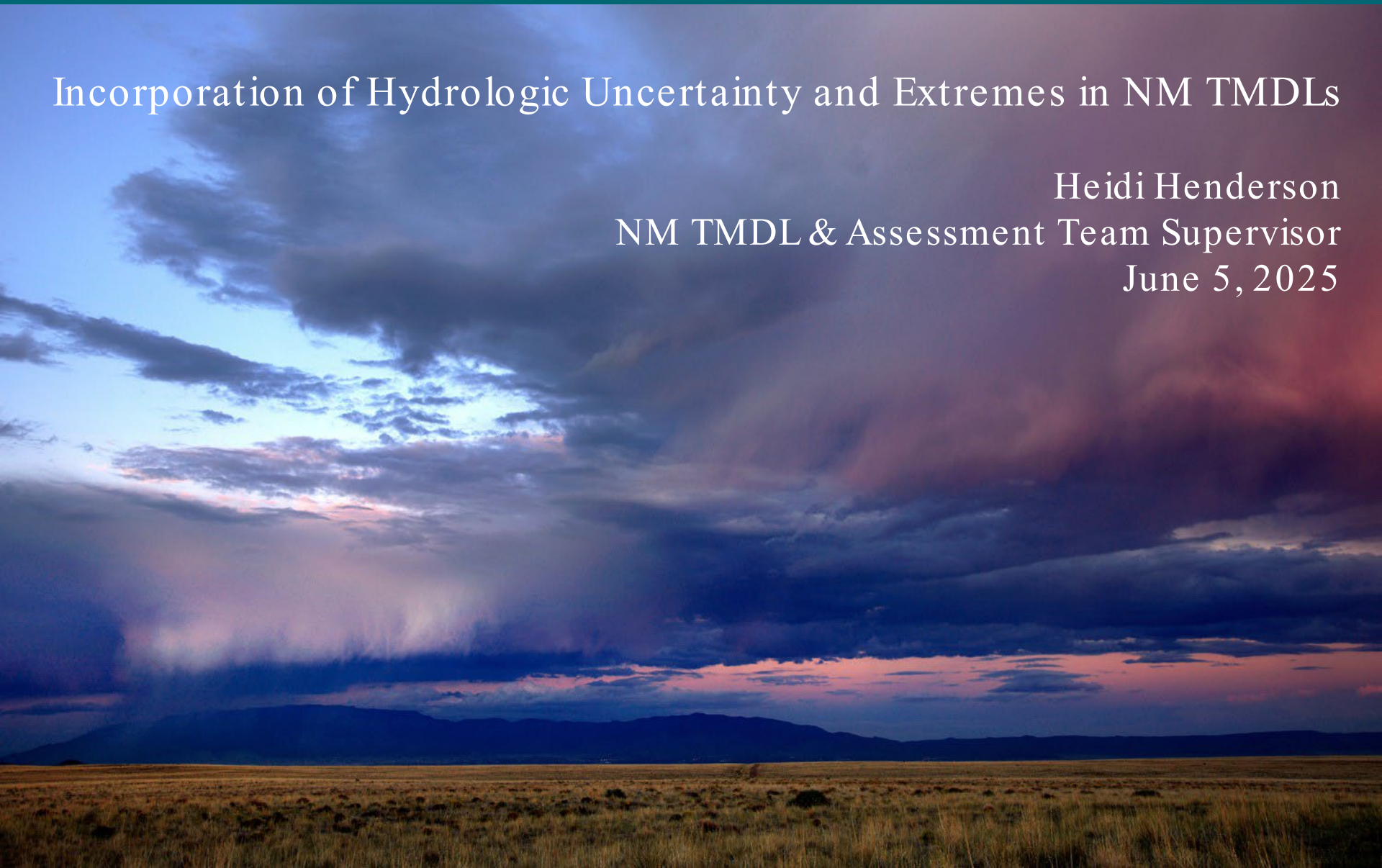
New Mexico Environment Department



Incorporation of Hydrologic Uncertainty and Extremes in NM TMDLs

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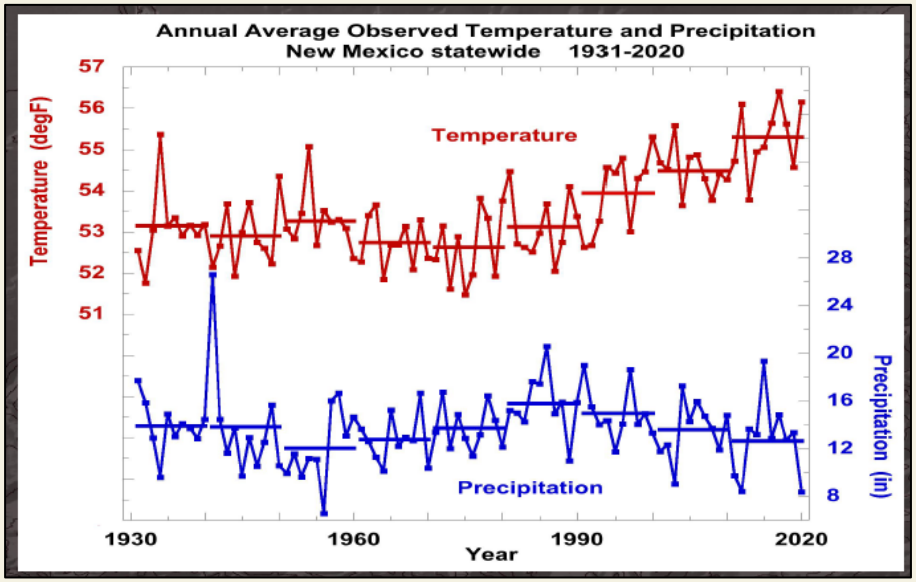
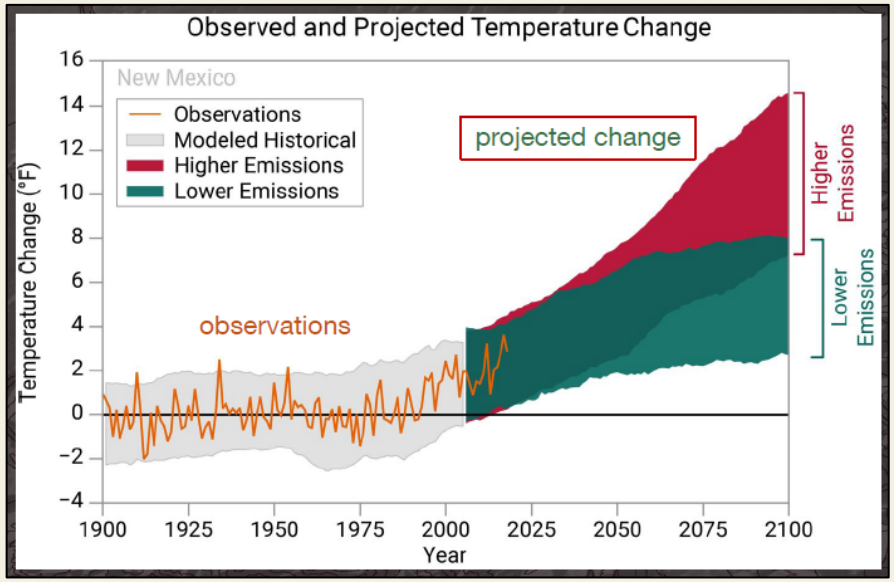
June 5, 2025

Hydrologic Uncertainty Overview





- 4 of the 5 driest years since 1930 in New Mexico have occurred in the last 20 years
- Temperatures in New Mexico have risen more than 2°C since 1900
- Spring precipitation is projected to decrease across most of the state
- Droughts are projected to become more intense

Sources: New Mexico Bureau of Geology and Mineral Resources, 2022 and NOAA, 2022

Hydrologic Uncertainty Overview

"Climate change is projected to impact river, lake, and wetland hydrology, with global implications for the condition and productivity of aquatic ecosystems"
(USGS 2024)

"Decreases in stream flow typically increase pollutant concentrations due to evaporation and less dilution. Other water quality impacts associated with climate change and drought include higher water temperatures, enhanced algal production, toxic algal blooms, and lower dissolved oxygen levels, all of which are stressors to aquatic life."
(NMED WQPP/CPP 2020)

Flow

4Q3 = critical low flow as determined by the minimum average flow over four consecutive days that occurs with a frequency of once in three years.

"For all other narrative and numeric criteria, the critical low flow is the minimum average four consecutive day flow that occurs with a frequency of once in three years (4Q3). The critical low flow may be determined on an annual, a seasonal or a monthly basis, as appropriate, after due consideration of site-specific conditions." 20.6.4.11(B)(2) NMAC

Flow - 4Q3 & Other Methods

- TMDL critical flow is typically 4Q3 flow
- 4Q3 methods-
  - USGS Hydrologic Toolbox for gaged streams
  - Thomas (1997) for nearby gaged streams
  - USGS regression equation (2023) and StreamStats for ungaged streams
- Load duration curves
- Seasonal flows

TMDL Sections & Revisions

- TMDL uncertainties, including hydrologic uncertainties, are addressed in Section 1.6 of all NMED TMDLs.
- TMDLs include explicit Margin of Safety to address uncertainties in 4Q3 flow estimates
- TMDLs are revised based on updated flows, ie: San Juan River TMDLs 4Q3 flows decreased 20-60% between 2005-2025

TMDLs for Intermittent Streams

- 20.6.4.98 INTERMITTENT WATERS: All non-perennial surface waters of the state, except those ephemeral waters included under section 20.6.4.97 NMAC or classified in 20.6.4.101-899 NMAC.

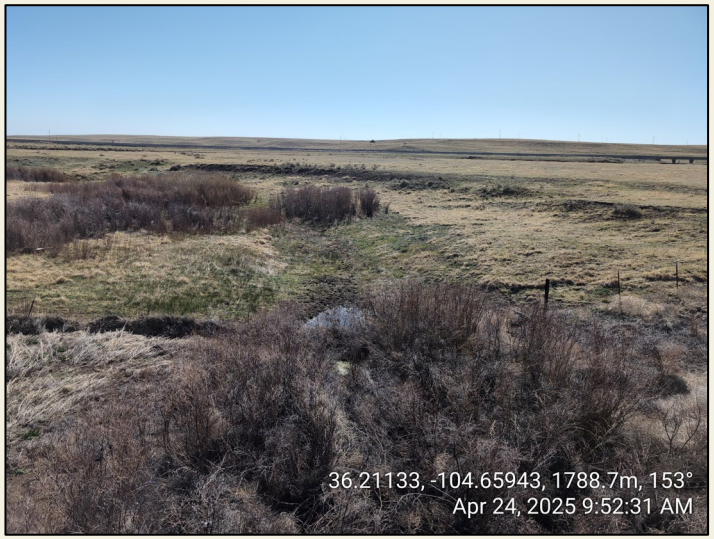
  A. Designated uses: livestock watering, wildlife habitat, marginal warmwater aquatic life and primary contact.

- Listings- dissolved oxygen, gross alpha, metals, PCBs, temperature

- TMDLs – *E.coli*, metals

IR Category 4C

- *"The most common example of waters impaired by pollution are those waterbodies not attaining their designated uses due to anthropogenic hydrologic and/or habitat alteration, including waterbodies impaired solely due to stream channelization or lack of adequate flow."*
  (NMED CALM-Appendix J)
- IR Category 4C impairment indicates that designated use impairments stem from the lack of a natural flow regime.
- IR Category 4C impairments may apply to livestock watering, wildlife habitat, and aquatic life uses
- NMED uses a weight-of-evidence approach to determine whether anthropogenic flow alteration (e.g., diversion) is causing a hydrologic alteration impairment
- Currently NMED has 20 Category 4C Listings



Climate Change Considerations

"These surface water quality standards serve to respond to the inherent threats of climate change and provide resiliency for the continued protection and enhancement of water quality." 20.6.4.6(D) NMAC

Governor Michelle Lujan Grisham issued Executive Order 2019-003 that includes directives for state agencies to incorporate climate mitigation and adaptation practices into their policies and operations.

NMED-Climate Change Bureau and Water Protection Division-Climate Resiliency Coordinator
https://www.env.nm.gov/climate-change-bureau/

References

- NM TMDLs
  https://www.env.nm.gov/surface-water-quality/tmdl/
- NM CALM – 4C Appendix J
  https://www.env.nm.gov/surface-water-quality/calm/
- NM 303(d)/305(b) Integrated Report
  https://www.env.nm.gov/surface-water-quality/303d-305b/
- NM WQMP/CPP
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- NM Climate Change Task Force
  https://www.climateaction.nm.gov/cap/
- Bell, M.T., and Tillery, A.C., 2023, Regression equations for estimating the 4-day, 3-year low-flow frequency and adjusted harmonic mean streamflow at ungaged sites for unregulated, perennial streams in New Mexico: U.S. Geological Survey Scientific Investigations Report 2023–5058, 31 p., https://doi.org/10.3133/sir20235058
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