

Changing Hydrology and Impacts on Water Planning in the Highland Lakes Watershed



*Accompanying the technical report by Jordan Furnans, PhD, PE, PG,
Windward Water Resources Engineering & Geoscience, PLLC*

Testing the Core Assumption Behind Texas Water Planning

Texas water planning rests on the premise that historical hydrology predicts future water availability.



The Central Texas Water Coalition (CTWC)

commissioned this independent research to test that assumption in one watershed, asking whether the Highland Lakes watershed functions today as it did during the drought of the 1950s (when we received less rainfall). The study finds that it does not. While long-term rainfall has remained relatively stable, significantly less water is reaching the Highland Lakes.

The watershed has changed. The way we evaluate and plan for available water must account for that change.

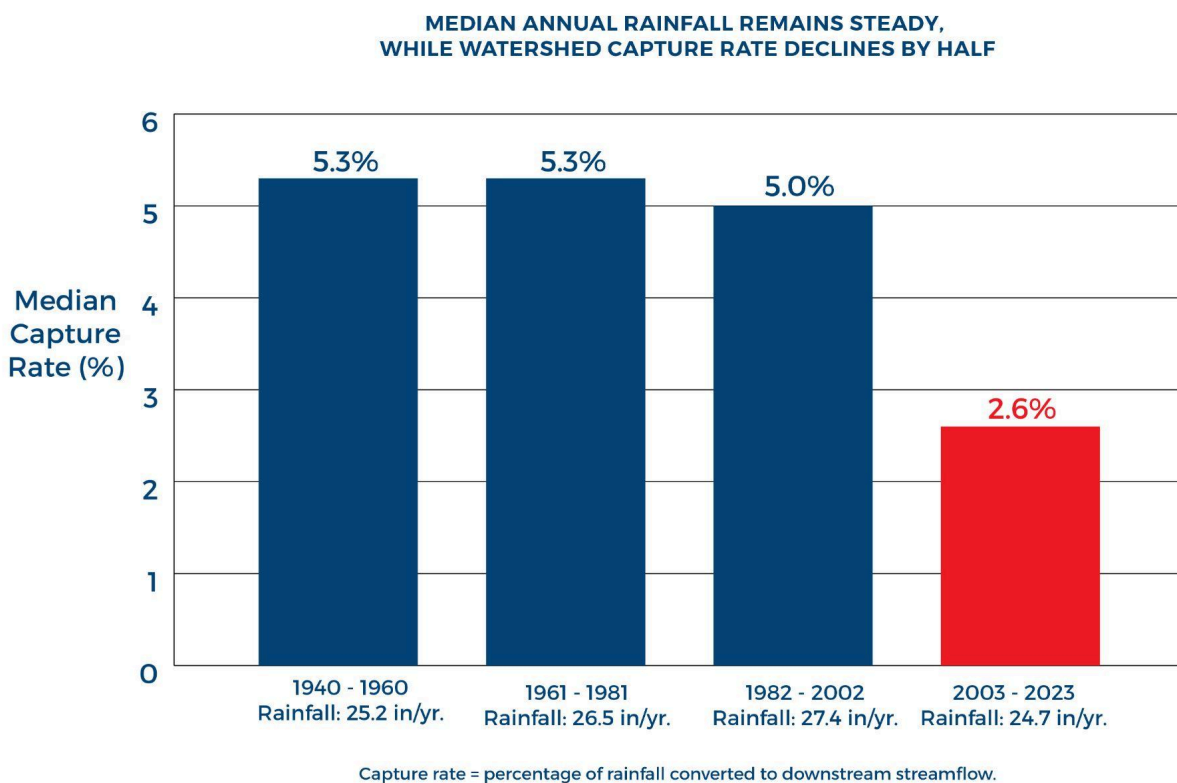
What We Studied

- **Asked whether the Highland Lakes watershed still responds to rainfall the way it did historically.** The study compared current watershed behavior with conditions reflected in the historical record, including the 1950s drought.
- **Tested current watershed conditions using the same modeling framework used for water planning and permitting.** The analysis used the Water Availability Model (WAM) and the Lower Colorado River Authority's (LCRA) proposed 2032 Water Management Plan modeling, modifying historical inflows to reflect observed changes in how much rainfall now reaches the Highland Lakes.
- **Tested the findings multiple ways.** Four separate methods were used to adjust historical inflows across 14 distinct model runs, allowing the study to

evaluate whether the results remained consistent under different approaches rather than relying on a single assumption or scenario.

What the Study Found

- **The Highland Lakes watershed is producing less water from roughly the same amount of rainfall.** Across more than a century of records, average annual rainfall has remained statistically stable at approximately 26 inches per year, but the amount of water reaching Lakes Buchanan and Travis has declined. Nine of the 10 lowest annual inflow years on record have occurred since 2006.



- **The 1950s drought is a more appropriate planning benchmark than the drought currently used.** The watershed received roughly 50 inches less total rainfall during the 1950s drought than during the 2008-2016 drought period used in LCRA's 2032 Water Management Plan analysis—meaning a repeat of the 1950s rainfall pattern today would place even greater stress on a watershed that is already producing less inflow.
- **The amount of water the Highland Lakes can reliably supply could be 9% to 21% lower than currently estimated.** When the study modeled 1950s

drought rainfall under today's less-productive watershed conditions, all model runs produced less available water—37,524 to 88,335 acre-feet less per year.

- **Lake storage falls below the 600,000-acre-foot level established in the proposed 2032 Water Management Plan in two scenarios, including the most comprehensive method.** Under these two scenarios, combined storage in Lakes Buchanan and Travis fell to approximately 532,000 to 548,000 acre-feet—roughly 52,000 to 68,000 acre-feet below the threshold.

The bottom line: The Highland Lakes watershed is less productive than it once was. If historical drought-level rainfall occurred under today's watershed conditions, less water would reach the lakes and less water would be reliably available for use. That means planning models based on historical watershed conditions and data may overstate available water supplies and underestimate the risks of future drought.

Why This Matters Now

- **Lake levels can change quickly, but the underlying watershed conditions change over decades .** Flooding in July 2025 took combined storage from approximately 51% to more than 90%. More flooding in July 2026 further refilled the lakes, but neither event changed the long-term decline in watershed productivity identified by this study.
- **The decisions being made today will guide Highland Lakes water management for years.** Once approved by the Texas Commission on Environmental Quality (TCEQ), LCRA's pending Water Management Plan is expected to govern management of the Highland Lakes water supply for approximately 5–7 years. The assumptions used today therefore matter well beyond current lake levels.
- **The amount of water considered reliably available affects how much water LCRA can commit.** This study finds that the reliable annual supply of Highland Lakes water could be as much as 21% lower.

When a watershed produces less water than the models predict, there is a risk of committing more water than will be reliably available when it is needed most—during a severe drought.

What We're Asking Policymakers to Do

For the Lower Colorado River Authority:

- **Test the study's findings.** Independently run the adjusted inflow and 1950s drought scenarios and publish the results, including impacts on firm yield and minimum combined storage.
- **Determine why inflows are declining.** Conduct a comprehensive watershed study to identify and quantify the factors causing significantly less runoff to reach the Highland Lakes.
- **Build in a greater margin of safety.** Implement a Safe Yield approach that maintains approximately one to two years of expected firm demand in storage. Establish triggers for evaluating and reopening the Water Management Plan if hydrologic conditions decline.

For the Texas Commission on Environmental Quality:

- **Evaluate the hydrology underlying the LCRA Water Management Plan.** As part of its review of LCRA's proposed WMP, consider whether historical inflows adequately represent current watershed conditions and require sensitivity testing where appropriate.
- **Review Water Availability Model assumptions.** Establish a process for determining when sustained, scientifically documented changes in watershed productivity warrant review or updating of WAM hydrology.
- **Ensure permitting reflects reliable water availability.** When scientific evidence demonstrates significant changes in watershed productivity, consider those conditions when evaluating water availability for water permitting decisions.

For the Texas Water Development Board:

- **Bring changing watershed conditions into regional water planning.** Develop guidance for identifying and evaluating watersheds where inflows or streamflows are declining despite relatively stable rainfall.
- **Regularly review planning assumptions.** As part of each five-year planning cycle, evaluate whether hydrology, naturalized flows, rainfall-runoff relationships, and drought assumptions continue to reasonably represent

current conditions.

- **Strengthen drought stress testing.** Where conditions warrant, evaluate severe historical drought rainfall using current watershed conditions and projected demands to identify vulnerabilities that standard planning assumptions may not reveal.

For the Texas Legislature:

- **Evaluate watershed productivity statewide.** Direct the TWDB, working with TCEQ, river authorities, and Regional Water Planning Groups, to analyze watershed productivity in basins showing declining reservoir inflows under stable rainfall, before major planning and infrastructure decisions are made.
- **Modernize the state water planning process.** Incorporate evolving hydrologic conditions where scientific evidence supports doing so, including periodic evaluation of watershed productivity and rainfall-runoff relationships.
- **Require periodic review of planning assumptions.** State Water Plans are updated every five years. The scientific assumptions underlying them, including hydrologic stationarity and naturalized flow methodology, should be reviewed on the same schedule.
- **Facilitate use of Safe Yield.** Encourage Regional Planning Areas facing rapid growth and declining water availability to maintain a margin of safety for future drought protection.
- **Strengthen regional water planning.** Provide Regional Water Planning Groups with the scientific resources, funding, and statutory authorities to address changing watershed conditions and evaluate emerging demands.
- **Consider the implications for water rights permitting.** TCEQ relies on WAMs to evaluate water availability when issuing and amending water rights. Watershed productivity should be a consideration when a WAM is used to make water availability decisions.