the distribution statistics are calculated, where  $X$  designates the specific metric of interest, and  $a_{ij}$  is the area of patch  $ij$ .

Area-weighted mean equation:

$$AM = \sum_{i=1}^m \sum_{j=1}^n \left[ X_{ij} \left( \frac{a_{ij}}{\sum_{i=1}^m \sum_{j=1}^n a_{ij}} \right) \right]$$

**Table 5.1** Calculations and descriptions for the seven representative landscape metrics

| Type        | Metric                      | Acronym | Description                                                                                                                                                               | Formula                          | Units  | Range           |
|-------------|-----------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------|-----------------|
| Area/Edge   | Radius of Gyration          | GYRATE  | Describes how far a landform element reaches, measured by the distance between each cell in an element and the element's centroid                                         | $\sum_{r=1}^z \frac{h_{ijr}}{Z}$ | Metres | $GYRATE \geq 0$ |
| Shape       | Shape Index                 | SHAPE   | Measures how irregular the shape of each landform element patch is, with 1 representing a square patch                                                                    | $\frac{p_{ij}}{\min p_{ij}}$     | None   | $SHAPE \geq 1$  |
| Aggregation | Euclidean Nearest Neighbour | ENN     | Measures the distance from the edge of each landform element to the nearest patch of the same element, describes how isolated each landform element is within a landscape | $h_{ij}$                         | Metres | $ENN > 0$       |

| Type                | Metric                    | Acronym | Description                                                                                                                                                                                   | Formula                                                                                                                                                                                             | Units                                                                                                                       | Range                     |
|---------------------|---------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Aggregation         | Proximity Index           | PROX    | Measures how close landform elements of the same type are by dividing the patch area by the distance to the edge of a patch of the same landform element type                                 | $\sum_{r=1}^n \frac{a_{ijs}}{h_{ijr}}$                                                                                                                                                              | None                                                                                                                        | $PROX \geq 0$             |
|                     | Connectance Index         | CONNECT | Describes how connected the landform element patches are by searching for the same landform element within a 100 m distance of each patch                                                     | $\left[ \frac{\sum_{j \neq k}^n c_{ijk}}{\frac{n_i(n_i - 1)}{2}} \right] (100)$                                                                                                                     | Percent                                                                                                                     | $0 \leq CONNECT \leq 100$ |
| Diversity/ Evenness | Simpson's Diversity Index | SIDI    | A measure of how diverse landform elements are within a sample landscape, based on the probability that two randomly selected pixels would be from different landform elements                | $1 - \sum_{i=1}^m P_i^2$                                                                                                                                                                            | None                                                                                                                        | $0 \leq SIDI < 1$         |
|                     | Shannon's Evenness Index  | SHEI    | Describes the distribution of landform elements in a landscape, a SHEI value close to 1 indicates that landform elements within a landscape have an even distribution of area                 | $\frac{-\sum_{i=1}^m (P_i * \ln P_i)}{\ln m}$                                                                                                                                                       | None                                                                                                                        | $0 \leq SHEI < 1$         |
|                     |                           |         | $a_{ij}$ = area of landform element $ij$<br>$h_{ij}$ = distance from element $ij$ to nearest element of the same type<br>$h_{ijr}$ = distance between cell $ijr$ and centroid of element $ij$ | $Z$ = number of cells in element $ij$<br>$P_i$ = area of landscape in element $i$<br>$p_{ij}$ = perimeter of element $ij$<br>$a_{ijs}$ = area of element $ijs$ within neighbourhood of element $ij$ | $h_{ijr}$ = edge-to-edge distance between element $ijs$ and element $ijr$<br>$m$ = number of element types in the landscape |                           |