



STAT 880 I

Case Study 6: MPCA

Zhou, Joel, Sarah, Matt, Lindsey, Chris H

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Recap of the situation



- Volunteers measure the clarity of streams by collecting water in a tube and noting how far down the tube they can see.
- The clarity varies by season and by stage (how high the water level is).
- The agency wants to know how the clarity in each stream has changed and what is the overall trend in the watershed.



Questions for the client



- Did each volunteer collect the data at the same spot?
- Does every volunteer have the same standard to determine water clarity?
- When did they collect the data?
 - Which time period of a day?
 - How often did they collect the data (equally spaced)?
- The number of measurements varies both by the volunteer and by the year. How large is the variance?
- Are there any replicates? Did each volunteer measure a different stream?
- What did they do if the depth of stream is less than 100 cm?
- Are there any other related information, like rainfall, population density.
- How to define watershed?

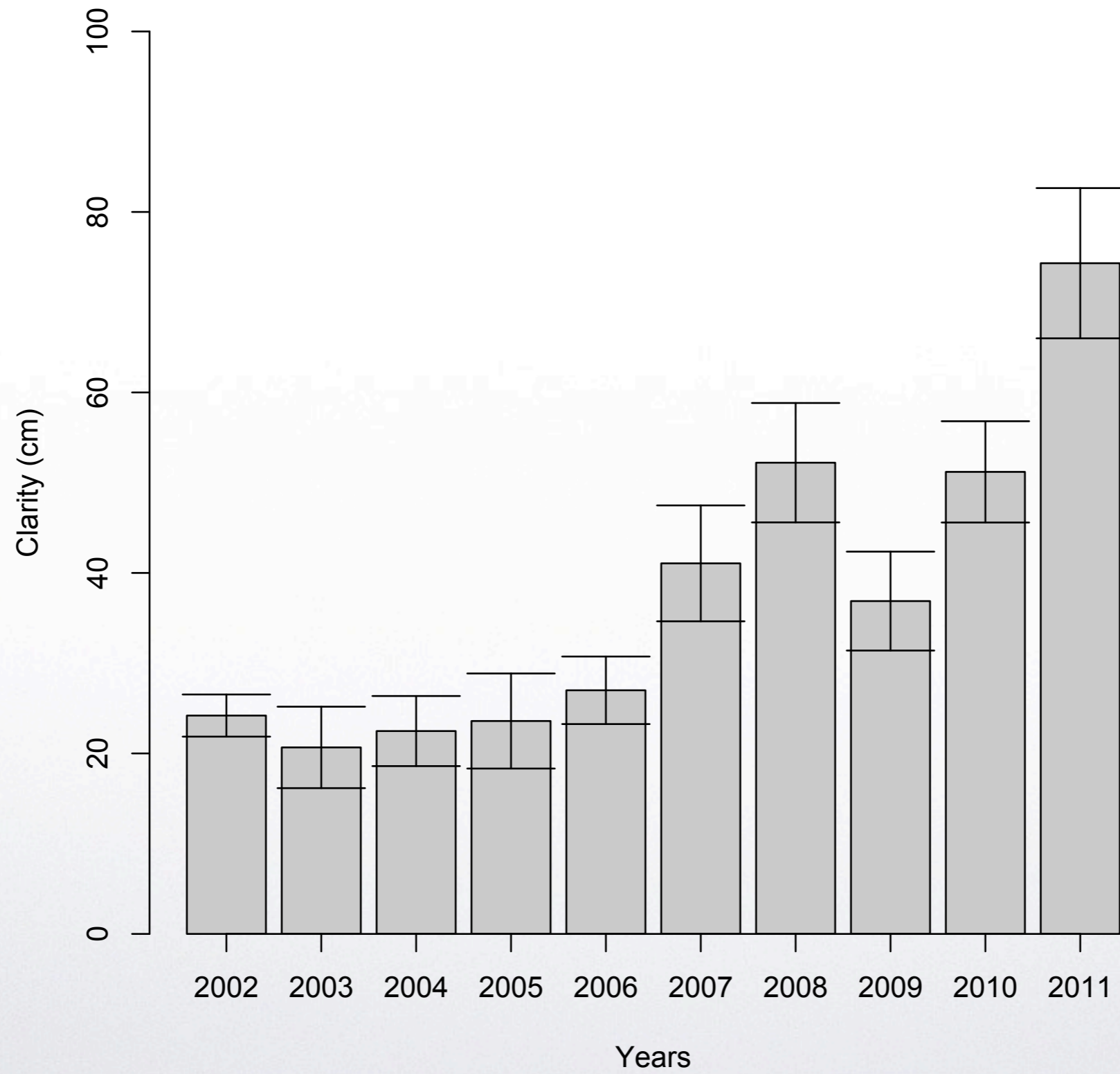


They got longer tubes (100 cm) five years ago, so the censoring was no longer 60 cm. How to deal with the difference of the censoring?

- For the data collected by the longer tube, we can treat the clarity between 60~100 cm as 60 cm.
- Analyze the data collected by the 60 cm tube and by the 100 cm tube separately.

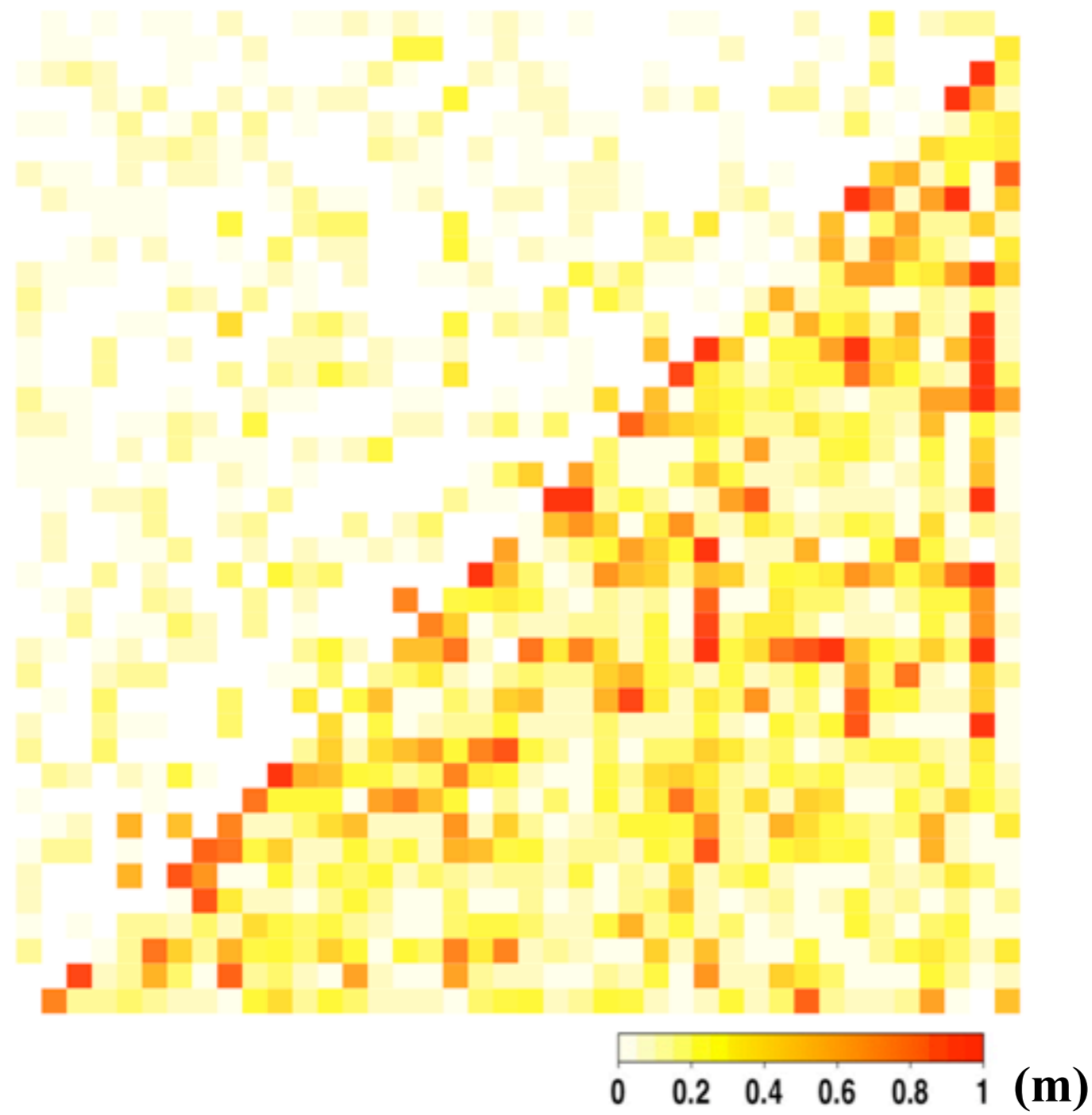


Graphical displays





Graphical displays





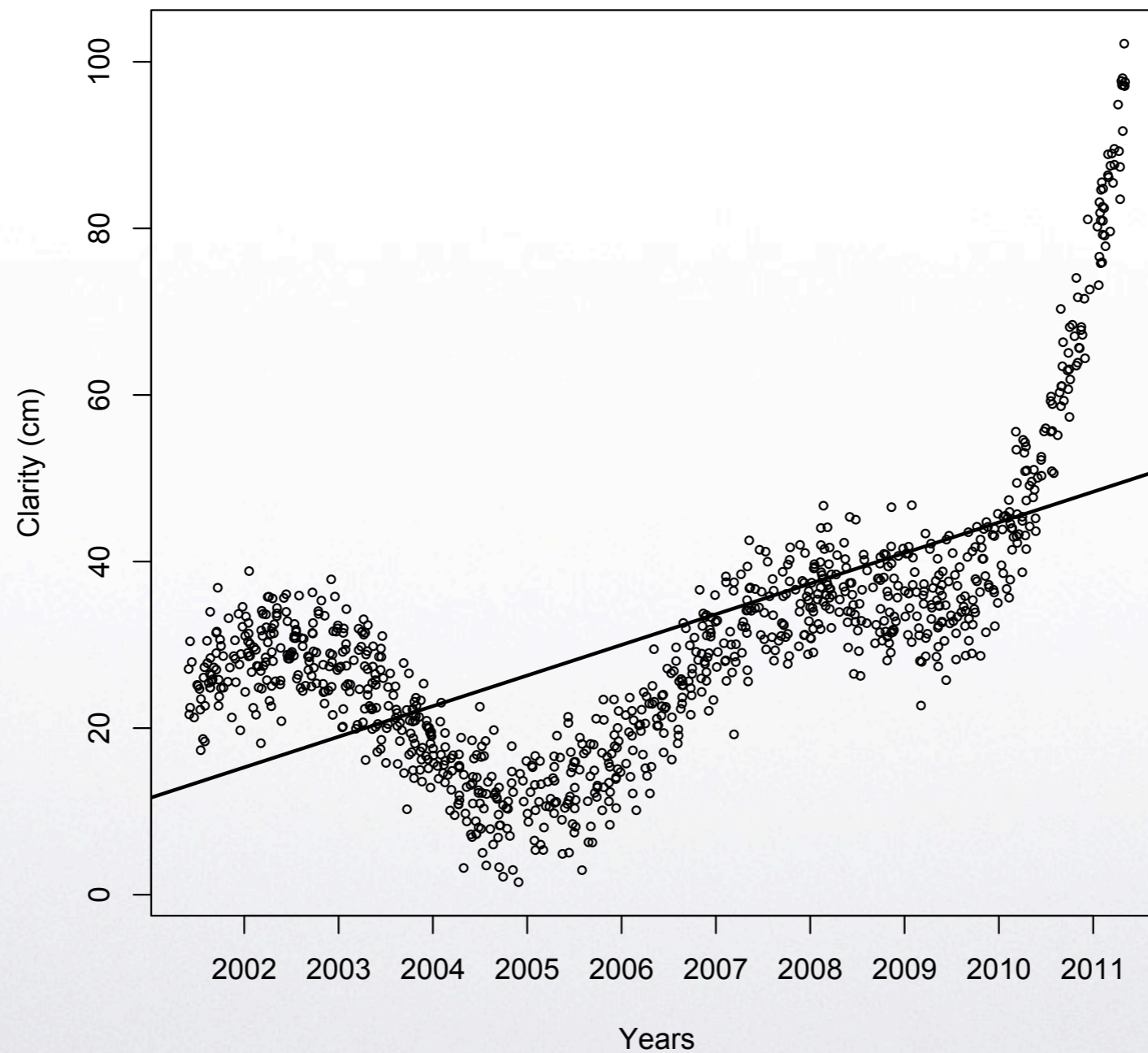
- Use ANOVA to test whether there is significant difference in clarity among all years based on the data collected by one volunteer with seasons and stages as fixed effects.
- We can also do pairwise comparison of the clarity between every two years to determine the trend using R function “pairwise” in library(Stat5303).



Data analysis



- We can also test whether or not there is a linear trend by fitting a regression line.

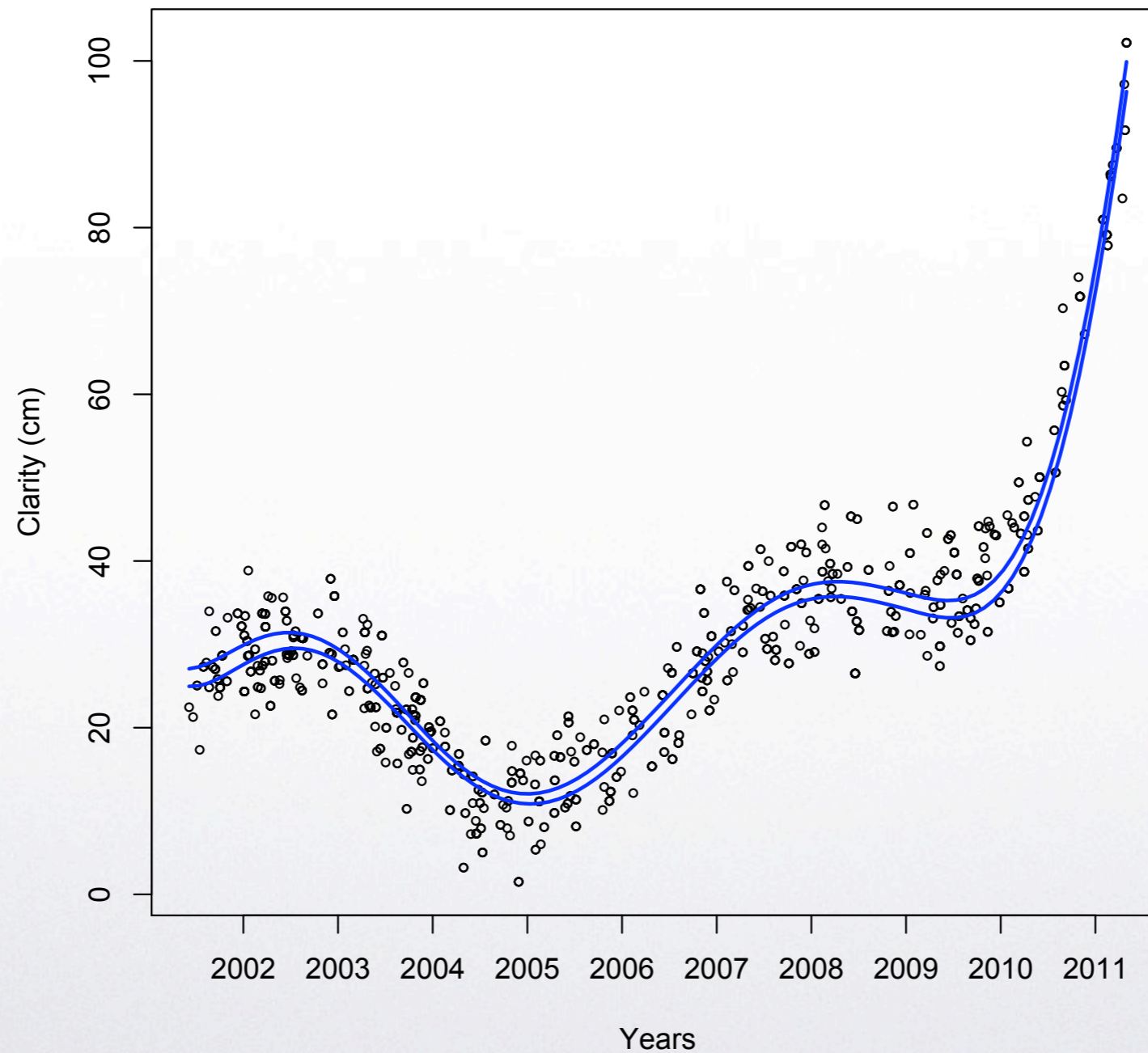




Data analysis



- We can also use nonparametric method to fit a local polynomial and construct its confidence band. We can make prediction for parameters of a time series.





Data analysis



- How each stream compares with others in the same watershed and if there is an overall trend in the watershed?
- Use ANOVA to test whether the stream effect is significant or not and which stream is most significant different from others.
- Plot the mean clarity of all streams in the same watershed at the same time period and see whether there is a trend.
- Rank correlation
- If the sample size at the same period is very different, we can do normalization.
- Because some volunteers have been doing this for only five years while some volunteers as long as 40 years, we can estimate the trend separately for experienced and inexperienced volunteers.