Predicting Landscape Hydrology Through the Scaling of Watershed Data

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Support:
Microsoft Research
UC CITRIS (Center for Information Technology Research in the Interest of Society)
DoD NDSEG Fellowship
Landscape Complexity at Multiple Scales:
Dry Creek, Russian River Watershed, Northern California
Data Analysis: Annual Water Balance Model

Water Balance: \[ P = R + ET + \Delta S \]

Annual Water Balance: for \( \Delta S \approx 0 \) \[ R = P - ET \]
Observed Annual Runoff of Napa River near Napa, CA using St. Helena Precipitation over the period 1940 - 2006

Watershed ET Capacity of 500 mm
Russian River Watershed is Rich in Flow Monitoring Data, but not Data Accessibility
Annual Water Balance for Russian River Gauges

![Graph showing the annual water balance for Russian River gauges. The graph plots runoff against Healdsburg precipitation. Different markers represent data from Ukiah (256 sq km), Hopland (930 sq km), Cloverdale (1300 sq km), Healdsburg (2030 sq km), and Guerneville (3400 sq km). A dashed line indicates ET = 400 mm.]
Spatial Variability of Precipitation using Oregon State University PRISM: Average Annual Precipitation over Napa River Watershed at 4 by 4 km Grid
Fitted ET Parameter from Automated Analysis of over 220 Unimpaired CA Watersheds
Test of $R = P - ET$ model for over 220 Unimpaired CA Watersheds
Fitted ET Parameter has Unexpected Spatial Variability. There is a Possible Bias in Precipitation Estimates.
Progress Thus Far

• Access to environmental data on the web made analysis of 1 watershed tedious, but suggestive.
• Datacube access to integrated environmental data demonstrated spatial scaling.
• Cloud computing was required to test generalization at hundreds of watersheds.
• Demonstrated that watershed hydrology need not be restricted to $n = 1$. 