About the README File Template

1. Dataset Title:hardwaregarmmready

2. Name and contact information of PI:

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6. Funding source: Utah Agriculture Experiment Station.

7. Project summary, description or abstract: Precipitation events are becoming more intense around the world, changing the way water moves through soils and plants. Plant rooting strategies that sustain water uptake under these conditions are likely to become more abundant (e.g., shrub encroachment). Yet, it remains difficult to predict species responses to climate change because we typically do not know where active roots are located or how much water they absorb. Here, we applied a water tracer experiment to describe forb, grass, and shrub root distributions. These measurements were made in 8 m by 8 m field shelters with low or high precipitation intensity. We used tracer uptake data in a soil water flow model to estimate how much water respective plant root tissues absorb over time. In low precipitation intensity plots, deep shrub roots were estimated to absorb the most water (93 mm yr-1) and shrubs had the greatest aboveground cover (27%). Grass root distributions were estimated to absorb an intermediate amount of water (80 mm yr-1) and grasses had intermediate aboveground cover (18%). Forb root distributions were estimated to absorb the least water (79 mm yr-1) and had the least aboveground cover (12%). In high precipitation intensity plots, shrub and forb root distributions changed in ways that increased their water uptake relative to grasses, predicting the increased aboveground growth of shrubs and forbs in these plots. In short, water uptake caused by different rooting distributions predicted plant aboveground cover. Our results suggest that detailed descriptions of active plant root distributions can predict plant growth responses to climate change in arid and semi-arid ecosystems.

8. Brief description of collection and processing of data: 1mL of 70% Deuterium oxide was injected in a 15 cm by 15 cm grid to the indicated target depth. Xylem water was collected and analyzed for deuterium concentrations two days after injections. Injections were performed in May and July 2020.

9. Description of files (names, or if too numerous, number of files, file type(s): ‘iso’

12. Descriptions of parameters/variables

a. Temporal (beginning and end dates of data collection): 2020

b. Instruments used and units of measurements: depth is in cm. Isotope ratios converted to proportion of isotope uptake by a plant type in a depth strata (i.e., unitless).

c. Column headings of data files (for tabular data):

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| Column A – date (month/day/year) |
| Column B – month (May or July) |
| Column C – trmt (treatment: control, 1, 2, 4, 18 mm) |
| Column D – lohi (treatment category: low intensity or high intensity) |
| Column E – plot (plot number)  Column F – depth (soil depth in cm)  Column G – pft (plant functional type: all, forb, grass, or shrub)  Column H – 18 (isotope ratio of 18O to 16O relative to standard mean ocean water [in delta notation])  Column I – d (isotope ratio of deuterium to hydrogen in water samples relative to mean standard ocean water [in delta notation])  Column J – dx (deuterium excess relative to the global mean water line – in delta notation)  Column K – dpercm (proportion of deuterium absorbed per cm of soil depth) |
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d. Location/GIS Coverage (if applicable to data): 41° 36’ 53” N, 111° 34’ 1” W

e. Symbol used for missing data:NA

14. Publications that cite or use this data: Root distributions predict shrub-steppe responses to precipitation intensity. Kulmatiski A., Holdrege M.C., Chirvasa, C., and Beard K.H. Biogeosciences. Special issue: Ecosystems experiments as a window to future carbon, water, and nutrient cycling in terrestrial ecosystems.