Using our Over-Sampled Environments to Design Efficient Monitoring Programs
QUANTIFYING UNCERTAINTY IN ECOSYSTEM STUDIES

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Acknowledge

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Characterizing Environmental Variability

![Histogram showing environmental variability with frequency on the y-axis and values of X on the x-axis.](chart.png)
Over-Sampled Environments

• Often research sites…

In order to conduct research, we need many observations. In the monitoring world, this is too many observations, which is useful.
How many rain gauges are needed to characterize inputs to a watershed?
Median Annual Precipitation

1974

1981

2004
What is optimal water sampling frequency to characterize extremes?
Road salt pollution can impair aquatic ecosystems. How large are the salt peaks they experience?
Actual Variability
52 Random Samples
More than 2 samples per day
How many plots should be sampled to report forest biomass with known confidence?
Data sets used in analysis:
• Hubbard Brook Watershed 6, where every tree is measured on each of 208 plots (each 25m x 25 m) every 5 years. We used data from 2002.

Analytical approach:
• We randomly selected subsets of plots and reported uncertainty in the estimates of forest biomass.
The range in elevation is 550-700 m, with significant vegetation change. Biomass equations were developed for three elevational bands. We used these three bands as strata when subsampling.
How can these ideas be applied now?
Update the histogram as new observations become available.
Conclusions

• We need to be using our heavily sampled environments to quantify information saturation.

• Subsampling approaches can produce new insights into monitoring efficiency.

• Running mean and running percentile approaches can help identify information stability.
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