



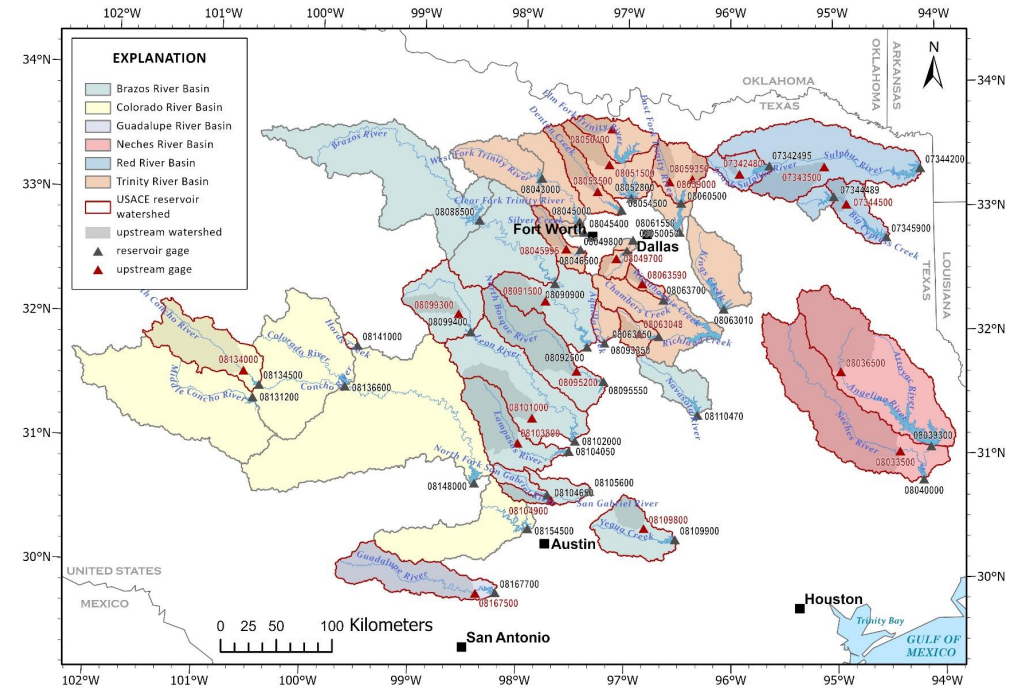
**US Army Corps
of Engineers®**

Precipitation Probability Distribution, Percent Runoff, and Trend Analysis for 25 U.S. Army Corps of Engineers Reservoir Basins in Texas from 1980–2019

GLENN R. HARWELL, MONICA V. YESILDIREK,
JERRY COTTER, DIANA L. HANBALI, AND
ERIC J. VAN VLEET

Introduction

- **SWF operates 25 U.S. Army Corps of Engineers reservoirs**
 - Flood risk management
 - Water supply
 - Hydropower
 - Recreation/Wildlife
- **This collaborative effort between the USGS and USACE will help us better estimate inflow into our reservoirs**
 - There is rapidly growing water supply demand in Texas
 - Can we hold more floodwater in our reservoirs while maintaining public safety and proper flood risk management?
 - We must understand associated risk
 - More accurate runoff/inflow estimates are crucial for USACE if FIRO is to be implemented



Base map modified from U.S. Geological Survey
1:4,600,000-scale digital data
Albers Equal-Area Conic projection
North American Datum of 1983

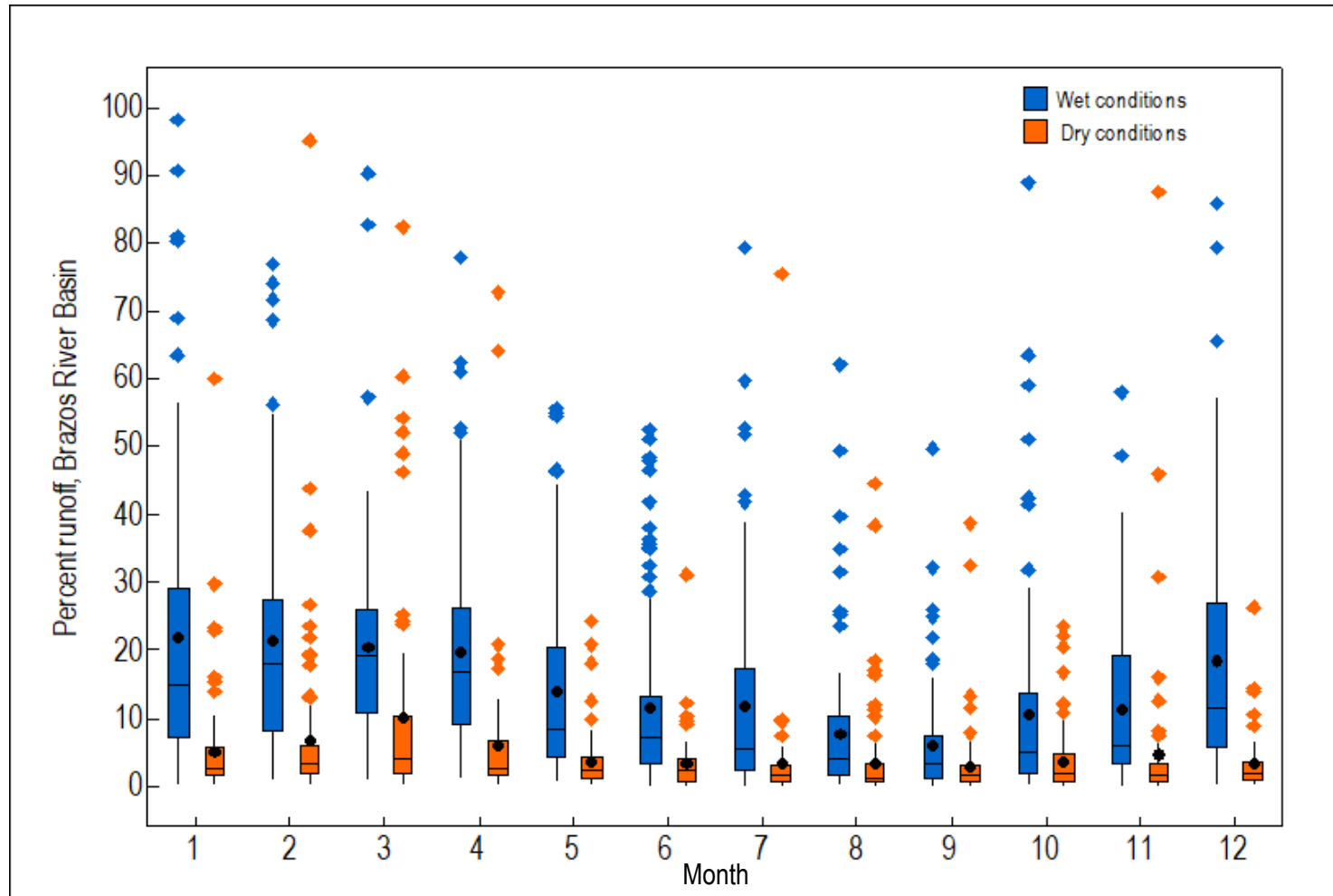


Data

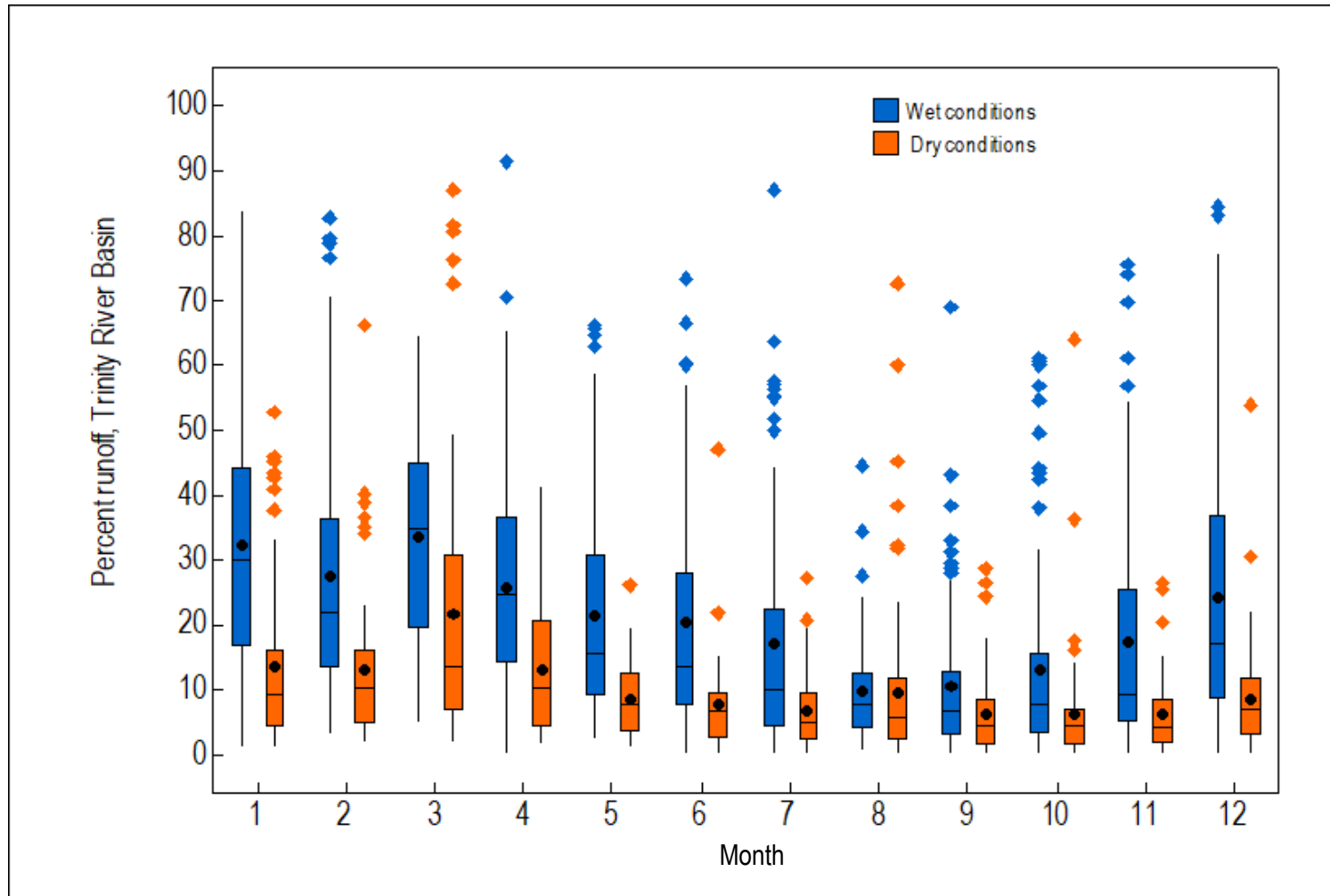
- **USACE** supplied reservoir inflow data for 25 **USACE** reservoirs in six basins including the Brazos, Colorado, Guadalupe, Neches, Red, and Trinity
- **Daymet** gridded 1-km daily precipitation estimates from 1980 through 2019 from the Environmental Sciences Division at Oak Ridge National Laboratory for 25 **USACE** reservoirs and 15 other reservoirs operated by different entities
- **USGS** streamflow data from 24 stations within the contributing areas to the 25 **USACE** reservoirs used to compute percent runoff
- **Drought Severity Coverage Index (DSCI)** weekly, **HUC-8** data from **US Drought Monitor**, a product of the National Drought Mitigation Center at University of Nebraska-Lincoln, **NOAA**, and the US Department of Agriculture from 2000 through 2019
- Used **HEC-SSP** to select the best fit probability distribution for annual, monthly, and maximum 2-day monthly precipitation data for 40 years of record from 1980 through 2019



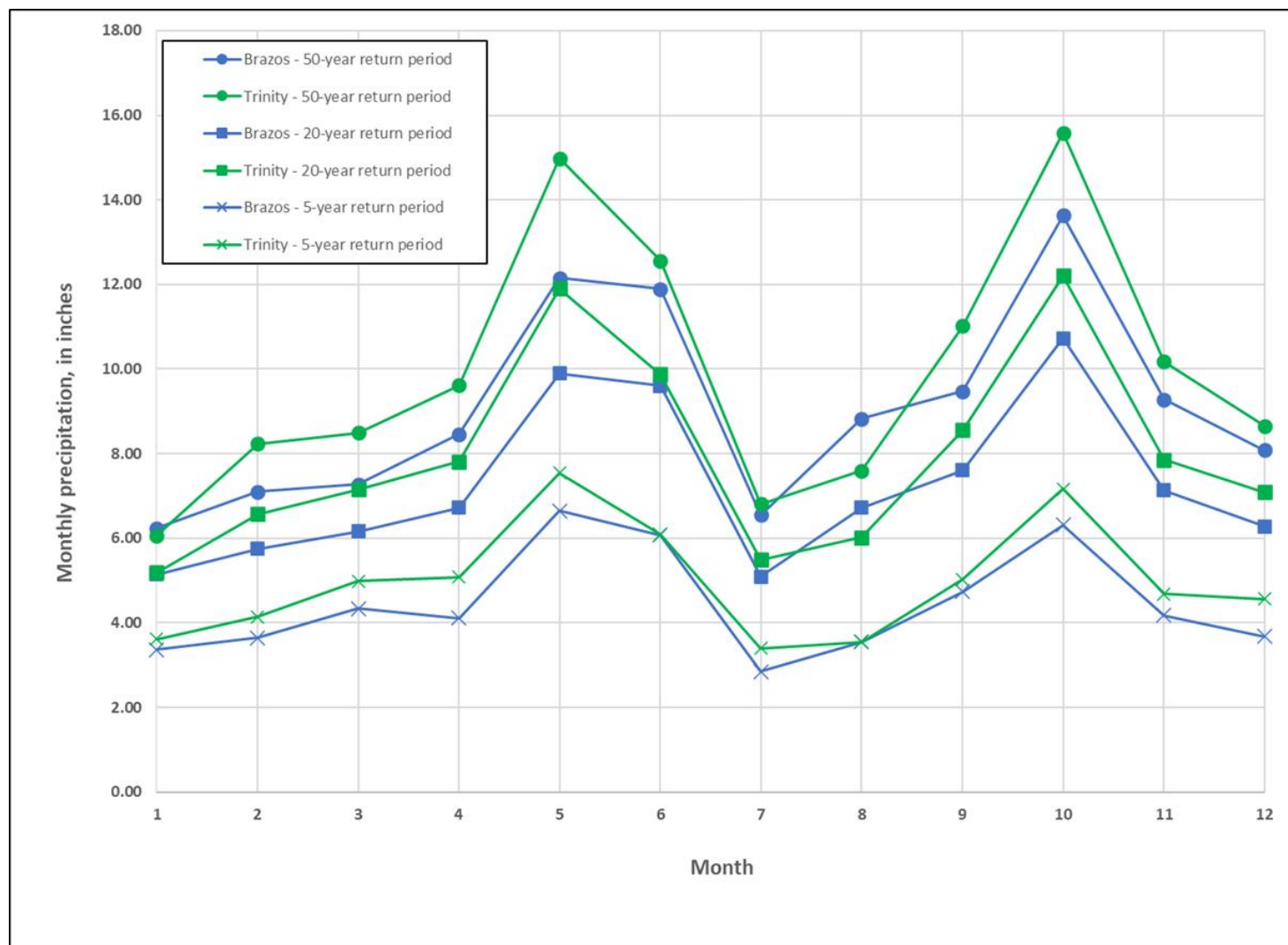
Brazos River Basin Surface Runoff



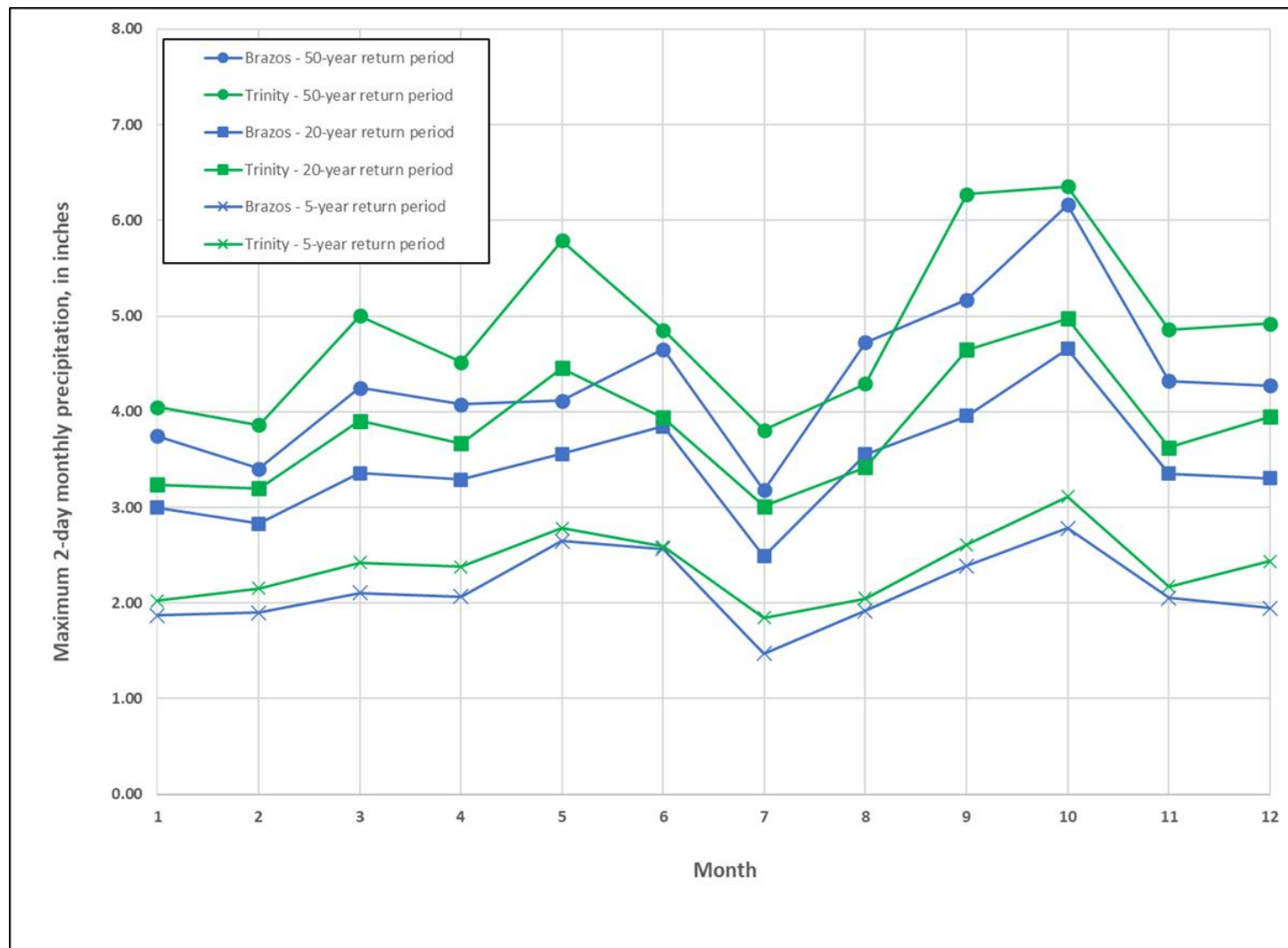
Trinity River Basin Surface Runoff



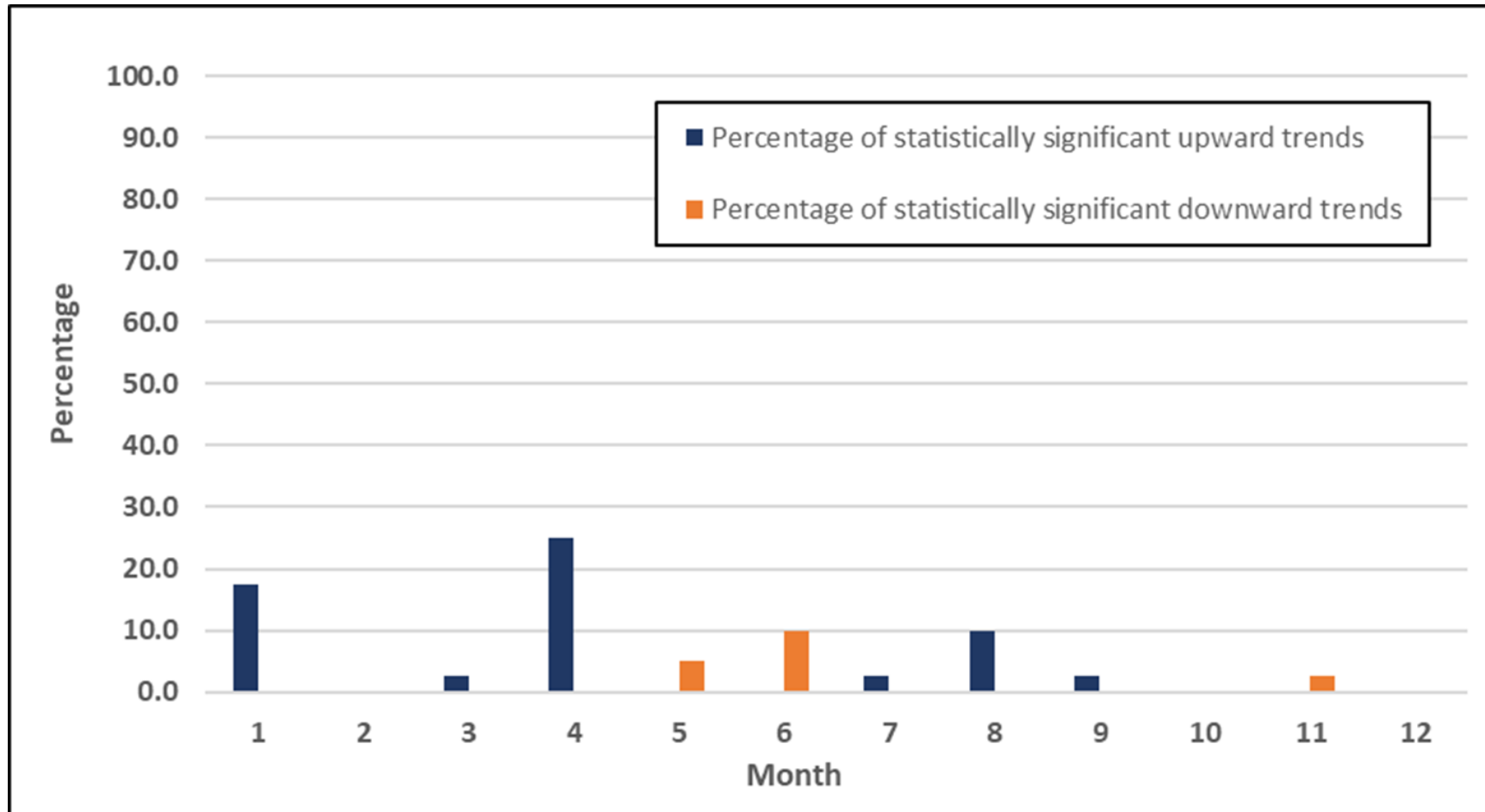
Brazos and Trinity River Basins Probability Analysis



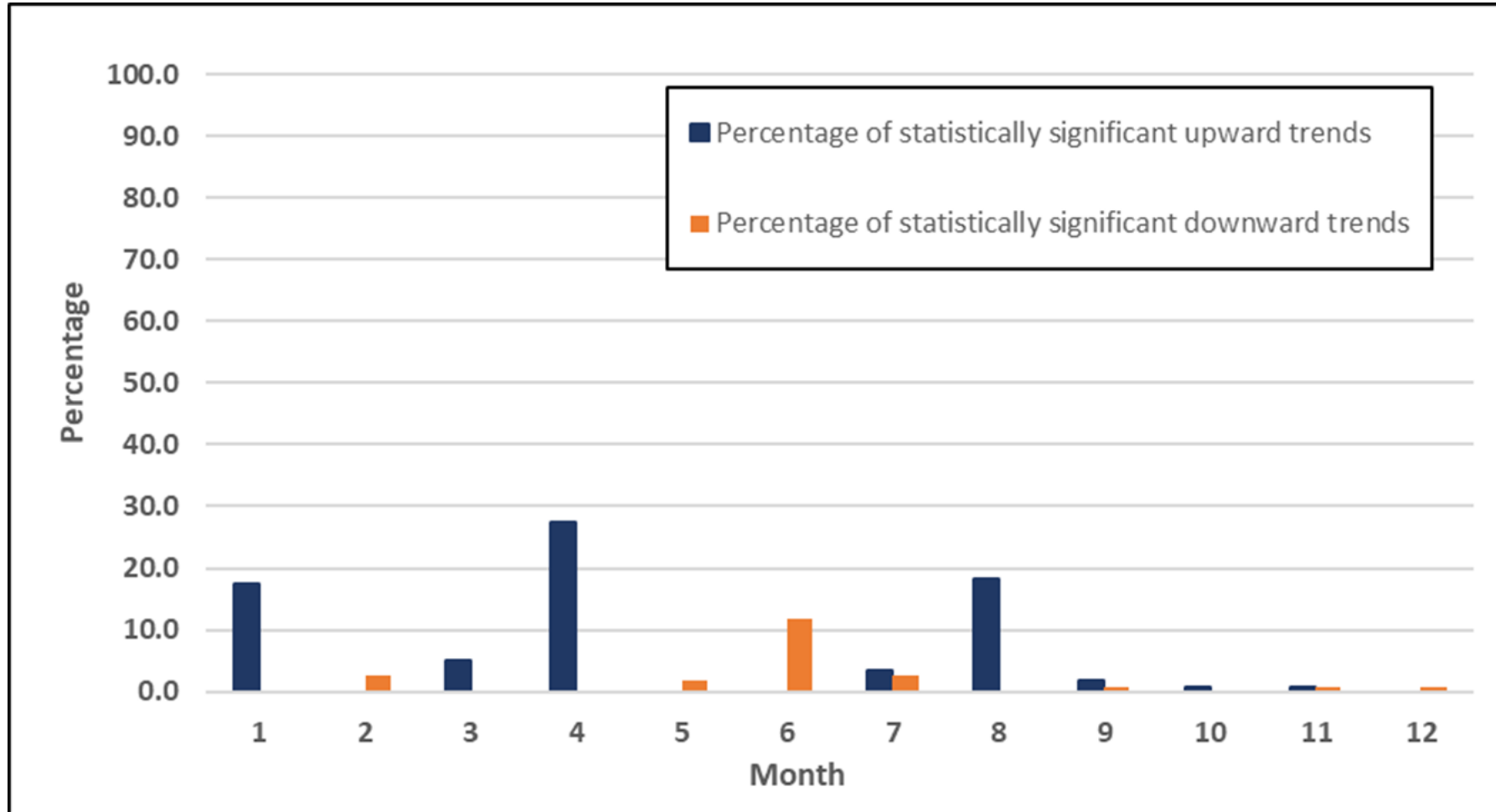
Brazos and Trinity River Basins Probability Analysis



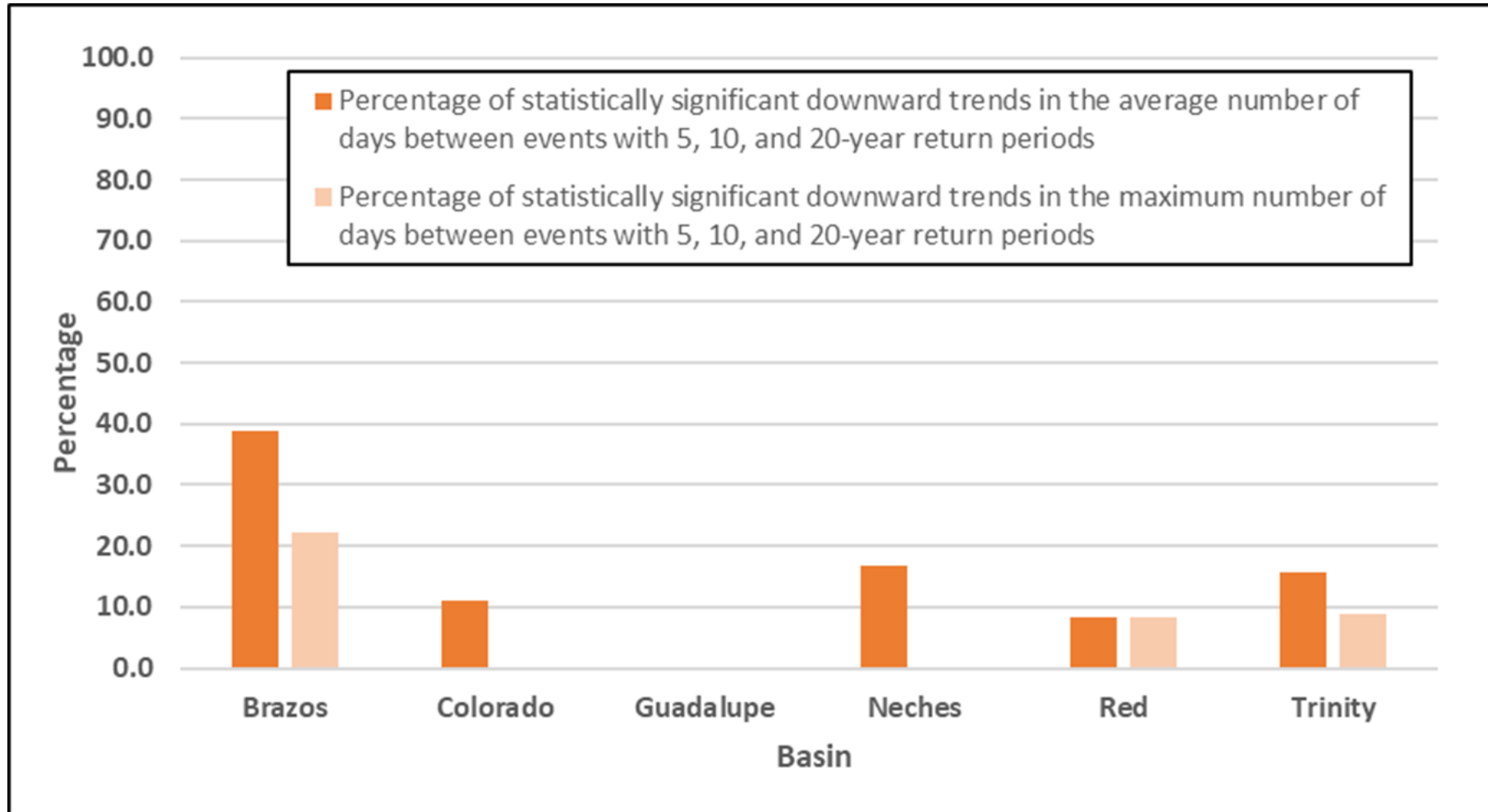
Trends – Maximum 2-day monthly precipitation

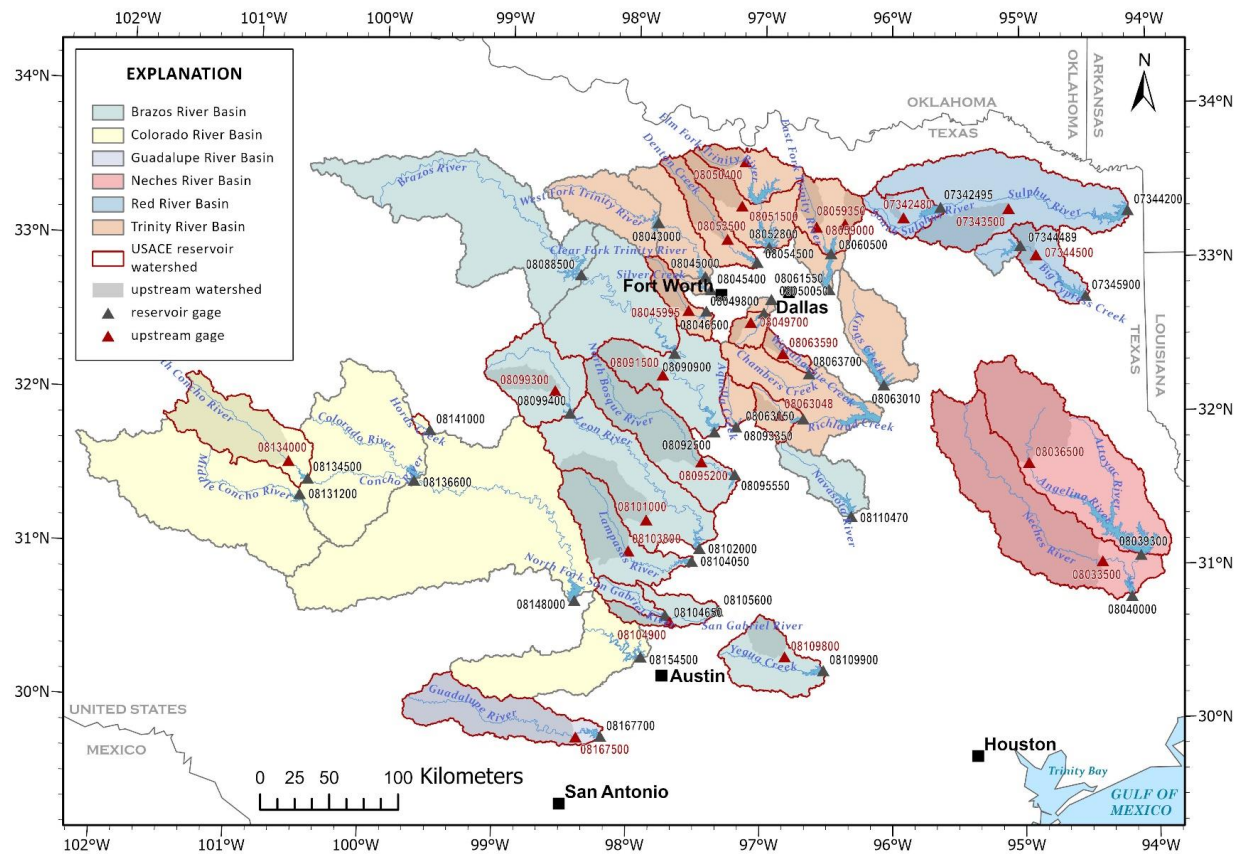


Trends – Number of events per year in which 2-day precipitation exceeds 5, 10, and 20-year return periods



Trends – Average and maximum number of days between events in which 2-day precipitation totals exceed 5, 10, and 20-year return periods

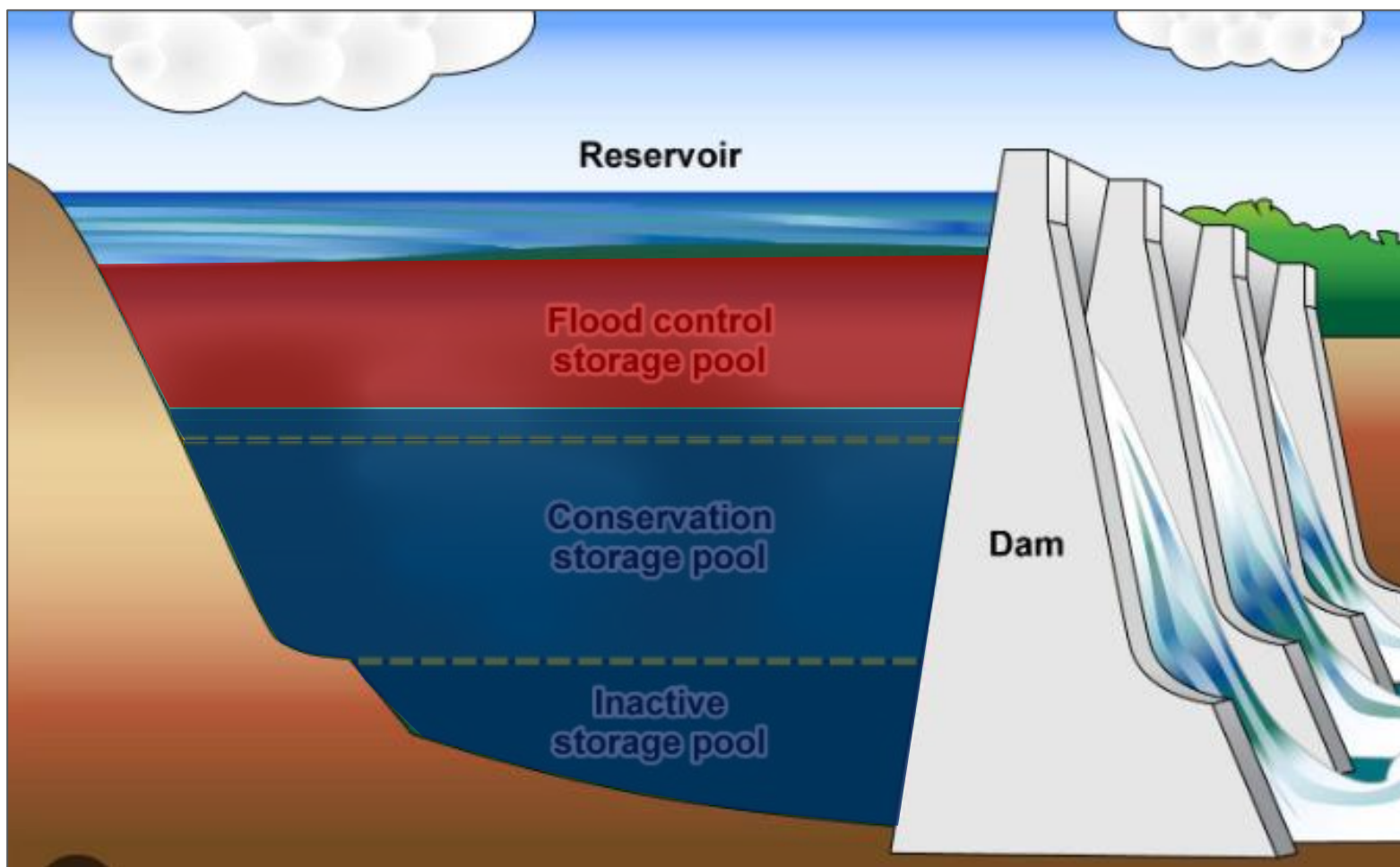




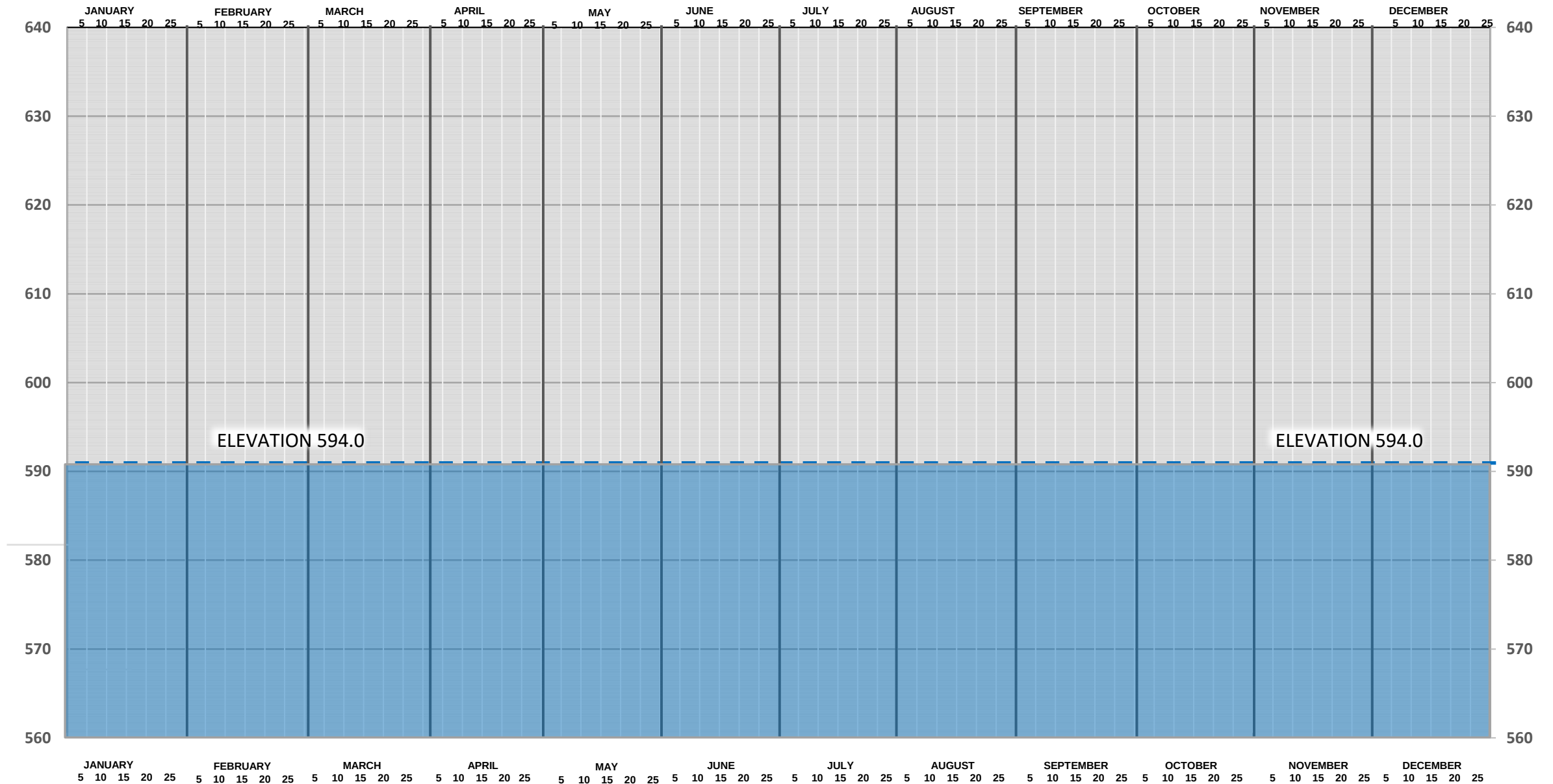
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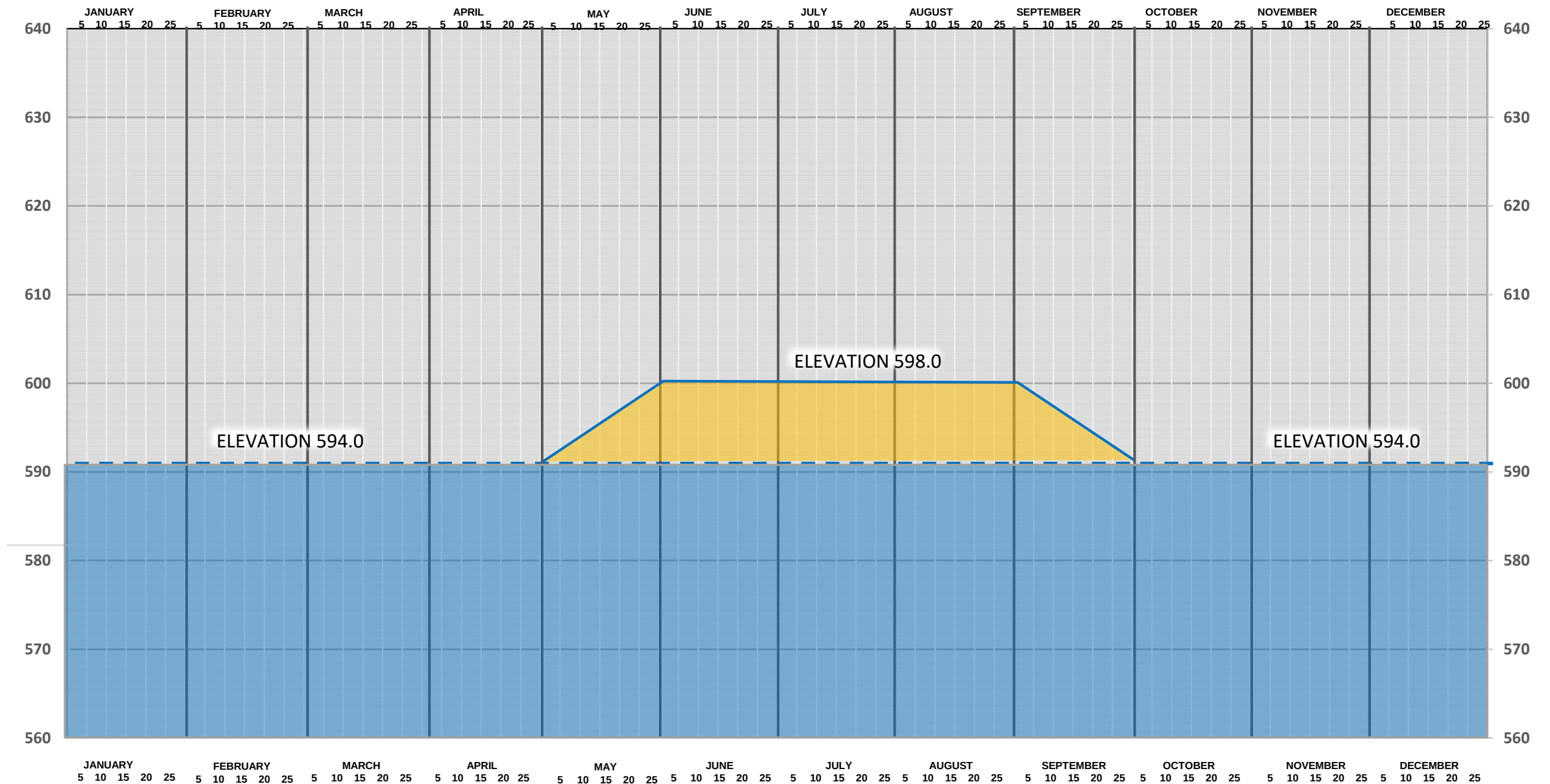
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FIRO Application



We have potential to retain an additional 12-15% of water supply



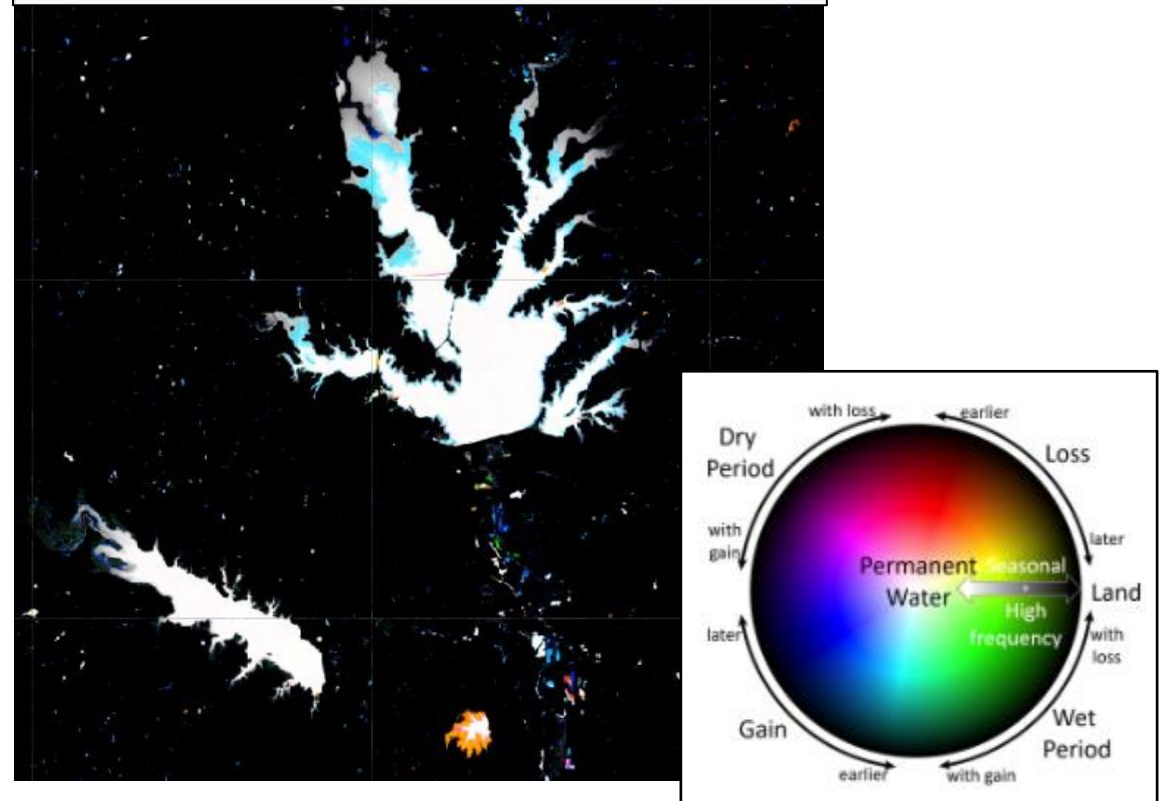


Phase II Scope

Implement machine learning to assess relationships between reservoir inflows and streamflow with various watershed attributes

1. Landcover
2. Vegetation
3. Drought
4. Geology
5. Surface water

GLAD global surface water dynamics 1999-2021



<https://glad.earthengine.app/view/surface-water-dynamics>