What Types of Correlations are there between Precipitation, E. coli, Phosphorus, and Total Suspended Solids in the 2011 Sampling Period?

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Background

After the June 2011 training in Vermont, Team Poughkeepsie found interest in the effects of precipitation on the three stream sampling protocols. Data was compiled during a season of many flood watches and Hurricane Irene on August 27, 2011.

Correlations Found

Precipitation/E. coli

Studies show E. coli will increase with an increase in precipitation. The August 27th date of Hurricane Irene indicates 4 of the 12 streams had a increase in E. coli. Each stream shows independent results that depend on local environmental factors.

Precipitation/Phosphorous

An increase in phosphorous found in streams is correlated to the runoff from rain. We may suspect that after a significant amount of rainfall, there might be an increase in the level of phosphorous. Following the August 27th date, 5 out of 12 streams had an increase in phosphorous. This indicates the results may also be driven by local environmental factors.

Precipitation/Total Suspended Solids

An increase in total suspended solids found in streams is also correlated to the runoff from rain. We suspected that after a significant amount of rainfall, there may be an increase in the level of TSS. The August 27th date shows 6 out of 12 streams had an increase in TSS. This also shows the results depend on local environmental factors.

Procedure

NOAA Weather stations were located near each site selected.

Excel Spreadsheets were compiled with:
- Days of the sampling season
- Precipitation per day
- Reported sampling results

Averages calculated for:
- E.coli
- Total Phosphorous
- Total Suspended Solids

Averages of replicates used to compile graphs.

Other Conclusions

After August 27th, HRD_Falkill_213 had its only significant spike of E. coli. This indicates a runoff due to the precipitation. Levels reached 1566 MPN /100ml.

HRD_Falkill_213 and HRD_IndKill_49 have significantly higher E. coli concentrations than any other site. This far exceeds the Class AA type water quality standard of 240 MPN /100ml.*

HRD_IndKill_49 has E. coli and TSS concentrations that fluctuate throughout the sampling season.

After many consecutive rainfalls, PSR_MRTribA_1232 showed a sharp increase in E. coli levels toward the end of the sampling season.

On the 45th day of sampling, there is a sharp increase in E.Coli and TSS, following 1.2 inches of precipitation in WR_Goldbrk_952.

Following Hurricane Irene, there is a sharp increase in all 3 protocols of WR_Jugbrk_1128.

WR_WRTribA_1069 shows to have consecutively high levels of TSS. Could be associated with the area the stream is located.

References

Karoline Rios, Estimating E. coli concentration in Agricultural Area at Potash Brook in Burlington, Vermont
http://www.uvm.edu/~streams/PDFFiles/symposium_projects/posters/Poster_Rios_Karoline_2010.pdf

Neil Gillies, Why it's so hard to study non point source pollution
http://www.cacaponinstitute.org/PHSWR%20BookshelF/studying_nps.htm

Department of Environmental Conservation Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations
http://www.dec.ny.gov/regs/4590.html