

Meadview Groundwater Basin Profile



Basin Summary Statistics

Size¹: 190 square miles

Elevation²: Range: 1,105-6,759 ft; Median: 3,601 ft

Top 3 land cover types by area³: Shrub/Scrub (91%), Evergreen Forest (5.3%), Woody Wetlands (1.5%)

Major surface watershed(s)⁴: Colorado River / Lake Mead

Groundwater subbasins¹: None

Groundwater-derived streamflow fraction⁵:

0.68 (Very High)



Mean Annual Hydrologic Cycle Components (1980-2020)
MEADVIEW

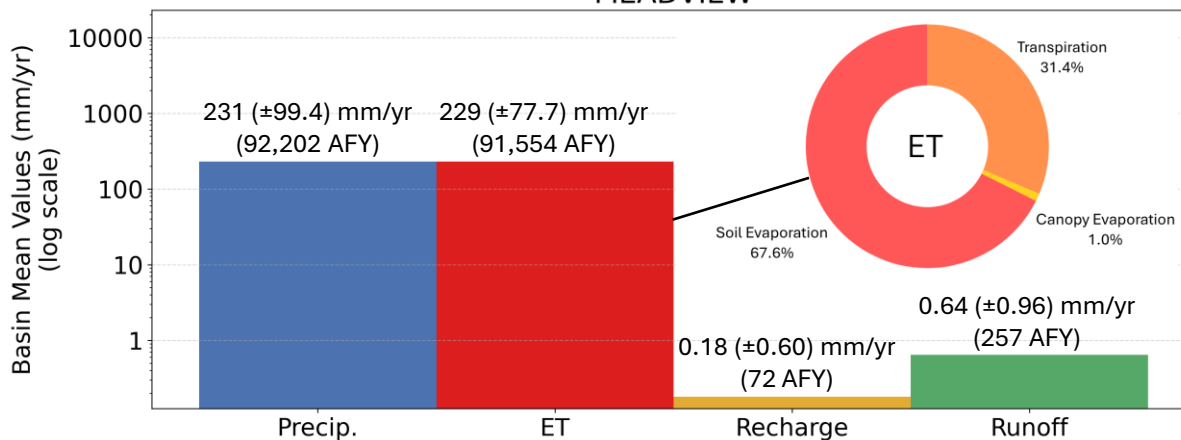


Figure 1 (above). Bar chart showing Noah-MP modeling results of the historical mean annual hydrologic cycle components (precipitation [P], evapotranspiration [ET], natural recharge, and runoff) in the basin from 1980-2020.⁶ ET is partitioned into soil evaporation, canopy evaporation, and transpiration. It is possible for ET to be greater than P when there are other sources such as groundwater, surface water, or water in storage.

Mean Monthly Hydrologic Cycle Components (1980-2020)
MEADVIEW

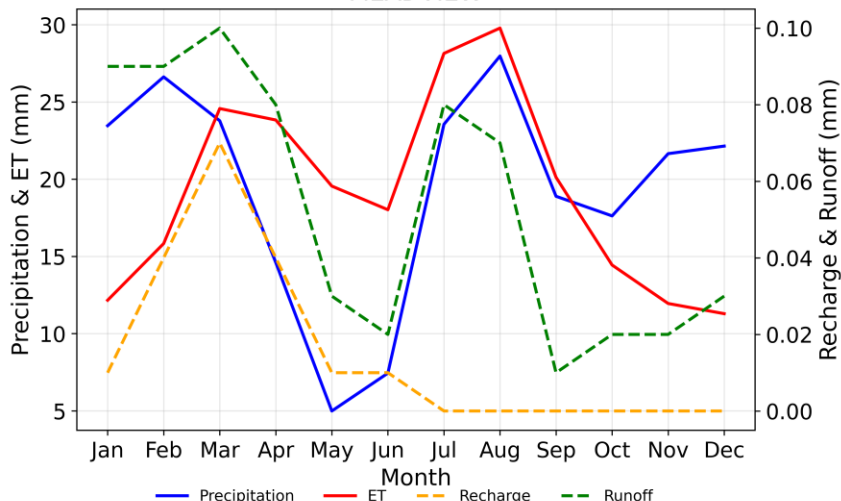


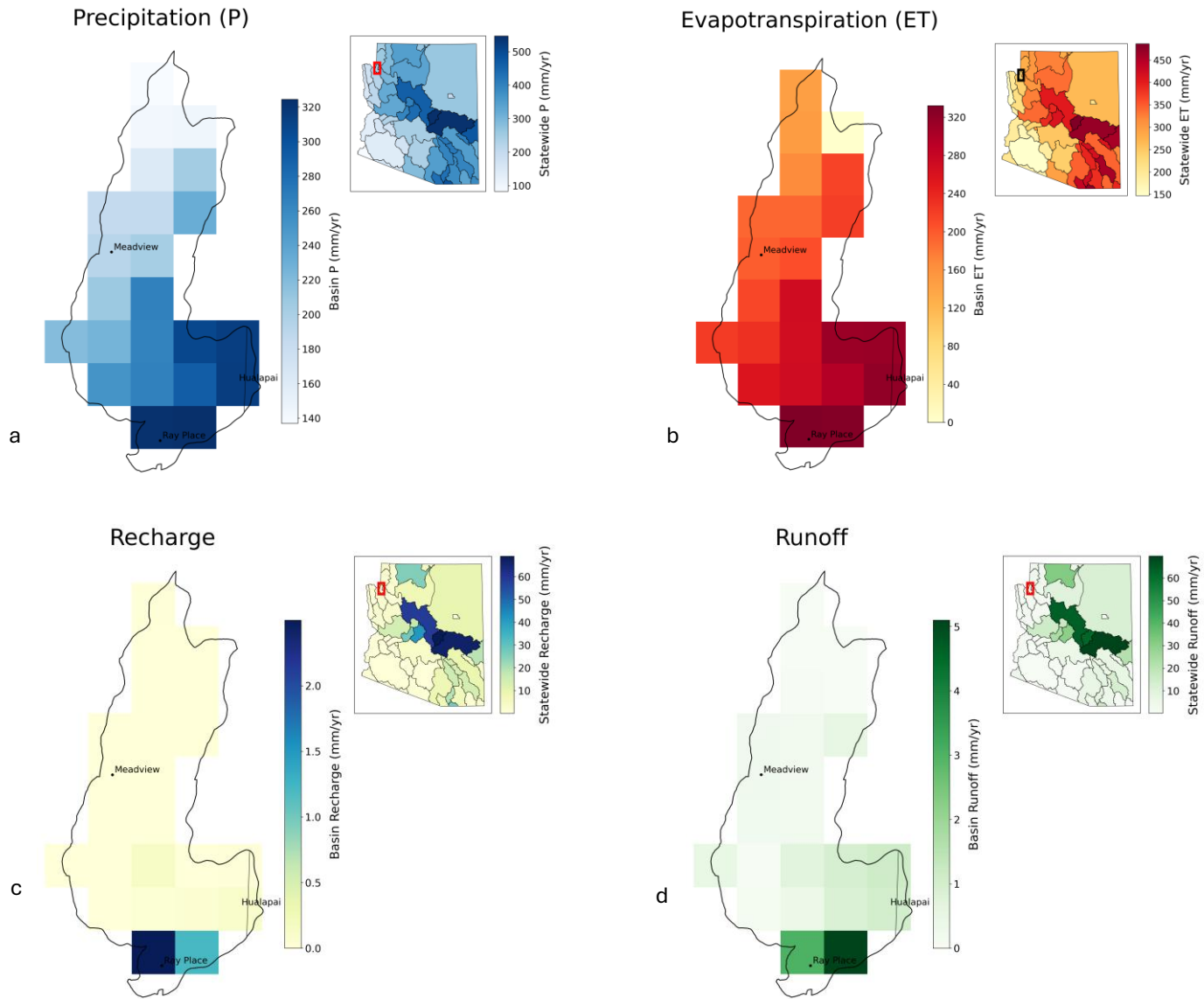
Figure 2. Graph showing monthly mean precipitation, ET, recharge, and runoff for the groundwater basin (1980-2020) from Noah-MP modeling results.⁶

Precipitation (P) in the Meadview basin is affected by the North American Monsoon during the summer months and large frontal systems during the winter. The greatest atmospheric losses occur during the summer months, where evapotranspiration (ET) exceeds P from March through mid-September. Soil evaporation makes up 67.6% of total ET in the basin, while transpiration comprises 31.4% and canopy evaporation accounts for the remainder (1.0%). Natural recharge (0.18 mm/yr) and runoff (0.64 mm/yr) are near zero on average across the basin.

Meadview



Figure 3 (below). Gridded depiction of mean annual water fluxes across the groundwater basin from Noah-MP modeling (1980-2020): (a) precipitation, (b) evapotranspiration, (c) recharge, (d) runoff.⁶ Major cities/towns⁷ and Native American Reservation boundaries⁸ are shown (as applicable) to help orient the reader.



Subsurface Infiltration Index (SbII)

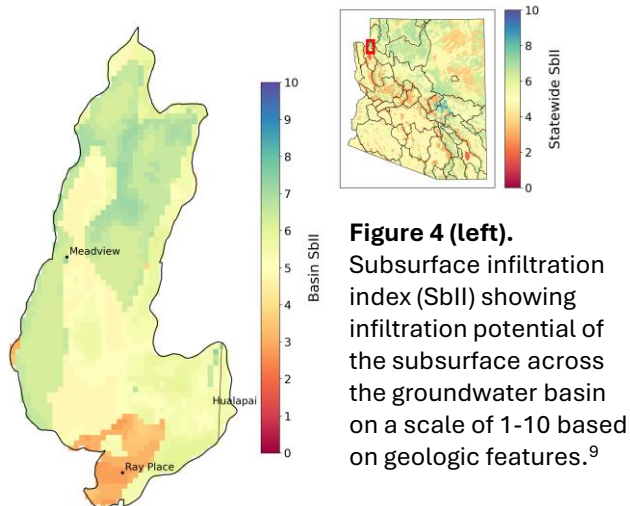


Figure 4 (left). Subsurface infiltration index (SbII) showing infiltration potential of the subsurface across the groundwater basin on a scale of 1-10 based on geologic features.⁹

Precipitation (P) in the Meadview basin is greatest at higher elevations to the southeast, where P exceeds 310 mm/yr on average. ET (~310 mm/yr) is also highest in this region. Natural recharge and runoff are minimal across the basin, with the highest values (2 and 4 mm/yr, respectively) occurring in the southernmost portion of the basin. The basin has relatively high infiltration potential due to the presence of moderately consolidated conglomerate that contains limestone in the northern and western parts of the basin.



Climate Change Projections: Changes in Temperature, Precipitation, ET, Recharge, and Runoff (2060-2099 vs. 1981-2020)

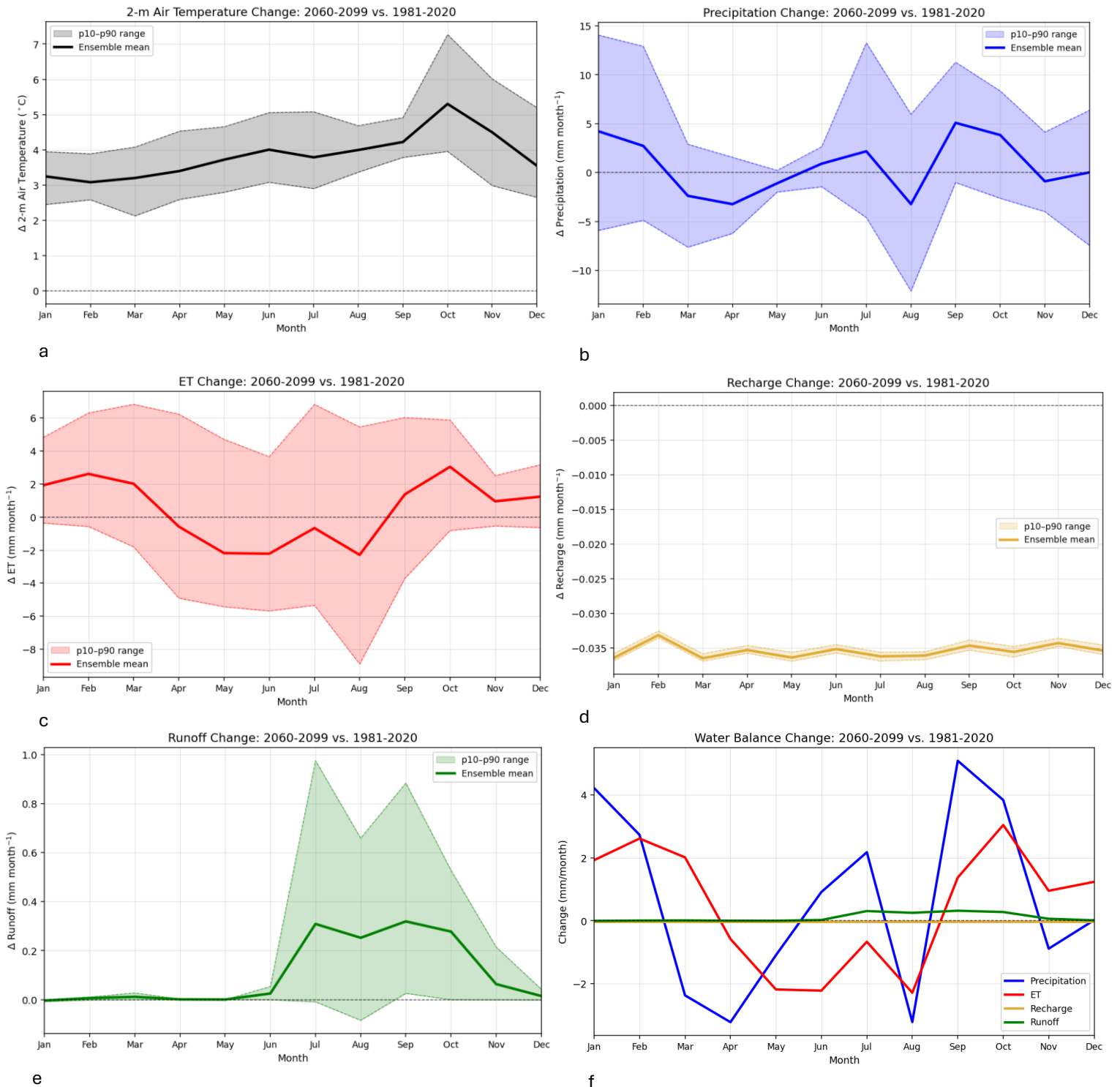


Figure 5. Plots (a)-(e) show projected changes in (a) temperature, (b) precipitation, (c) evapotranspiration (ET), (d) natural recharge, and (e) runoff statewide, comparing end of the 21st century to the historical record from 1981-2020 under the IPCC Scenario SSP3-7.0.¹⁰ Plot (f) shows the change in the water balance components (P, ET, recharge, and runoff) on a single graph for direct comparison. The analysis uses 14 dynamically downscaled global climate models (GCM) at 9-km resolution and the Noah-MP land surface model. The ensemble mean of the 14 GCMs is shown in bold for each component of the hydrologic cycle, with the 10-90th percentile shaded to show model projection uncertainty.



Climate change projections across the Meadview basin show drier springs (10-23% drier March through May), and a drier August (10%) and November (5%). September and October are projected to be 22-29% (3.9-5.1 mm/month) wetter on average, which is consistent with a projected increase in extreme events associated with hurricane and tropical cyclone activity by the end of the century. Natural recharge is projected to remain near zero and slightly negative (approximately -0.05 mm/month) throughout the year.* While runoff is projected to remain near zero for most of the year, minor increases of 0.26-0.33 mm/month are projected for July-October. Projected increases in temperature range from approximately 3.1 °C in February to 5.3 °C in October. Higher temperatures and greater water availability from precipitation lead to a projected 22% (3.1 mm) increase in evapotranspiration (ET) in October and a 17% (1.9-2.6 mm/month) increase in January-February compared to the baseline period, while less water availability in August leads to a projected decline in ET (8% or -2.1 mm).

*Projected negative recharge values are attributed to increased capillary rise from the aquifer through the vadose zone due to climate factors, resulting in water loss from the system. Because the Noah-MP model does not include groundwater pumping, this indicates that climate-driven factors play a significant role in groundwater storage decline in Arizona.

References

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