

Parker

Groundwater Basin Profile



Basin Summary Statistics

Size¹: 2,230 square miles

Elevation²: Range: 183-4,856 ft; Median: 976 ft

Top 3 land cover types by area³: Shrub/Scrub (74%), Barren Land (12%), Cultivated Crops (6.2%)

Major surface watershed(s)⁴: Colorado River

Groundwater subbasins¹: La Posa Plains, Colorado River Indian Reservation, Cibola Valley

Groundwater-derived streamflow fraction⁵:

0.01 (Very Low)



Mean Annual Hydrologic Cycle Components (1980-2020)
PARKER

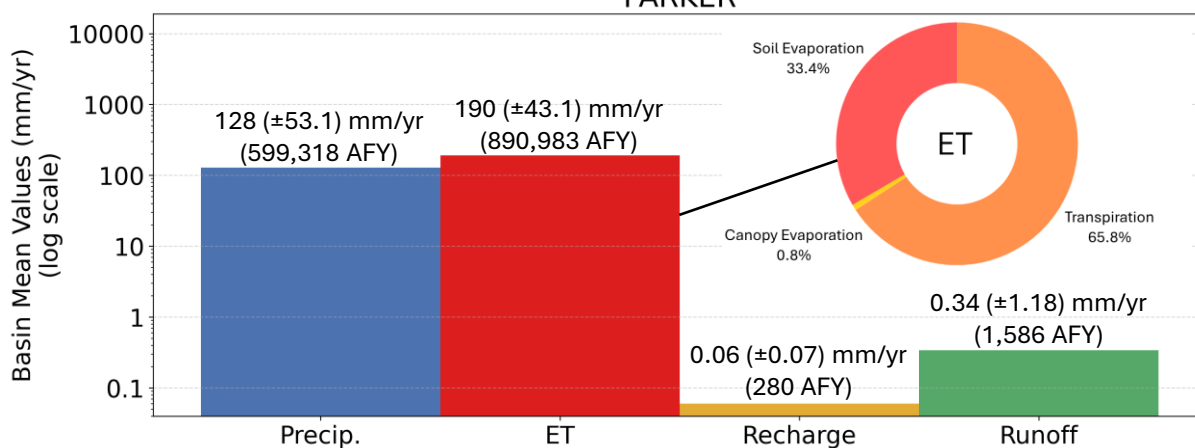
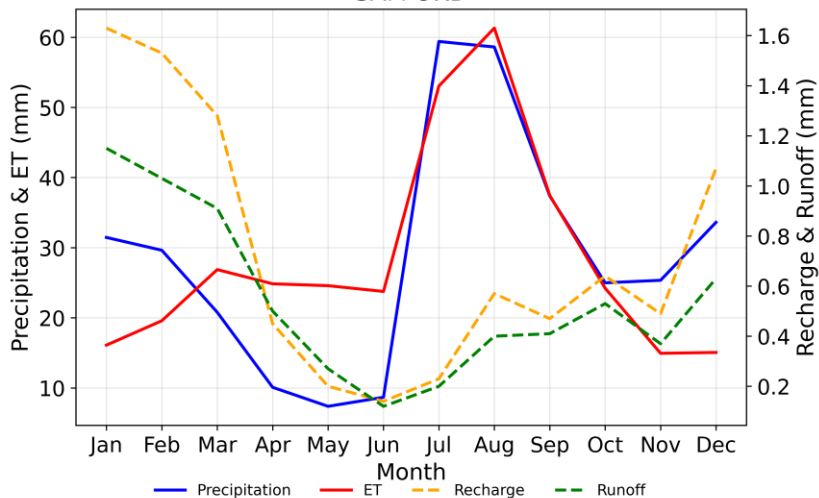


Figure 1 (above). Bar chart showing Noah-MP modeling results of the historical mean annual hydrologic cycle components (precipitation [P], evapotranspiration [ET], natural recharge, and runoff) in the basin from 1980-2020.⁶ ET is partitioned into soil evaporation, canopy evaporation, and transpiration. 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)
SAFFORD



On annual timescales, evapotranspiration (ET) exceeds annual precipitation (P) across the basin, resulting in basin-wide averages near zero for natural recharge (0.06 mm) and runoff (0.34 mm). ET is greater than P for most of the year, with the exception of the winter months (from mid-October to mid-February). Soil evaporation makes up 33.4% of total ET in the basin, while transpiration comprises 65.8% and canopy evaporation accounts for the remainder (0.8%).

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

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.

Parker

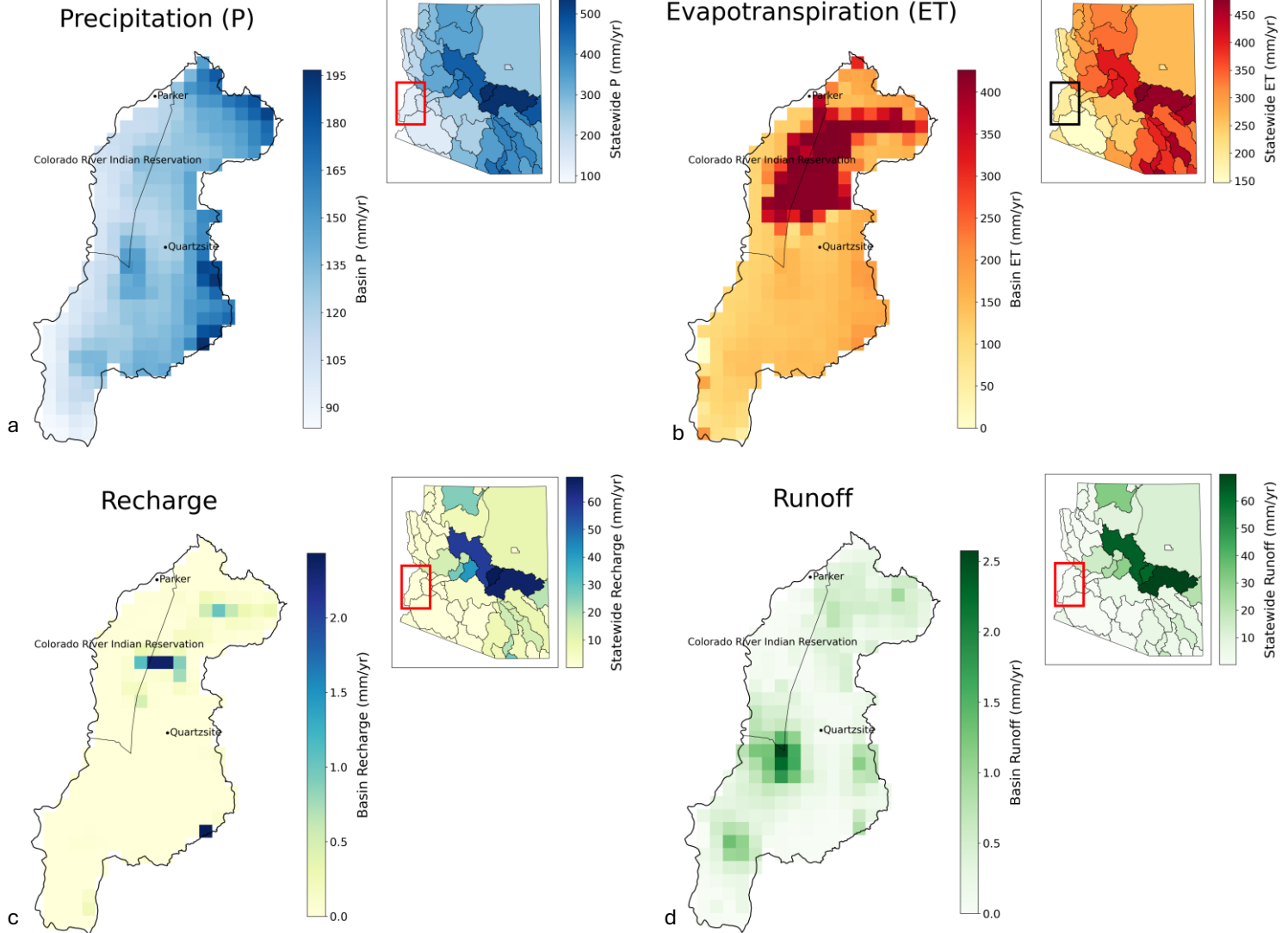
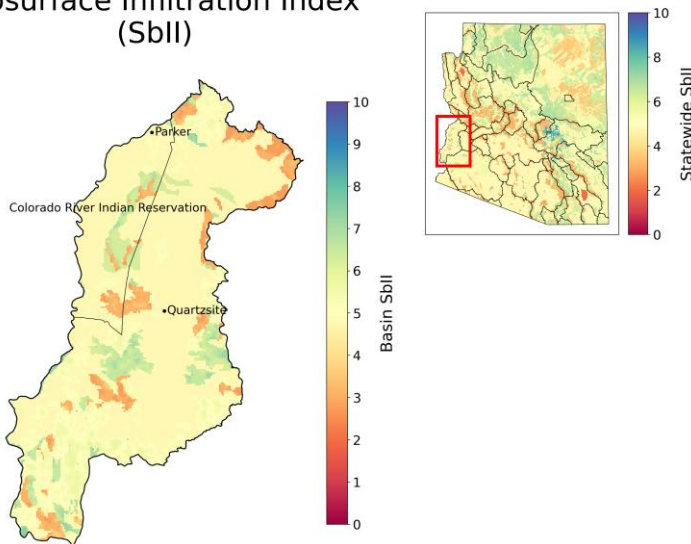


Figure 4 (below). Subsurface infiltration index (SbII) showing infiltration potential of the subsurface across the groundwater basin on a scale of 1-10 based on geologic features.⁹

Subsurface Infiltration Index (SbII)



ET in the Parker basin is greatest in the Bouse Dunes, between Parker and Bouse, AZ, exceeding 400 mm/yr. P is highest at the eastern edges of the basin in the Plomosa Mountains, nearing 200 mm/yr. Runoff and natural recharge are both minimal across the basin due to low water availability. Infiltration potential varies across the basin, but is generally greater in the karst-type geology and alluvial deposits along the low mountain regions.



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

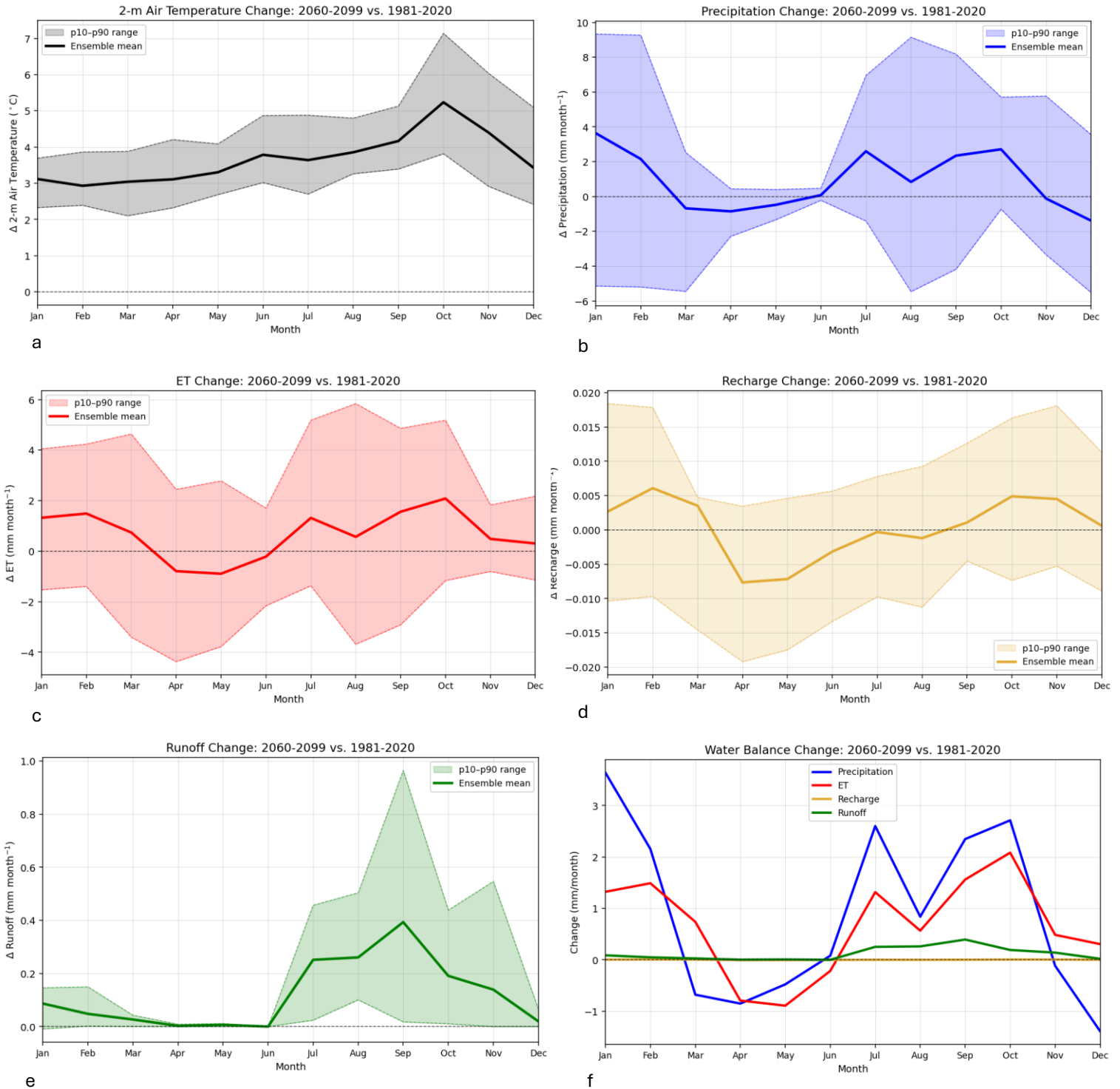


Figure 5. Plots (a)-(e) show projected changes in (a) temperature, (b) precipitation, (c) evapotranspiration (ET), (d) natural recharge, and (e) runoff statewide, comparing end of the 21st century to the historical record from 1981-2020 under the IPCC Scenario SSP3-7.0.¹⁰ Plot (f) shows the change in 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 Parker basin show drier springs (6-23% drier March through May) and a drier December (8%). January-February (12-22%) and June-October (4-38%) are projected to be wetter on average by the end of the century. The increase in precipitation in September-October (2.4-2.8 mm/month) is consistent with a projected increase in extreme events associated with hurricane and tropical cyclone activity. Natural recharge remains negative (-0.03 to -0.07 mm/month) throughout the year.* While remaining below 0.4 mm/month, runoff is projected to increase by 0.14 to 0.38 mm/month from July through November by the end of the century. Projected increases in temperature range from approximately 3.0 °C in February to 5.3 °C in October. Evapotranspiration (ET) is projected to generally track with precipitation throughout the year, showing increases of 3-25% (0.55-2.1 mm/month) from July through October due to high temperatures and greater water availability.

*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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