**Table 1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Response | Model type | Predictor | Main effect | | SWAFR effect | | SWAFR interaction | |
| (a) *S*QDS | Main effect × region | Elevation | 140.2 | \*\*\* | 124.4 | \*\*\* | -56.1 | \* |
|  |  | MAP | 172.0 | \*\*\* | 54.5 | \*\* | -54.1 | \*\* |
|  |  | PDQ | 73.4 | \*\*\* | 55.6 | \* | 61.9 | \*\* |
|  |  | NDVI | 154.9 | \*\*\* | -7.8 |  | -102.2 | \*\*\* |
|  | Main effect + region | PC1 | 67.0 | \*\*\* | 92.5 | \*\*\* |  |  |
|  | Main effect only | Surface T | 62.1 | \*\*\* |  |  |  |  |
|  |  | CEC | 14.7 |  |  |  |  |  |
|  |  | Clay | 42.1 | \*\*\* |  |  |  |  |
|  |  | Soil C | 62.9 | \*\*\* |  |  |  |  |
|  |  | pH | 21.9 | \* |  |  |  |  |
| (b) *S*HDS | Main effect × region | MAP | 399.0 | \*\*\* | -41.5 |  | -185.0 | \*\* |
|  |  | Clay | -12.8 |  | -216.1 | \*\* | 173.6 | \* |
|  | Main effect only | Elevation | 163.7 | \*\*\* |  |  |  |  |
|  |  | PDQ | 226.3 | \*\*\* |  |  |  |  |
|  |  | Surface T | 135.9 | \*\*\* |  |  |  |  |
|  |  | NDVI | 246.6 | \*\*\* |  |  |  |  |
|  |  | Soil C | 159.4 | \*\*\* |  |  |  |  |
|  |  | PC1 | 123.1 | \*\*\* |  |  |  |  |
|  | Region only | CEC | -26.3 |  | -251.9 | \*\* |  |  |
|  |  | pH | 53.8 |  | -193.0 | \* |  |  |
| (c) *S*DS | Main effect × region | Elevation | -1455.9 | \* | -2278.4 | \*\* | 1668.5 | \* |
|  |  | MAP | 683.3 | \*\*\* | -519.1 | \*\* | -382.1 | \* |
|  |  | CEC | -933.3 | \*\* | -1043.4 | \*\*\* | 837.1 | \* |
|  | Main effect + region | Clay | 273.0 | \* | -542.8 | \* |  |  |
|  |  | Soil C | 246.5 | \* | -615.4 | \* |  |  |
|  | Main effect only | PDQ | 363.1 | \*\* |  |  |  |  |
|  |  | Surface T | 336.7 | \*\* |  |  |  |  |
|  |  | NDVI | 475.3 | \*\*\* |  |  |  |  |
|  |  | pH | 448.4 | \*\*\* |  |  |  |  |
|  |  | PC1 | 231.1 | \*\*\* |  |  |  |  |

**Table 2**

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A close up of text on a white background

Description automatically generated

**Figure 2**

**A close up of a map

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**Figure 3**

**A screenshot of a cell phone

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**Figure 4**

**A screenshot of a cell phone

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**Figure 5**

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**Figure S1–3**

**A close up of a map

Description automatically generatedFigure S4** […] Environmental heterogeneity variables’ loadings are labelled as follows: 1, elevation; 2, MAP; 3, PDQ; 4, surface T; 5, NDVI; 6, CEC; 7, clay; 8, soil C; 9, pH.

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**Figure S5–S6**

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**Figure S7**

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**Figure S8**

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**Figure S9–S10**