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Climatic displacement exacerbates the negative impact of drought on plant performance and associated arthropod abundance

*Ecology*

**Appendix S4**: Extraction methods and results for physical soil properties at each *Artemisia californica* source site.

**Table S1.** List of nine soil properties extracted from the USDA NRCS SSURGO database, the variable name as listed in the “chorizon” table, and the descriptions provided by the USDA.

|  |  |  |
| --- | --- | --- |
| Abbreviation | SSURGO Variable Name | Variable description† |
| Sand | sandtotal\_r‡ | Mineral particles 0.05mm to 2.0mm in equivalent diameter as a weight percentage of the less than 2 mm fraction |
| Silt | silttotal\_r | Mineral particles 0.002 to 0.05mm in equivalent diameter as a weight percentage of the less than 2.0mm fraction |
| Clay | claytotal\_r | Mineral particles less than 0.002mm in equivalent diameter as a weight percentage of the less than 2.0mm fraction |
| OM | om\_r | The amount by weight of decomposed plant and animal residue expressed as a weight percentage of the less than 2 mm soil material |
| Ksat | ksat\_r | The amount of water that would move vertically through a unit area of saturated soil in unit time under unit hydraulic gradient |
| K | kffact | An erodibility factor which quantifies the susceptibility of soil particles to detachment by water |
| CEC | cec7\_r | The amount of readily exchangeable cations that can be electrically adsorbed to negative charges in the soil, soil constituent, or other material, at pH 7.0, as estimated by the ammonium acetate method |
| pH | ph01mcacl2\_r | The negative logarithm to base of 10 or the hydrogen ion activity in the soil, using the 0.01M CaCl2 method, in a 1:2 soil:solution ratio. A numerical expression of the relative acidity or alkalinity of a soil sample. (SSM) |
| AWC | awc\_r | The amount of water that an increment of soil depth, inclusive of fragments, can store that is available to plants. AWC is expressed as a volume fraction, and is commonly estimated as the difference between the water contents at 1/10 or 1/3 bar (field capacity) and 15 bars (permanent wilting point) tension and adjusted for salinity, and fragments. |

† Variable descriptions from the “chorizon” table within the USDA NRCS SSURGO database (“Soil Survey Geographic (SSURGO) Database” n.d.)

‡ r indicates that the values extracted were representative for the horizon.

**Section S1.** Description of the methods for extracting soil characteristics from each *Artemisia californica* site.

*Methods*

Using the USDA NRCS SSURGO database, we extracted nine physical attributes thought to be relevant for plant performance. These attributes are listed in Table D1. Each population occurs within a distinct soil type called a map unit. Each map unit is comprised of various soil components (component units), and the proportion of each component unit varies depending on the map unit. Moreover, each component unit contains unique soil horizon data. Soil properties were specifically extracted from the “chorizons” table within the SSURGO database. The chorizons table contains information on soil attributes at various soil depths, but because the majority of *A. californica* roots are concentrated within the first 50 cm of soil (Goldstein and Suding 2014), we computed weighted means for each of the nine attributes by soil depth. For instance, if the first soil layer depth was 30 cm and the second 20 cm, the attributes would be weighted accordingly. Next, to account for the varying amounts of component units within a map unit, we computed another weighted mean of the nine attributes weighted by component unit percentage. We were able to extract soil properties for 17 sites, and these results are plotted in Figure S1.

Chart

Description automatically generated

**Figure S1.** (left) Best fit line ± 95% C.I. for the relationship between the first principal component for soil properties (explaining 53.3% of total soil variation) across *Artemisia californica* population source sites and source site latitude. (right) PC loadings indicating how each of the nine individual soil properties load onto the first principal component.