Case Study 6: MPCA

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Summary

- Client: Minnesota Pollution Control Agency
- 40 year program to measure water clarity
- Their project is essentially a PR piece for an internal public: they want to reward volunteers for their involvement
- And since they're doing the work anyway, they might as well do some comparisons among streams within watersheds and among watersheds.

First, what methods of inference could you use for investigating trends in individual systems?

- De-trending algorithm
- ARIMA, SARIMA, or sin/cosine curves
- Fourier or Wavelet analysis
- Locfit, or multiple polynomial fit
- Derivative of the locfit

Second, what methods of inference could you use for investigating overall trends in the various watersheds?

- Determine how you are going to combine scores from multiple streams (simple or weighted average)
- Use any of the methods for individual streams
- Use a dynamic linear model with time as the predictor and check for a Box-Cox transformation
- Compare multiple watersheds with a Tukey HSD test

Third, how would you report the results in a way the public would understand?

- Write a summary for each watershed to be included in the report
- Include a watershed graph with all stream or quantiles
- Include a map
- Show a time series plot with locfit regression and its derivative

Fourth, what kinds of graphical displays might you suggest for their reports?

- Time series plot
- Locfit and derivative
- Comparative graph with all streams or quantiles
- A map
- Longitudinal data analysis graph
- Some graphic explaining: What is clean?

Additional questions for the client

- Need to discuss best methods for dealing with censored or missing data.

- Is there some order to which streams were monitored first?

- Are we looking at equal distances from the source?

- Are we taking multiple samples from the same stream at different locations?

- Is clear water really clean water?