Mitigating Flood Hazards on Tribal Lands with Data Science

Draft

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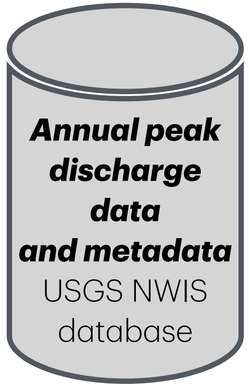
Problem statement

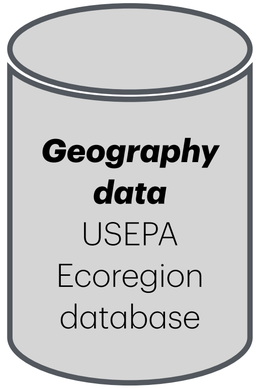
- Floods are natural hazards
- Human actions can intensify or mitigate the impacts of floods
- Floodplain designation, '*the 100 year floodplain*', reduces risks to lives and property
- Floodplains have not yet been designated for many Reservation communities
- My research aims are to:
  - 1) Develop a robust approach to estimate 100-year flood magnitudes by clustering streams with similar flood behaviors from across a wide geographic area
  - 2) Identify key drivers of flood behavior, such as elevation, climate, geography.

Analysis approach

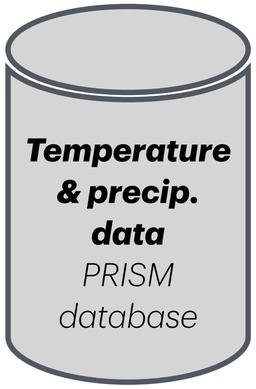
Import data



Annual peak discharge data and metadata
USGS NWIS database



Geography data
USEPA Ecoregion database



Temperature & precip. data
PRISM database

Clean data

Select High Plain & Great Plain Ecoregions

Remove regulated gages & gages with < 20 yr of record

Normalize peak discharge by watershed area

Calculate station skewness

Identify regions

Cluster station skewness - *Gaussian Mixture Model*

Select best fit model - *BIC*

Visualize groups - tSNE

Confirm groups - Silhouette Sc. & Cal-Har Index

Understand results

Identify key drivers - *Elastic Net regression*

Apply results

Calculate regional skewness

Determine 100-yr flood for gages of interest — White Clay Creek