

Lower Gila Groundwater Basin Profile



Basin Summary Statistics

Size¹: 7,309 square miles

Elevation²: Range: 158-4,681 ft; Median: 889 ft

Top 3 land cover types by area³: Shrub/Scrub (84%), Barren Land (8.1%), Grassland Herbaceous (5.2%)

Major surface watershed(s)⁴: Lower Gila River, San Cristobal Wash, Tenmile Wash

Groundwater subbasins¹: Dendora Valley, Childs Valley, Wellton - Mohawk

Groundwater-derived streamflow fraction⁵:

0.02 (Very Low)



Mean Annual Hydrologic Cycle Components (1980-2020)
LOWER GILA

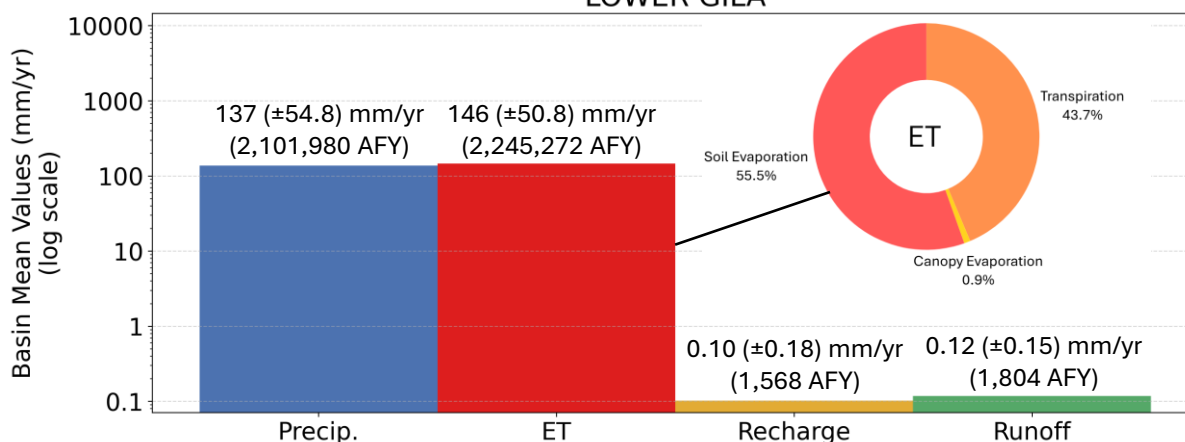


Figure 1 (above). Bar chart showing Noah-MP modeling results of the historical mean annual hydrologic cycle components (precipitation [P], evapotranspiration [ET], natural recharge, and runoff) in the basin from 1980-2020.⁶ ET is partitioned into soil evaporation, canopy evaporation, and transpiration.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

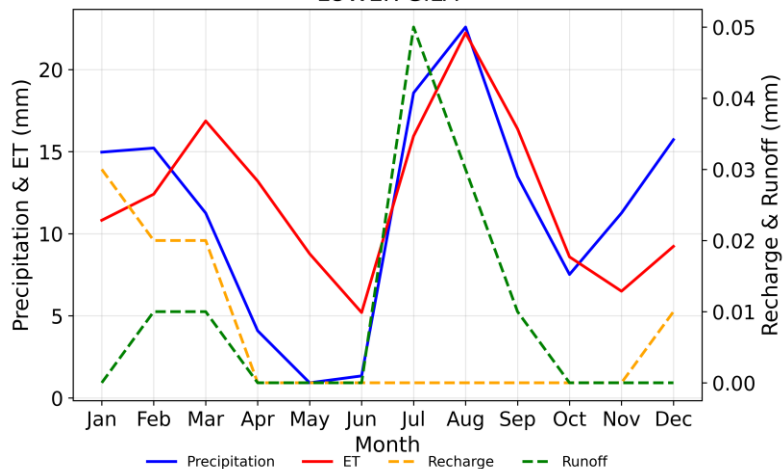


Figure 2. Graph showing monthly mean precipitation, ET, recharge, and runoff for the groundwater basin (1980-2020) from Noah-MP modeling results.⁶

On annual timescales, evapotranspiration (ET) exceeds precipitation (P), resulting in near-zero values for natural recharge and runoff in the Lower Gila basin. P is affected by the North American Monsoon during the summer months and large frontal systems in the winter. ET exceeds P from March to June and tracks closely with P from June through October. Soil evaporation makes up 55.5% of total ET, while transpiration comprises 43.7% and canopy evaporation accounts for the remainder (0.9%).

Lower Gila



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.

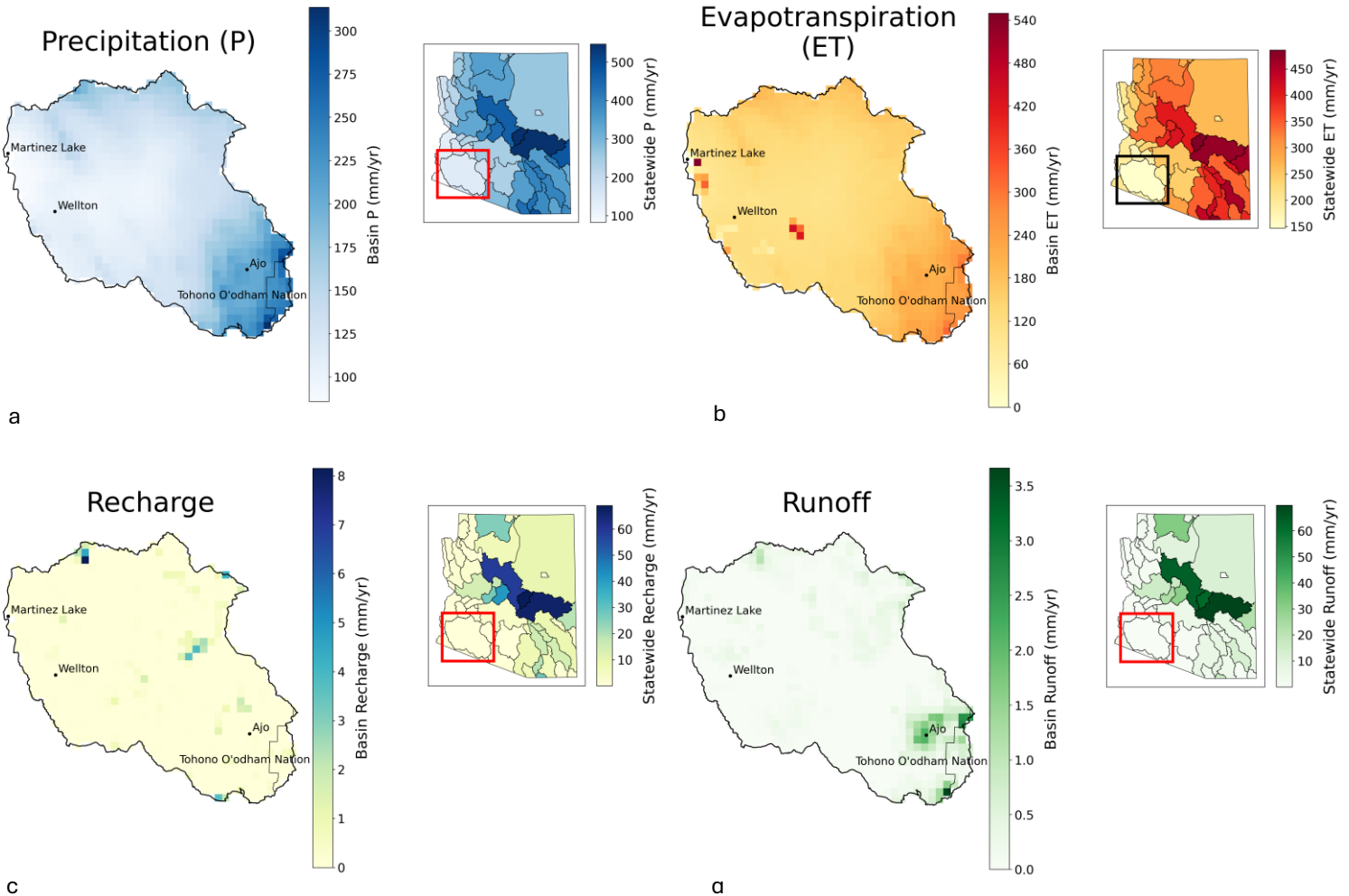
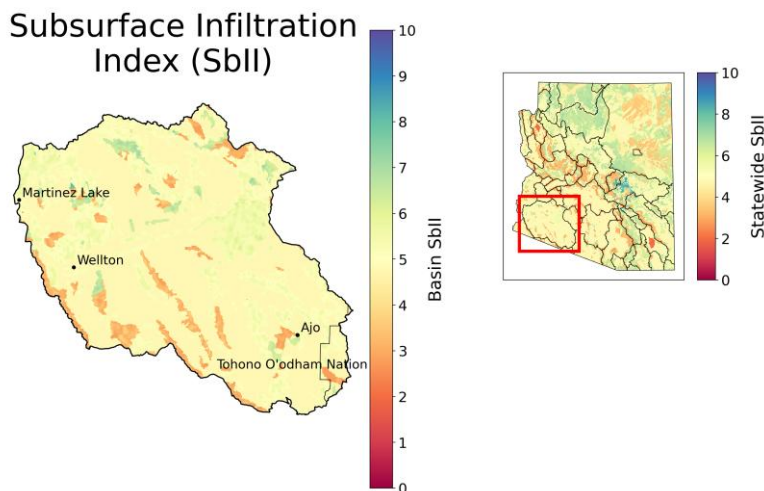


Figure 4 (below). Subsurface infiltration index (SbII) showing infiltration potential of the subsurface across the groundwater basin on a scale of 1-10 based on geologic features.⁹



Precipitation (P) in the Lower Gila basin is greatest in the southeast portion of the basin where it can exceed 250 mm/yr on average. Evapotranspiration (ET) is highest (~450 mm/yr) in the wash just west of the Mohawk mountains. Natural recharge is highest (~6 mm) in the Kofa National Wildlife Refuge to the north, and runoff (~3 mm) is highest in the southeast portion of the basin. The Lower Gila basin generally has moderate infiltration potential with areas of higher potential in regions with karst-type geology.

Lower Gila



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

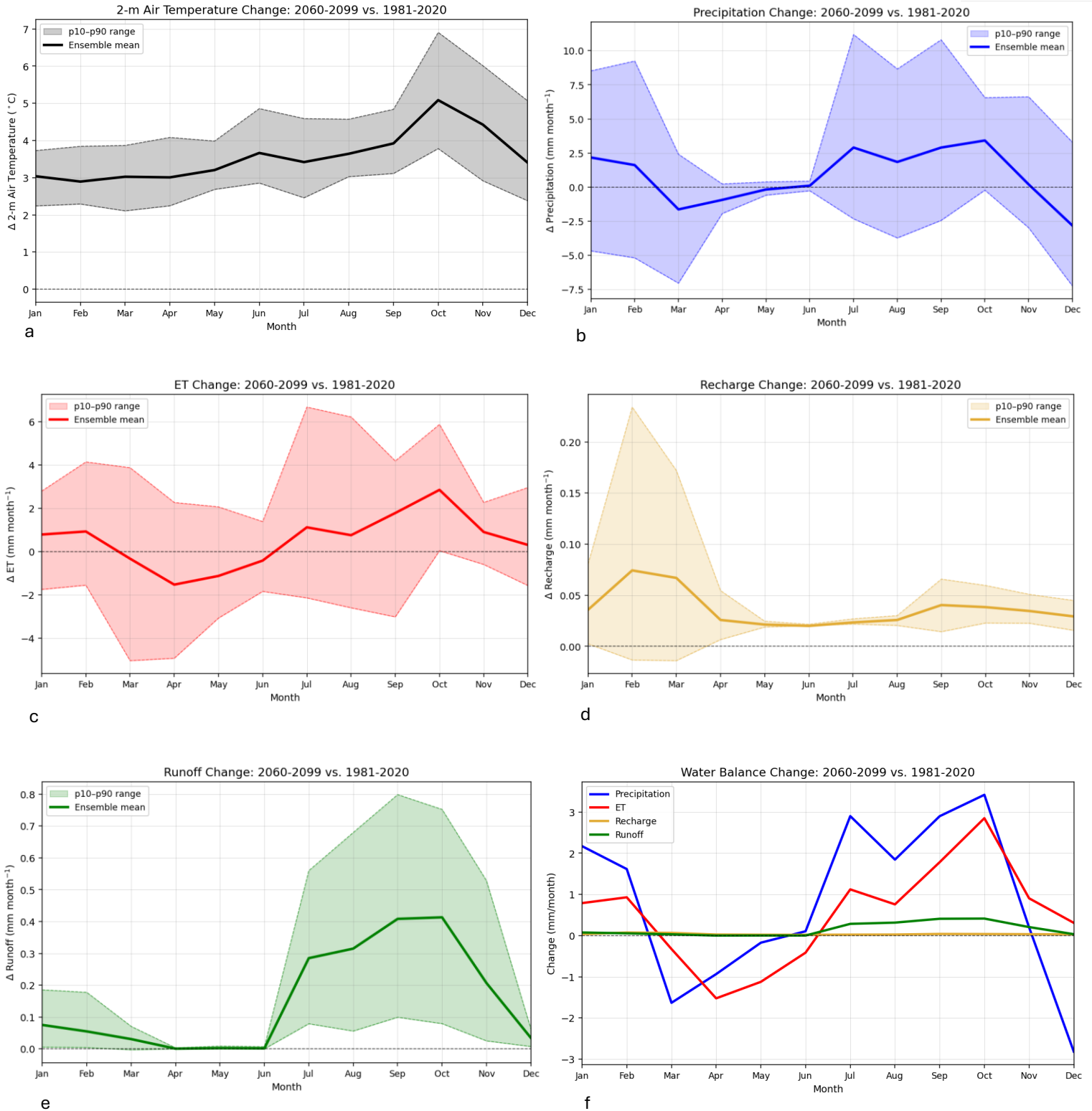


Figure 5. Plots (a)-(e) show projected changes in (a) temperature, (b) precipitation, (c) evapotranspiration (ET), (d) natural recharge, and (e) runoff statewide, comparing end of the 21st century to the historical record from 1981-2020 under the IPCC Scenario SSP3-7.0.¹⁰ Plot (f) shows the change in 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 Lower Gila basin show drier springs (13-31% drier March through May) and a drier December (17%). January-February (10-15%) and June-October (7-42%) are projected to be wetter on average by the end of the century. The increase in precipitation in September-October (2.9-3.5 mm/month) is consistent with a projected increase in extreme events associated with hurricane and tropical cyclone activity. Natural recharge is projected to remain near zero, with slightly negative projections (-0.01 to -0.03 mm/month) from May through December.* While runoff is projected to remain below 0.5 mm/month, minor increases of 0.21-0.42 mm/month are projected for July-November. Projected increases in temperature range from approximately 2.9 °C in February to 5.1 °C in October. Less precipitation in April and May leads to a projected 12-15% (-1.1 to -1.6 mm/month) decrease in evapotranspiration (ET), while higher temperatures and greater water availability lead to a projected 11-31% (0.91-2.9 mm/month) increase in ET from September through November compared to the baseline period.

*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

1. ADWR Groundwater Basin and Subbasin shapefiles. Retrieved from: <https://gisdata2016-11-18t150447874z-azwater.opendata.arcgis.com/>
2. USGS Digital Elevation Model data. Retrieved from: <https://apps.nationalmap.gov/downloader/>
3. Annual National Land Cover Database – Land Cover (2024). Retrieved from the Multi-Resolution Land Characteristics Consortium: <https://www.mrlc.gov/data>
4. USGS HUC8 Watersheds. Retrieved from: <https://hydro.nationalmap.gov/arcgis/rest/services/wbd/MapServer>
5. Mroczek, C., Springer, A. E., Gupta, N., Sankey, T., & Lucas, B. (2025). Regional base-flow index in arid landscapes using machine learning and instrumented records. *Journal of Hydrology: Regional Studies*, 62, 102778. <https://doi.org/10.1016/j.ejrh.2025.102778>
6. Gupta, A., Qiu, Y., Behrangi, A., & Niu, G. (2026). Noah-MP 40-Years Climatology for Water Balance over Ground Water Basins in Arizona, HydroShare, <http://www.hydroshare.org/resource/a3cc182071124849a463b6132213af23>. (Figures by Hinkley, M. & Mohsenzadeh Karimi, S.)
7. AZGeo City Points shapefile. Retrieved from AZGeo Data Hub: <https://azgeo-open-data-agic.hub.arcgis.com/datasets/azgeo::city-points/about>
8. Federal American Indian Reservation boundaries shapefile. Retrieved from: https://services2.arcgis.com/FiaPA4ga0iQKduv3/arcgis/rest/services/Federal_American_Indian_Reservations_v1/FeatureServer
9. Lima, R., Springer, A., Sankey, T. (2026). Arizona Subsurface Infiltration Index v.2, HydroShare, <https://doi.org/10.4211/hs.abcd8aa1a793463ab33677ce9d46db58>
10. Qiu, Y. (2026). Future Projection of Hydroclimate over Arizona Version 2, HydroShare, <https://doi.org/10.4211/hs.a5751f0af305483682501f79d9af0bd7>

