

## 1) Introduction

- This research is part of the NSF AQUA-CLIME project, which advances climate-resilient water management through data integration and community partnerships.
- AQUA-CLIME develops practical tools that use limited climate data to assess water availability across diverse regions.

## 2) Study Goals

- Evaluate LOCA2 historical Thornthwaite budgets against NCEI climate-zone water budgets.
- Validate modeled water-balance behavior using observed USGS streamflow.
- Apply the validated framework to LOCA2 CMIP6 future scenarios to assess projected changes in water availability.

## 3) Research Area

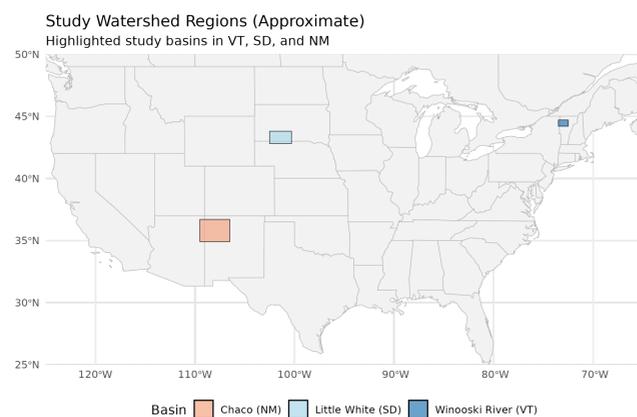


Figure 1. Study basins (HUC-08) across humid, semi-arid, and arid regions of the United States.

- HUC08 04300103 – Winooski River, VT (Humid)
- HUC08 10140203 – Little White River, SD (Semi-Arid)
- HUC08 14080106 – San Juan-Chaco, NM (Arid)

## 4) Data and Methods

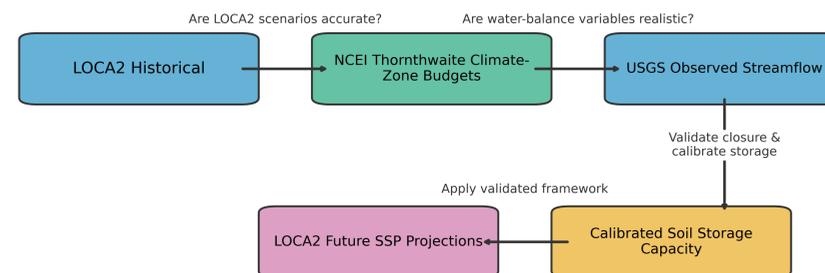


Figure 2. Schematic illustrating the processing chain from LOCA2 climate inputs through PET estimation, soil-water accounting, snow storage, and validation against USGS streamflow observations.

- Monthly LOCA2 precipitation and temperature were extracted for each HUC-08 basin and quality-checked against NCEI climate records.
- Temperature-driven PET and a soil-moisture accounting framework were used to simulate storage, deficit, surplus, snowpack, and runoff.
- Modeled outputs were compared with USGS streamflow to evaluate water-balance realism and parameter sensitivity.

## 5) Thornthwaite

$$P - AET = R + \Delta S_{soil} + \Delta S_{snow}$$

- A monthly “bucket” water-balance model that tracks how precipitation is partitioned into actual evapotranspiration, runoff/recharge, and changes in storage.
- Requires only precipitation and air temperature.
- Enables water-availability assessment in data-sparse basins and is ideal for climate projections because future changes are driven directly by P and temperature-derived PET.

## 6) Results

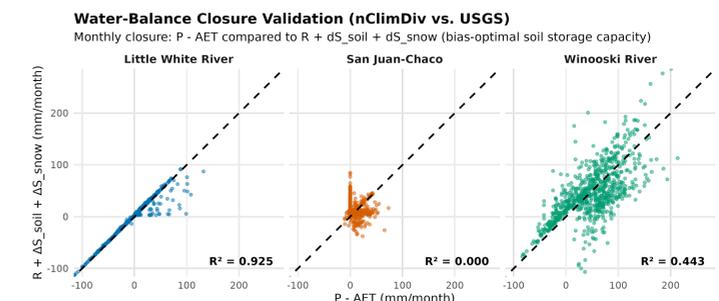


Figure 3. Historical validation of Thornthwaite–Mather water balance against USGS streamflow using nClimDiv climate data (1951–2014).

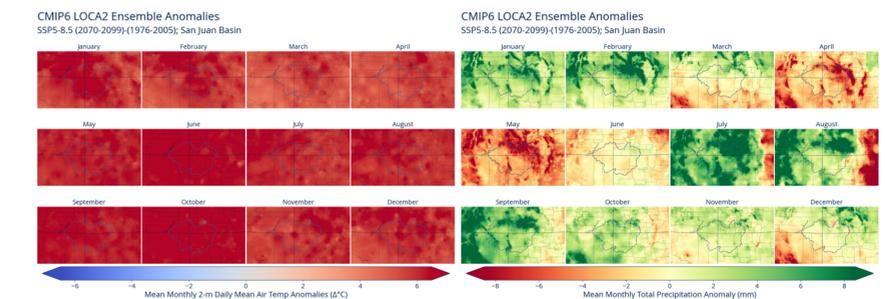


Figure 4. Future Thornthwaite–Mather projections forced by CMIP6-LOCA2 anomalies for mid- and late-century periods relative to 1976–2025.

## 8) Acknowledgments

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