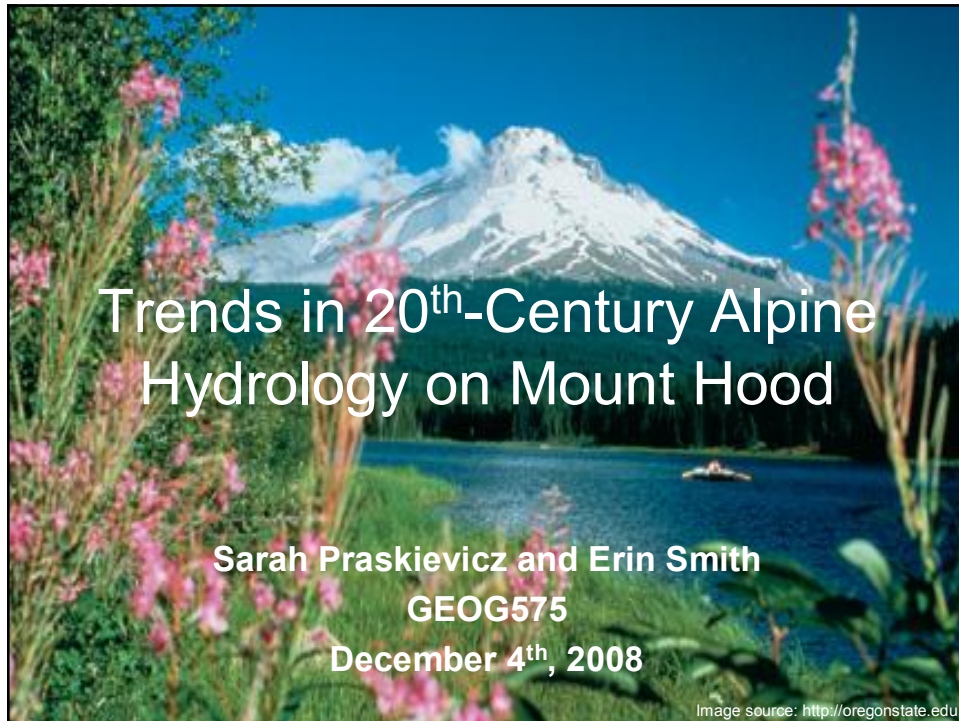


Outline

- Background
- Design objectives
- Data layer specifications and geographic extents
- Methods and techniques
- Intended applications
- Demonstration application
- Limitations and quality statements

Background

- Anthropogenic climate change is expected to affect water resources
- In PNW, reduction of snowpack is likely impact
- Changes in alpine hydrology have significant implications for regional water resources

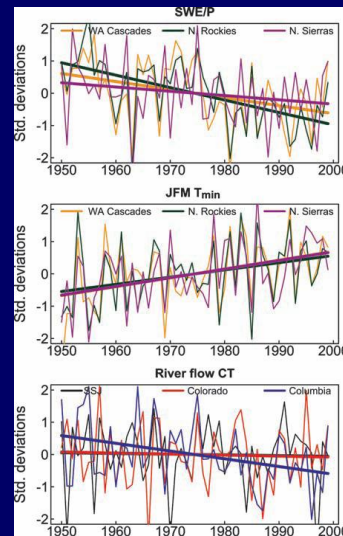
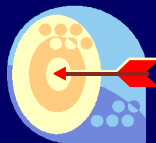
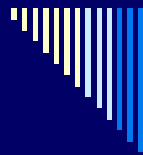


Image source: Barnett et al. 2008

Design Objectives

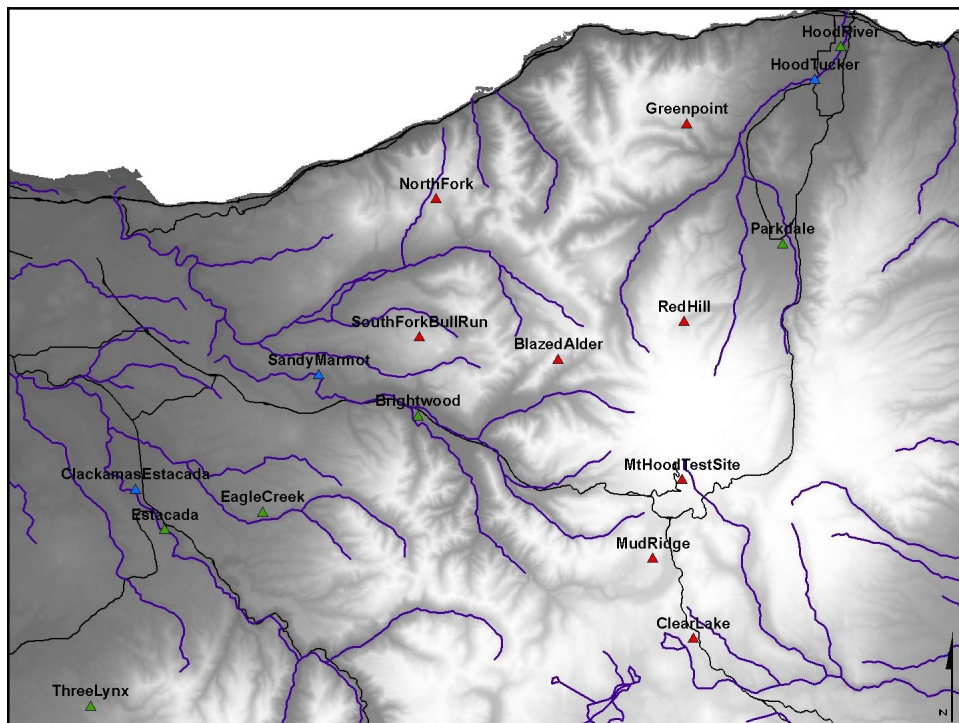
- Consolidate climatic and hydrological spatial and time series data for Mount Hood
- Facilitate querying and analysis of hydroclimatic data
- Enable more efficient statistical analysis of trends in alpine climate and hydrology





Data Layer Specifications and Geographic Extents

- Study area is Mount Hood (eastern Multnomah county, Clackamas and Hood River counties)
- GIS data layers:
 - Base cartography
 - Derived point layers of station locations
- Time series data:
 - Temperature, precipitation, snowfall (six WRCC sites, 1893-2008)
 - Snow-water equivalent (eight SNOTEL sites, 1973-2008)
 - Discharge on Clackamas, Sandy, and Hood Rivers (USGS, 1911-2008)

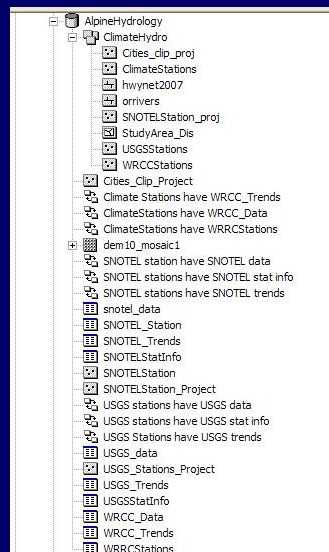


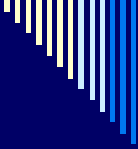
Methods and Techniques

- Created geodatabase and imported layers
- Derived point layers from station x-,y-coordinates
- Obtained and formatted climatic and hydrological data
- Built relationship classes to link spatial and time series data



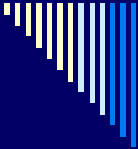
Final Database





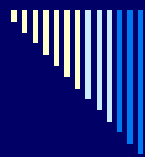
Intended Applications

- Facilitate statistical analysis of climate and hydrological data
- Provide estimates of intensity and rate of regional climate change
- Enable water resource managers to investigate hydrological patterns

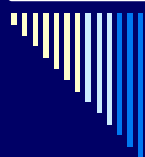
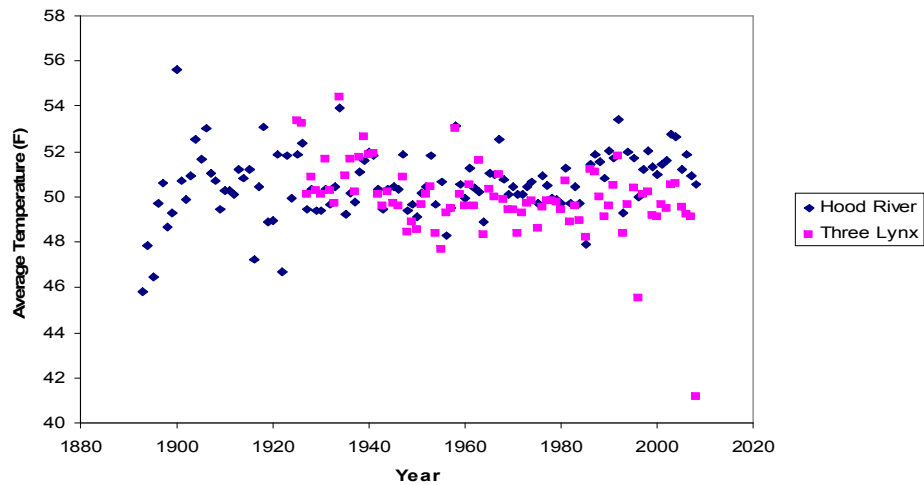


Demonstration Application

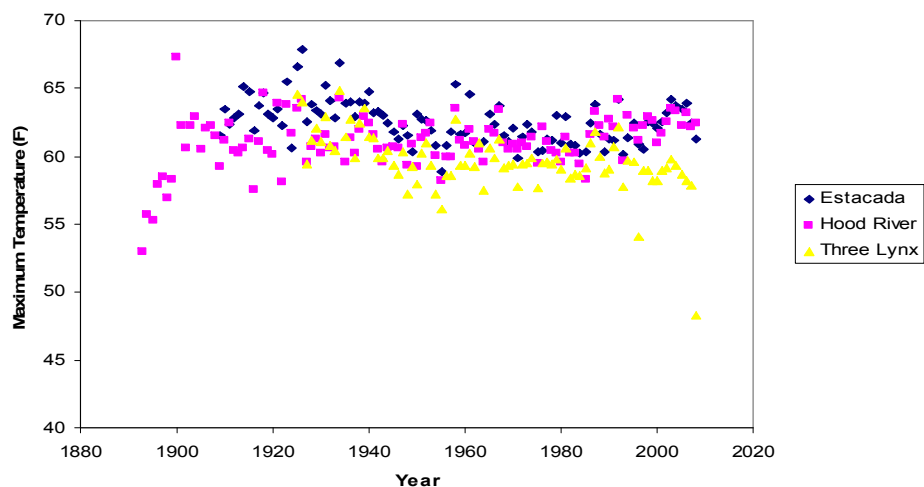
- Examined trends in three sets of hydroclimatic variables:
 - Basic climatology (WRCC)
 - Snow-water equivalent (SNOTEL)
 - River discharge (USGS)
- Lengths of time series varied
- Used Kendall's tau to assess significance

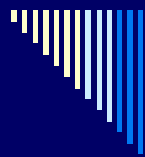


Average Annual Temperature

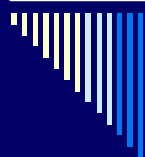
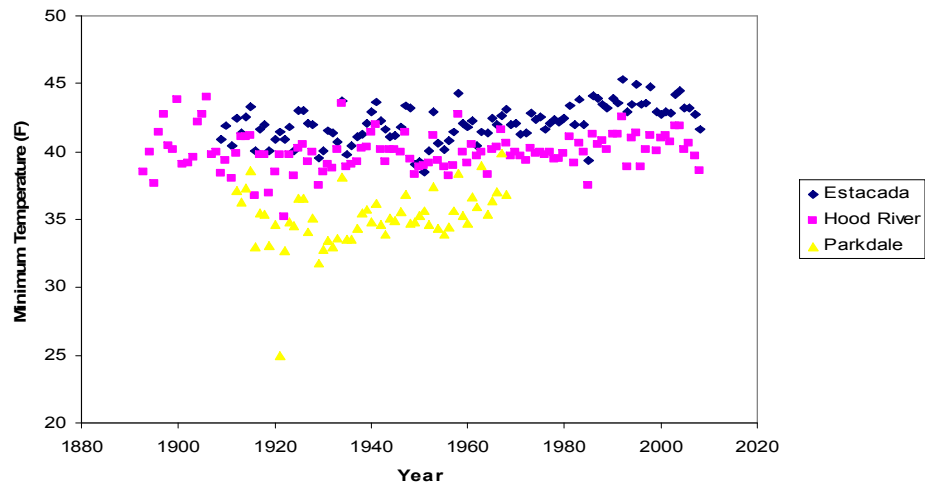


Maximum Annual Temperature

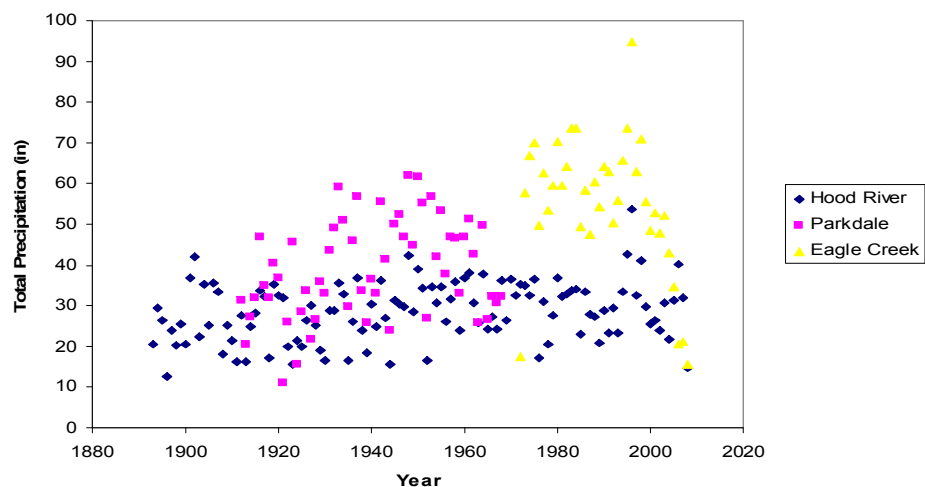


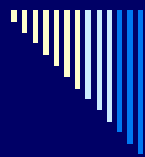


Minimum Annual Temperature

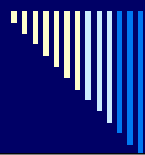
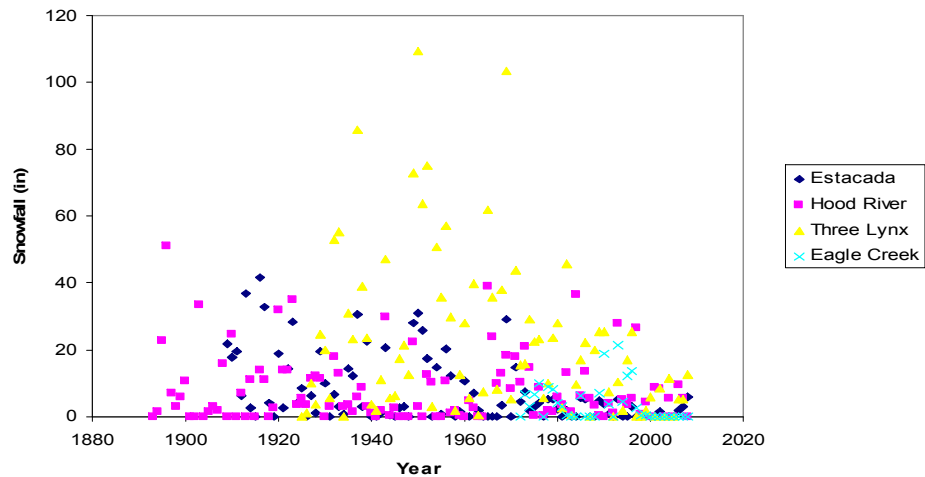


Total Annual Precipitation

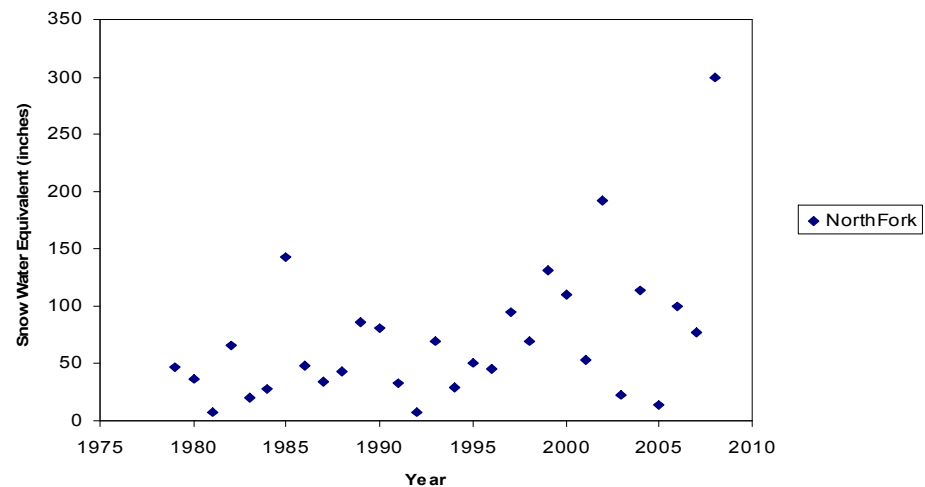


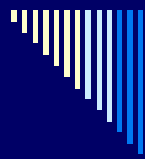


Total Annual Snowfall

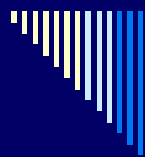
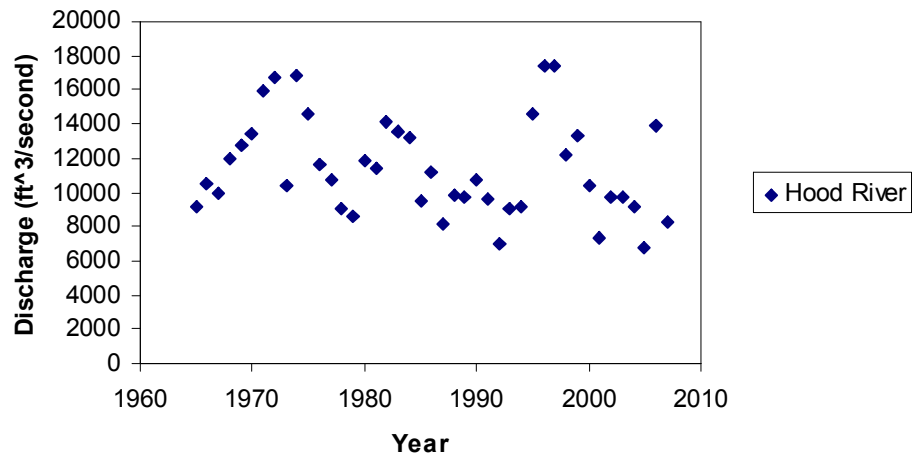


Average Snow-water Equivalent





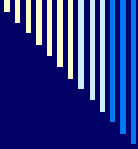
Average Stream Discharge



Limitations and Quality Statements

- Inclusion of data constrained by availability
- Significance of trends affected by start and end dates of time series
- Analysis is based solely on correlation and cannot make conclusions about causation





Questions?

References:

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