Nevada GDE Water Needs Explorer Tool

Soldier Meadows © *David Page/Desert Research Institute.*

https://watersmartgdeapp.streamlit.app/

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Groundwater-dependent ecosystems (GDEs) – including meadows, wetlands, rivers, and some forests and shrublands – play a critical role in sustaining biodiversity and supporting human and nature's water needs. These systems rely on accessible water levels, making them particularly vulnerable to changes in groundwater availability caused by climate variability and human activities. The Nevada GDE Water Needs Explorer Tool was developed by the Desert Research Institute, The Nature Conservancy, and the University of Wisconsin-Madison to fill a gap in understanding of the connections between groundwater availability and ecosystem response of groundwater-dependent ecosystems. The purpose of the tool is to enable users to get insights on how GDE groundwater needs vary across climate, soils and vegetation type.

The tool provides estimations of the groundwater component of evapotranspiration (ET_{GW}) and the groundwater subsidy ($GW_{subsidy}$).

This tool presents the results of modeling for Reclamation WaterSMART Applied Science project R19AP00278 Quantifying Environmental Water Requirements for Groundwater Dependent Ecosystems for Resilient Water Management. See this link for more information about the project.

Groundwater component of ET: *portion of total ET extracted from groundwater*

ET_V ET_{Total} ET_{GW}

Vadose
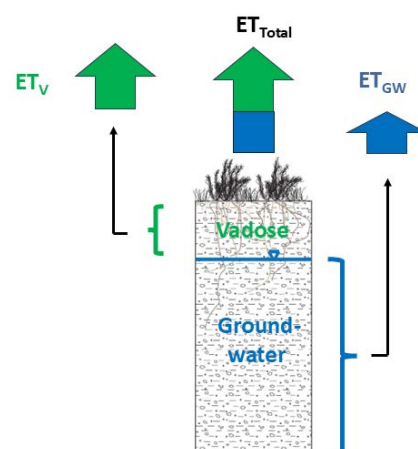
Ground-water

Groundwater subsidy: *additional water available for root water uptake resulting from shallow water table conditions*

Transpiration (with shallow GW)

Transpiration (with free drainage)
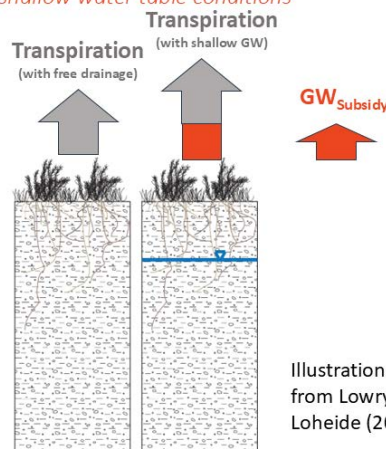
$GW_{subsidy}$

Illustrations modified from Lowry and Loheide (2010)

Reference:
Lowry CS, Loheide SP. 2010. Groundwater-dependent vegetation: Quantifying the groundwater subsidy. Water Resources Research 46:W06202. https://doi.org/10.1029/2009WR008874

Climate:

Annual PWD (Precipitation – Potential ET)

-700
-800
-900
-1000
-1100
-1200
-1300

GDE Type:

Shrubland GDE 3.6 m root

Grassland GDE 2 m root

Wet Meadow 0.5 m root

Soil Texture:

USDA Soil Texture
- Sand
- Loamy Sand
- Sandy Loam
- Loam
- Silt Loam
- Silt
- Sandy Clay Loam
- Clay Loam
- Silty Clay Loam
- Sandy Clay
- Silty Clay
- Clay

Here's how the tool works:

1. User identifies the GDE location and its attributes using public data available in the tool

2. Tool provides model-based estimates of leaf area index, actual evapotranspiration, groundwater subsidy, and groundwater evapotranspiration.
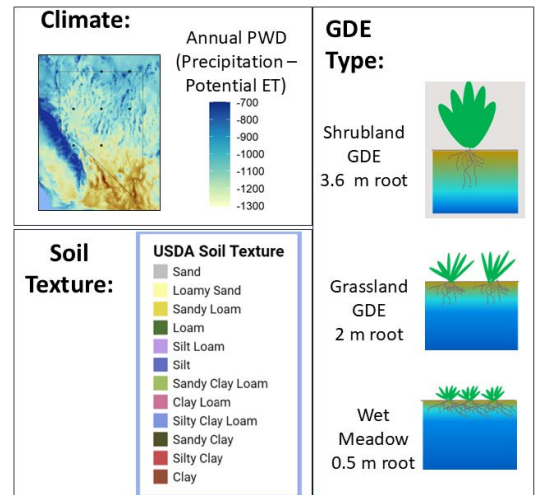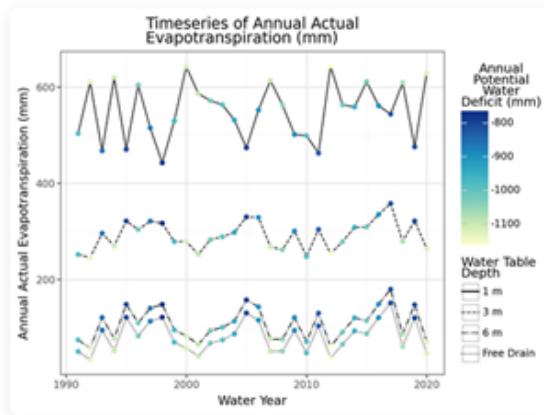
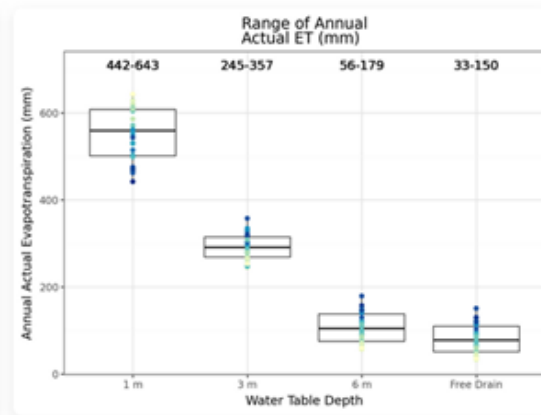We've got your data, here is a summary:

Location: 40.93 N, -116.22 W   Soil type: clayloam   Annual precipitation: 279.30 mm   Annual evaporative demand: 1244.95 mm

Rooting Depth: 2 mm   Admin Basin ID: 051   Admin Basin Name: Maggie Creek Area

Actual Evapotranspiration (AET) Analysis

Annual Actual Evapotranspiration-Total (AET)
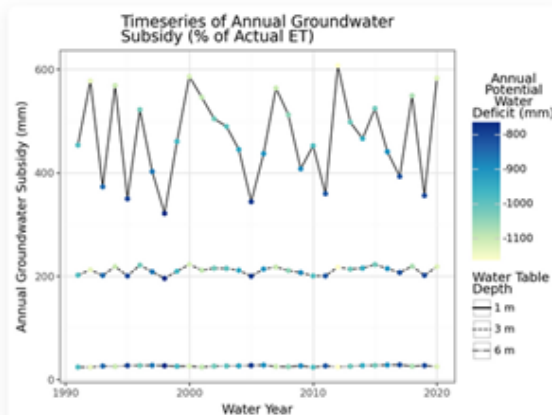

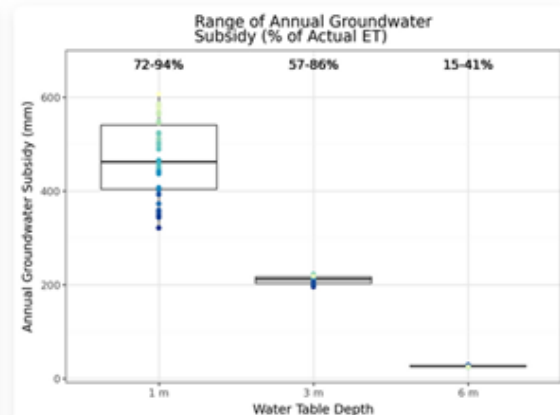### Boxplot of Annual Actual Evapotranspiration-Total (AET)

Groundwater Subsidy (GWsubs) Analysis

Groundwater Subsidy Time Series

Boxplot of Annual Groundwater Subsidy

3. The user can download a report of the results.

Disclaimer: This tool provides estimates of how a GDE would respond IF it existed at the selected location with the chosen soil, vegetation and groundwater characteristics the user defines. This tool does not provide exact quantities because it is an idealized representation of vegetation and soils at a given location.