Synthesis of Hydrologic Data Reveals Rainfall-Runoff Relationships and Examines Watershed-Scale Changes

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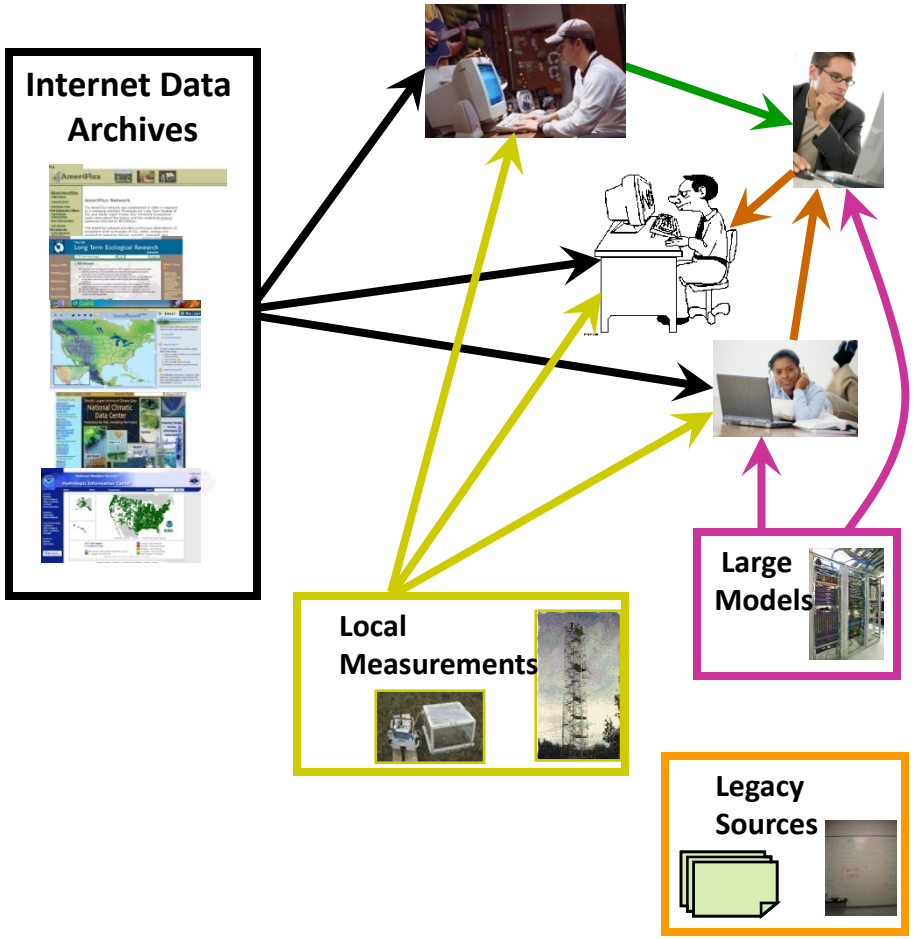
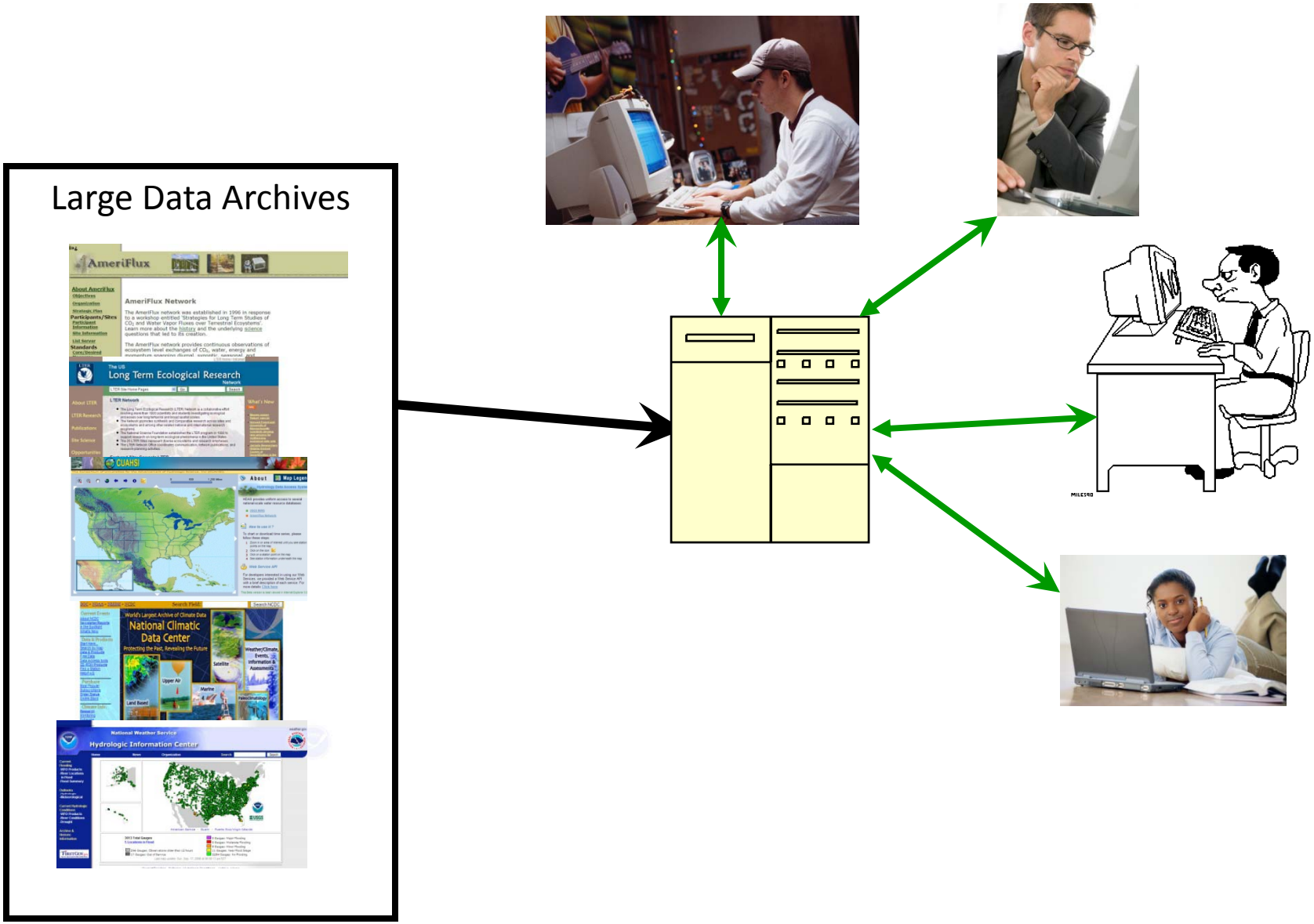
There is an Environmental Data Management Crisis

- Much data retrieved by each investigator individually
- Data corrections and updates applied
- Data are often scattered, across a wide array of locations
- Data not stored for archival purposes



Demonstrating a Hydrologic Data Server with USGS and NOAA Data



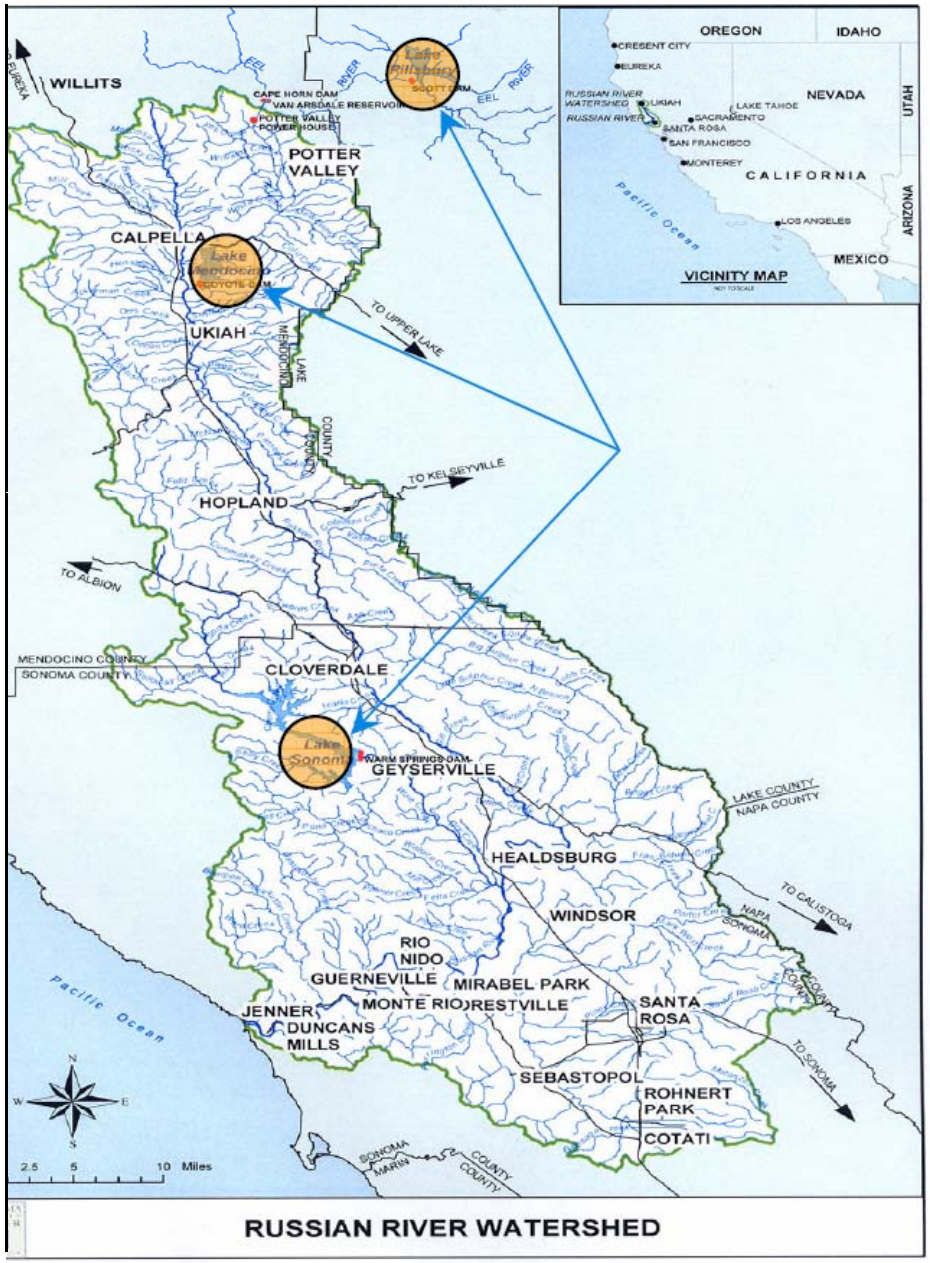
California Water Resources Management: largely self-contained but complex

Digital watershed project identified the Russian River watershed as initial focus

Water Resources Management in the Russian River Watershed

Participants in this effort include

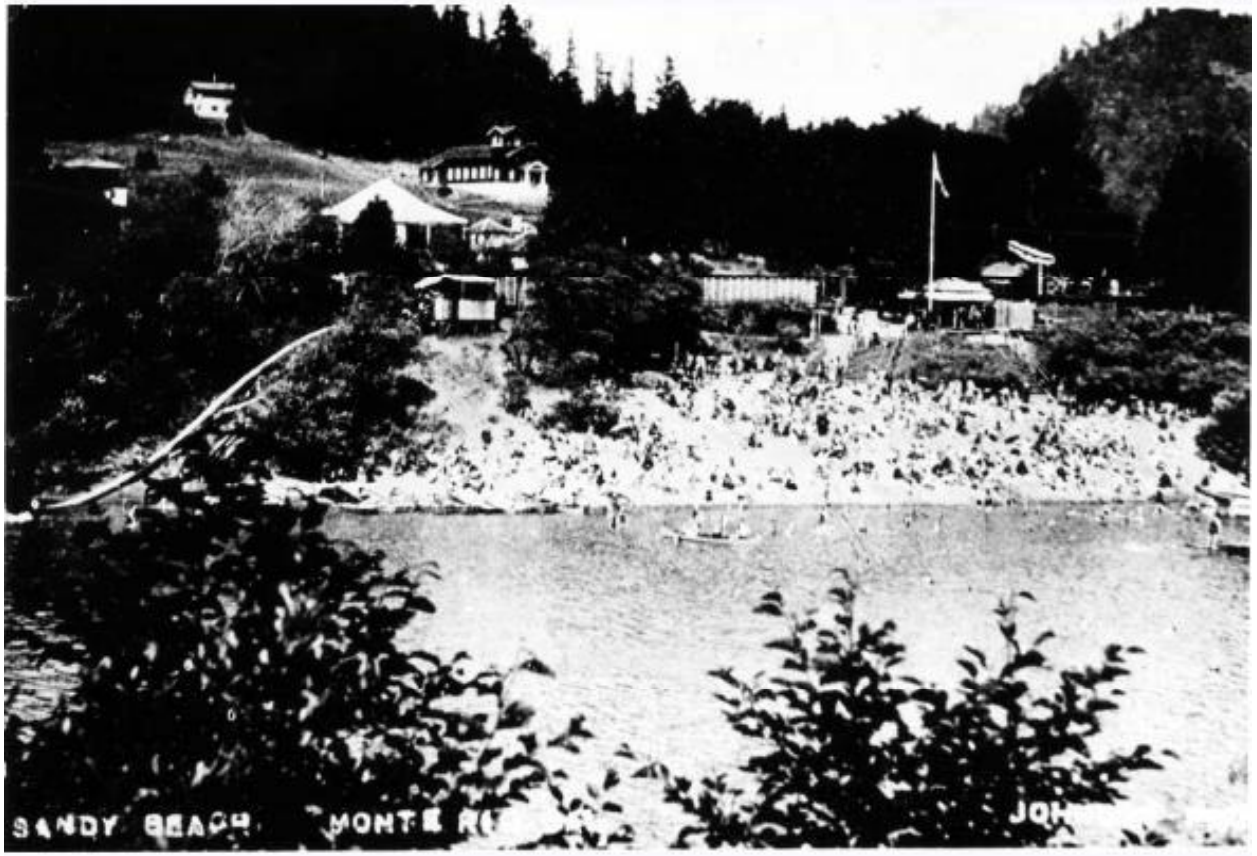
Sonoma County Water Agency
National Marine Fisheries Service



Russian River Upper Watershed (June)

West Fork Russian River, July

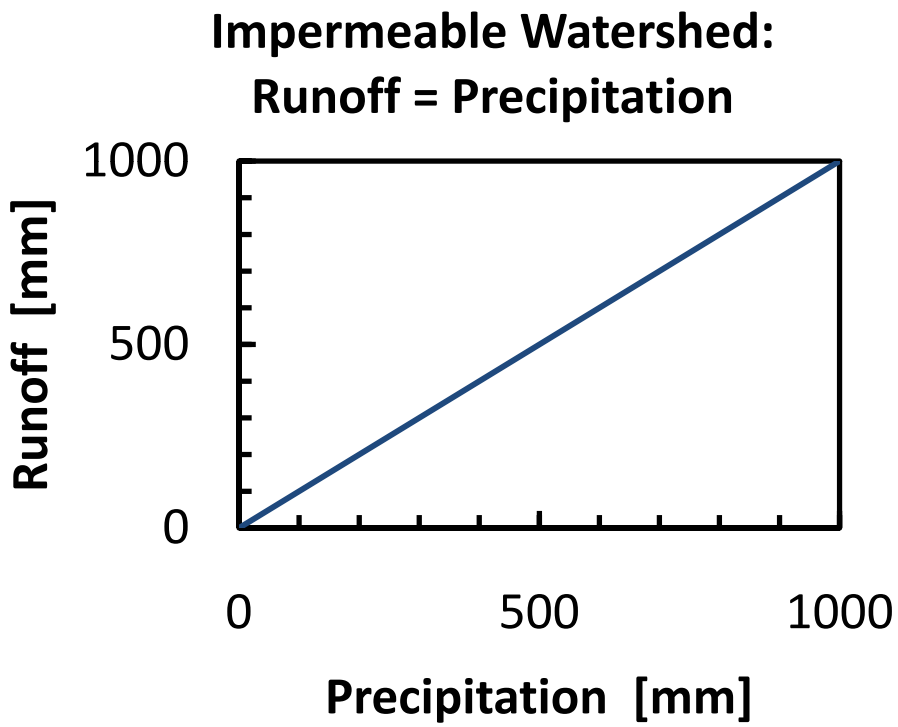
Waterslide, Sandy Beach, Russian River at Monte Rio, 1920

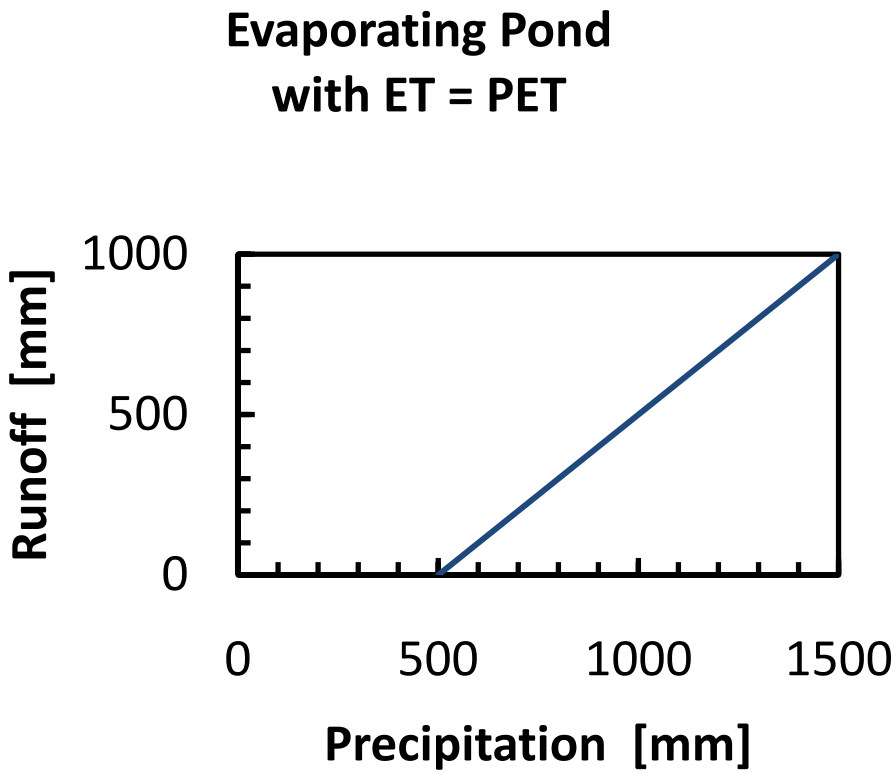


Inflatable Dam on Russian River

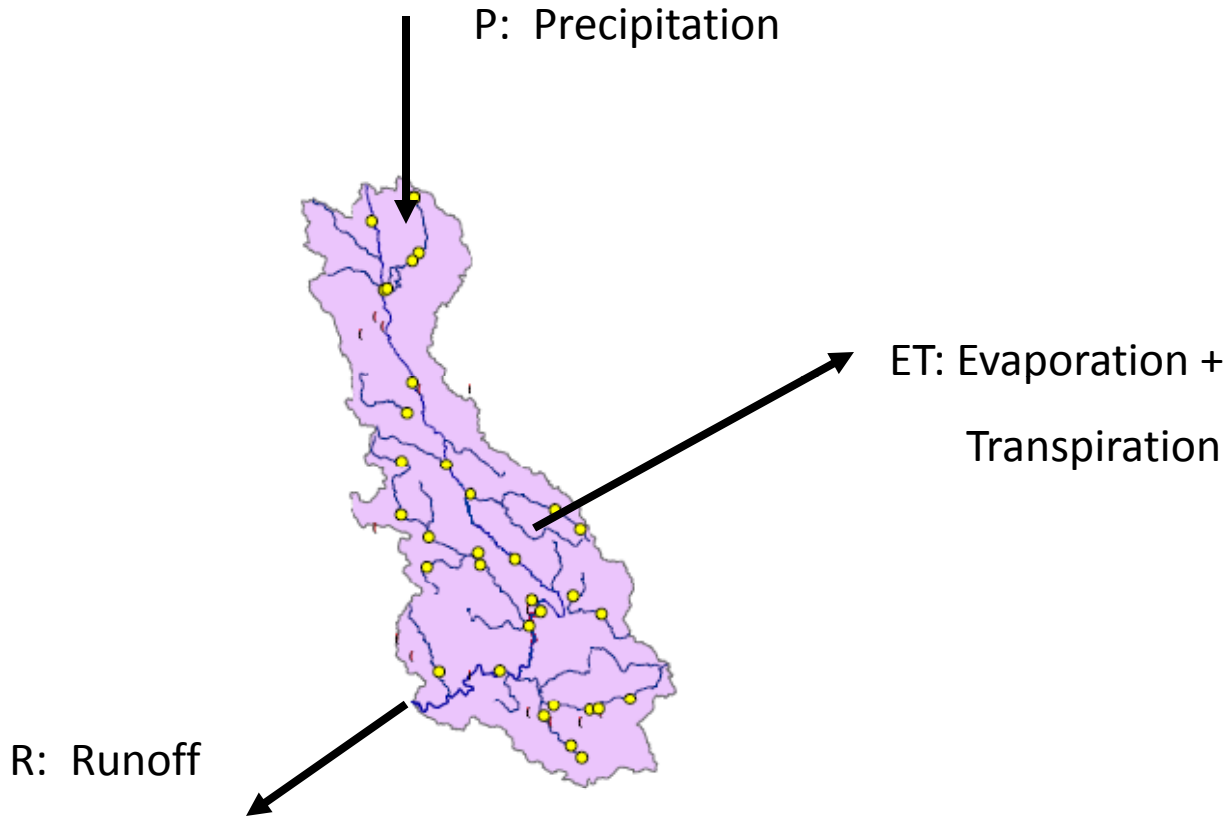
Water Resources Engineering Challenges in the Russian River Watershed

Idealized Annual Models for Watershed Runoff vs. Precipitation





Russian River Water Balance Model

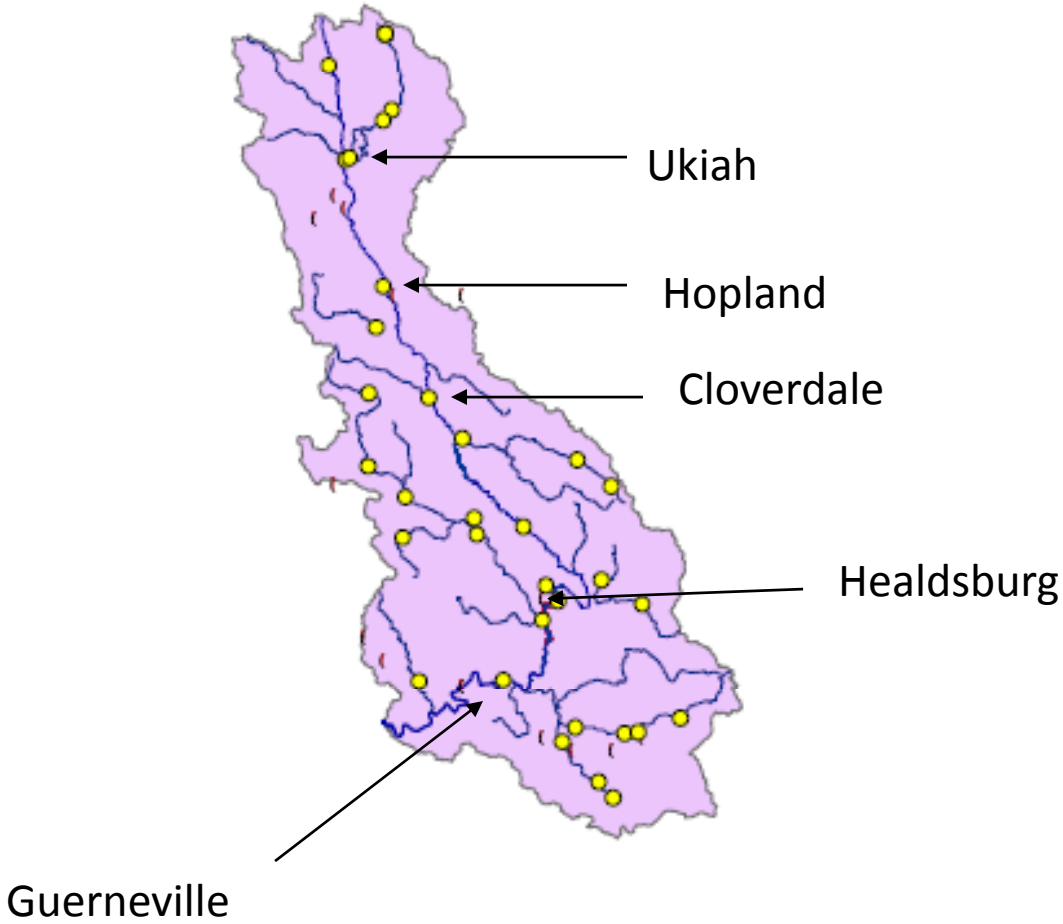


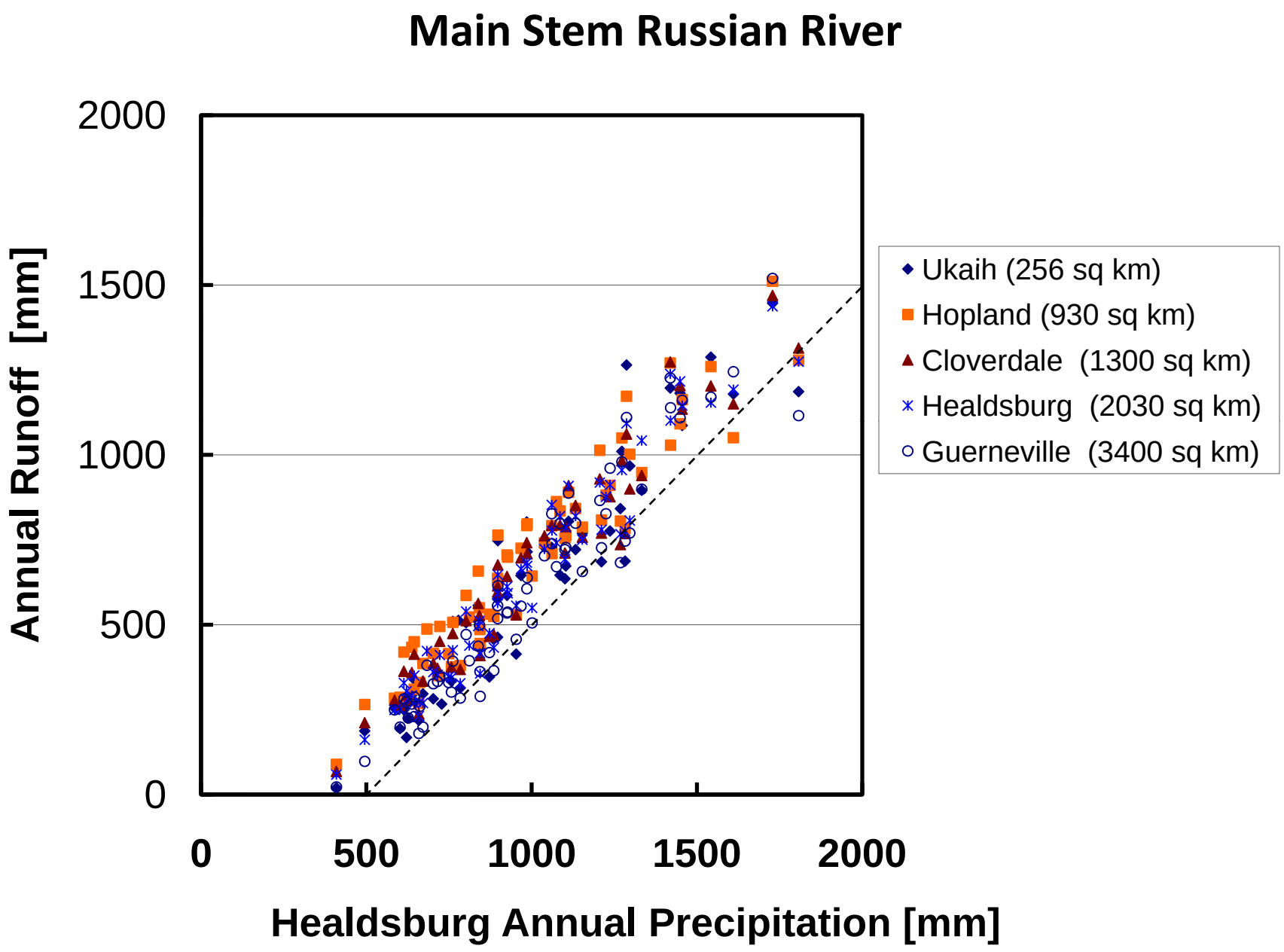
Water Balance: $P = R + ET + \Delta S$

Annual Water Balance: $\Delta S \approx 0$

Main Stem Russian River Gauging Stations

Each Has 60+ Years of Daily Flow Data

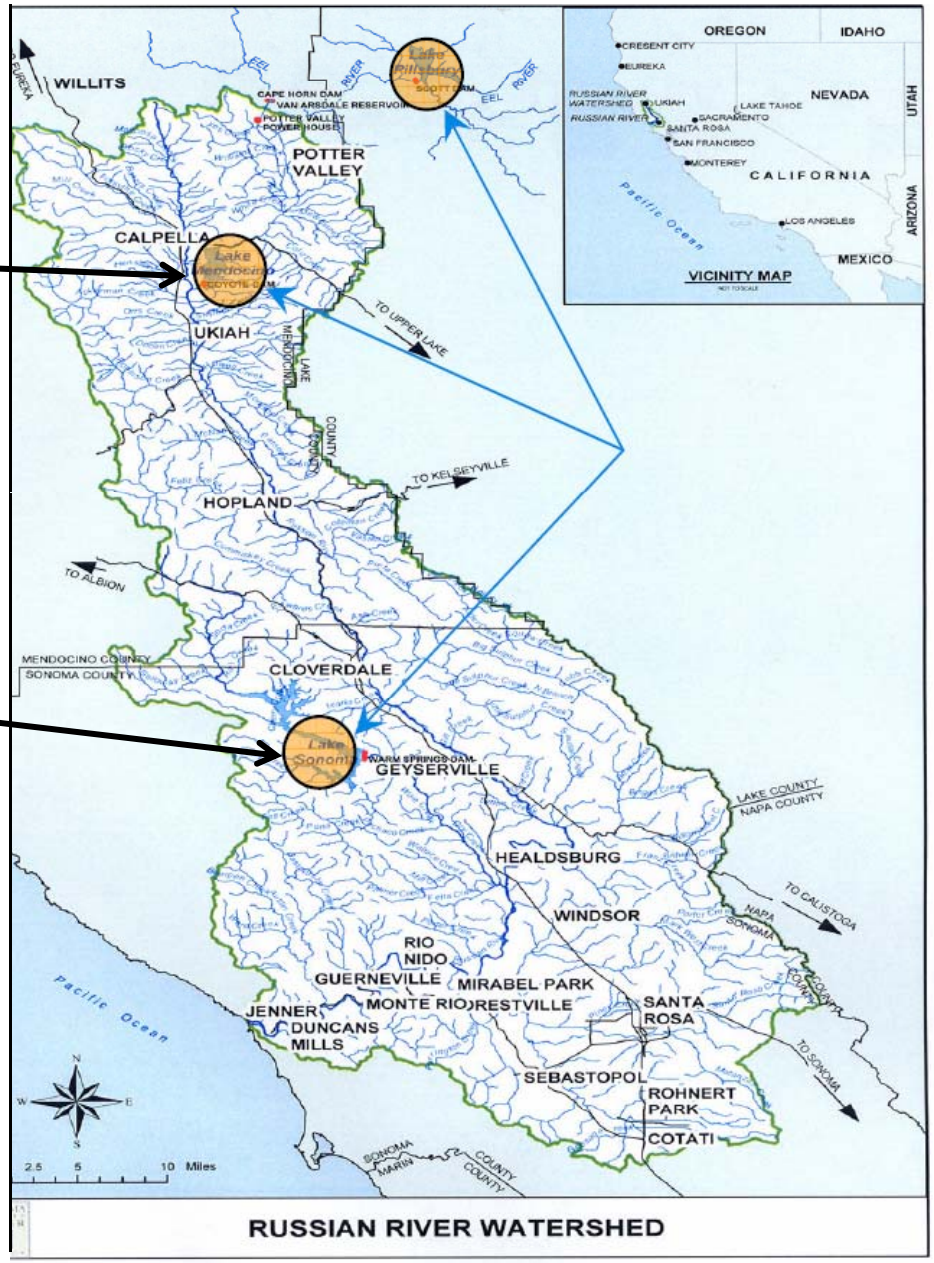


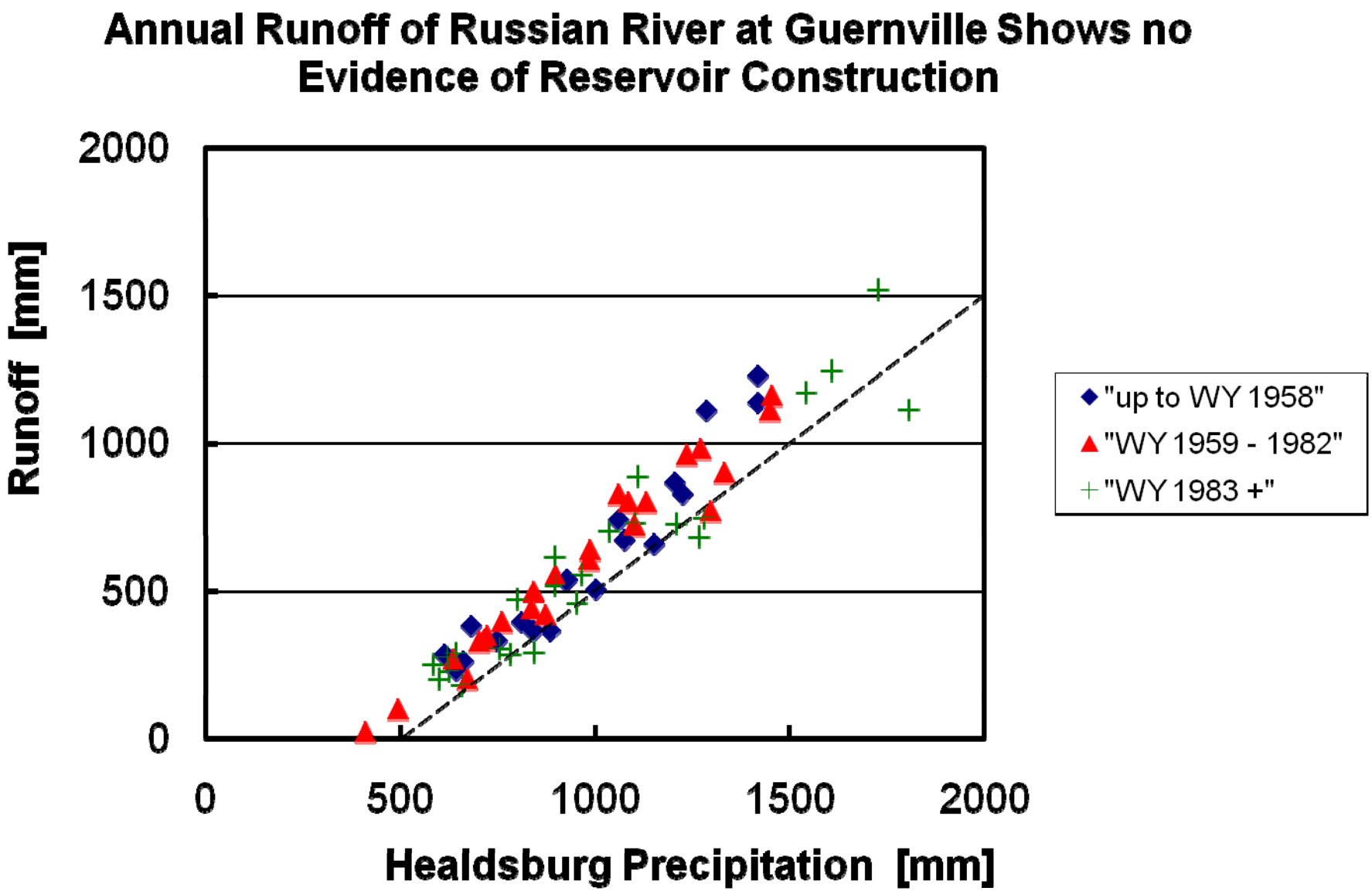

Main Stem Russian River
Annual Runoff [mm]
2000
1500
1000
500
0
0
500
1000
1500
2000
Healdsburg Annual Precipitation [mm]
Ukaih (256 sq km)
Hopland (930 sq km)
Cloverdale (1300 sq km)
Healdsburg (2030 sq km)
Guerneville (3400 sq km)

Water Resources Development in the Russian River Watershed

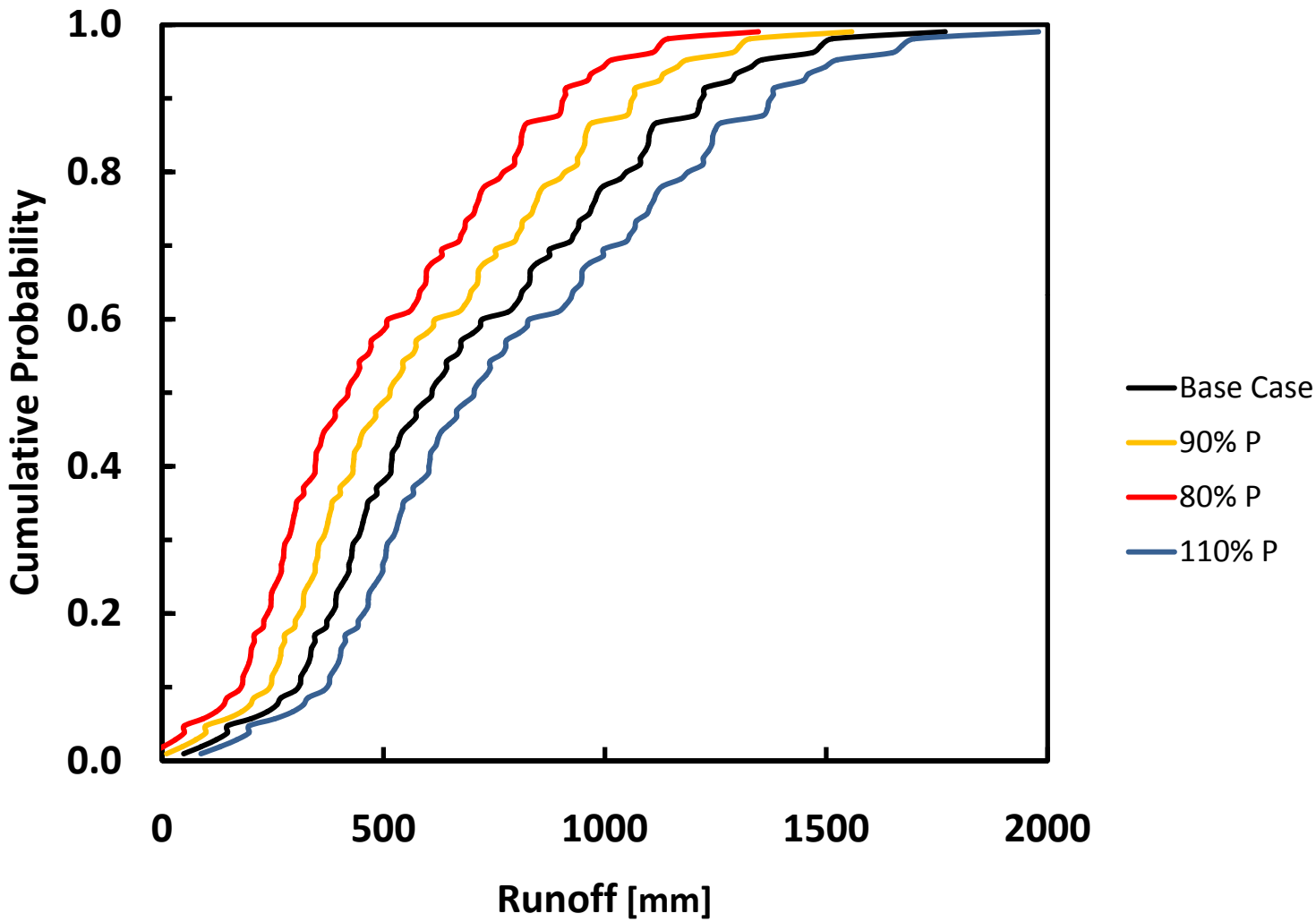
Lake Mendocino, 1958

Lake Sonoma, 1983




Annual Runoff of Russian River at Guernville Shows no Evidence of Reservoir Construction
Runoff [mm]
2000
1500
1000
500
0
0
500
1000
1500
2000
Healdsburg Precipitation [mm]
"up to WY 1958"
"WY 1959 - 1982"
"WY 1983 +"

Russian River Response to Changes in Precipitation based on 108 Years of Precipitation Data from Healdsburg



Summary

- Massive amounts of data exist but access requires computational tools as challenging as numerical methods for solving partial differential equations
- Mining historical data is essential when coupled with process level descriptions.
- Continuing work is examining
    - additional watersheds within California,
    - fine scale features of sediment transport (Rebecca Leonardson),
    - stream temperature dynamics.