Supplementary materials

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| Table S1. Sources of natural background EC data used in background model. US EPA = US Environmental Protection Agency, USGS = US Geological Survey |
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| Table S2. Comparison of the distributions of environmental predictors in each dataset. |
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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | Predictor | Rock % CaO | **Max Air Temp**  **(deg C)** | **Min Precipitation (mm)** | **Annual Precip (mm/yr)** | | Importance | 92 (4.1) | **71 (1.7)** | **60 (1.4)** | **59 (1.7)** | | Effect |  |  |  |  | | Predictor | Atmospheric Ca Deposition (mm/yr) | Rock % S | Rock Uniaxial Compress Strength (MPa) | Soil K Factor | | Importance | 53 (1.6) | 50 (1.8) | 45 (1.2) | 45 (1.3) | | Effect |  |  |  |  | | Predictor | Soil Bulk Density | **% Evergreen** |  |  | | Importance | 42 (1.2) | **41 (2.1)** |  |  | | Effect |  |  |  |  | | |
| Figure S1. Predictors included in the background EC model. Dynamic predictors are indicated by bold text. Variable importance is calculated as percent change in mean squared error when a variable is permuted, with standard error of the mean in parentheses (calculated from 50 separate models). Effects of variation in individual predictors are illustrated with partial dependence plots that show how EC (in mS cm-1) changes with each variable while holding all others at their mean value. | |
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| Figure S2. Plot of out-of-bag predictions compared to observed EC. |

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | Predictor | **Minimum Precipitation (mm)** | Rock % S | **Annual Precipitation (mm/yr)** | Atmospheric Ca Deposition (mm/yr) | | Importance | **38 (1.3)** | 37 (1.4) | **34 (1.8)** | 31 (1.0) | | Effect |  |  |  |  | | Predictor | **% Crops** | Rock Uniaxial Compress Strength (MPa) | **Dryness Index** | Soil Bulk Density | | Importance | **26 (1.8)** | 25 (0.9) | **24 (1.2)** | 23 (1.0) | | Effect |  |  |  |  | | Predictor | **% Pasture/Hay** | **% Developed** | **% Mining** |  | | Importance | **22 (1.2)** | **19 (0.9)** | **12 (1.1)** |  | | Effect |  |  |  |  | |
| Figure S3. Predictors included in the model of EC deviance from background. Dynamic predictors are indicated by bold text. Variable importance is calculated as percent change in mean squared error when a variable is permuted, with standard error of the mean in parentheses (calculated from 50 separate models). Effects of variation in individual predictors are illustrated with partial dependence plots that show how the altered EC (mS cm-1) changes with each variable while holding all others at their mean value. |

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| EC Alteration  Min Precipitation  % Crops |
| Figure S4. Partial dependence plot showing the interaction between minimum precipitation and % crops on EC alteration, with maximum alteration occurring where precipitation is minimized. |

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| Figure S5. Plot of model predicted amount of EC alteration vs. observed amount of alteration from background. 1:1 line is overlain as a dashed line. | Figure S6. Plot of predicted EC vs. observed EC for combined background and alterations from background models. 1:1 line is overlain as a dashed line. |