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Storm Effects

The Correlation of Storm Duration and Intensity to Phosphate Levels In the Upper Missisquoi River

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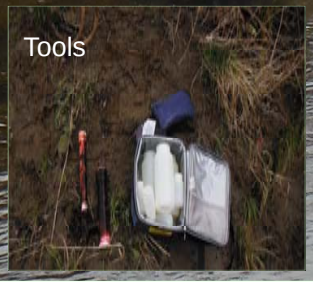
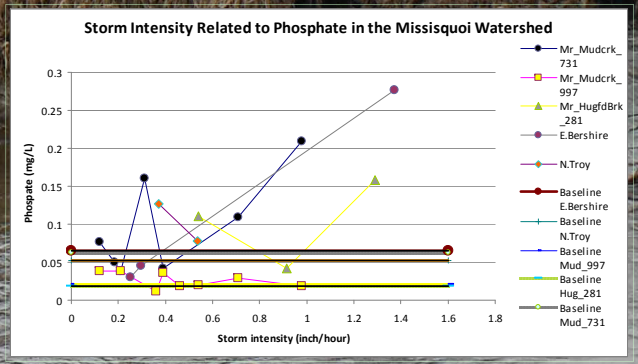
Study Question

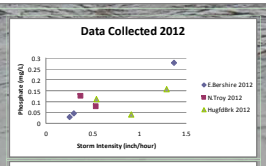
Is there a relationship between storm duration and intensity to phosphate levels in the upper Missisquoi River?

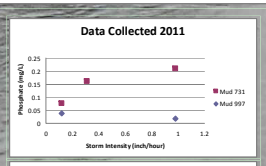
Introduction

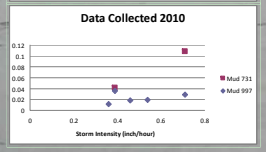
One result of increased CO_2 levels in the earth's atmosphere may be an increase in storm intensity and duration. (Curry, J., Mar. 2006). Phosphate, a macronutrient, is a limiting factor in aquatic plant growth. Excess phosphates in fresh waterways can cause eutrophication and phytoplankton production. (Daniel, et al., 1998) Phosphate loading to rivers and streams occurs during rain events. "Missisquoi Bay located in the northern part of Lake Champlain has elevated phosphorus levels and has had a series of algae blooms". (Lake Champlain Basin Program, 2012) We looked to see if there was a change in phosphate levels relative to storm duration and intensity. We identified a storm as weather data showing at least .1" of precipitation on the preceding day of phosphate collection.

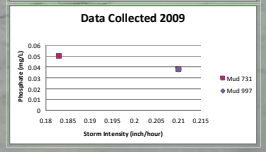


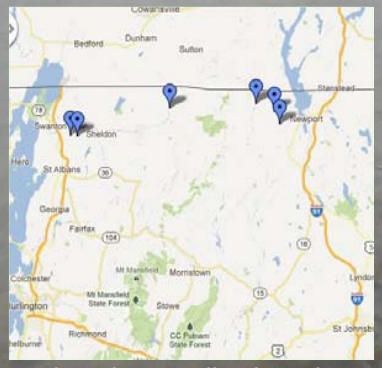












Phosphate Collection Sites

Methods

- Phosphate data came from water samples collected at various times then lab tested for phosphate and nitrogen.
- Samples were collected from six different stream sites.
- Two sites are managed by USGS, MR_MREBrk_04293500 (East Berkshire) and MR_MRSwtn_04294000 (North Troy). Four sites were managed by VT EPSCoR RACC, these were MR_HngfdBrk_307, MR_HngfdBrk_281 (both St. Albans), MR_MudCrk_731, and MR_MudCrk_997 (both Newport).
- Phosphate collection dates from USGS stream gauge data and VTEPSCoR data were matched with precipitation data from wunderground.com. Weather stations; MEBKV1, KVTSWANT2, and VTNEWPO3 were used.
- Phosphate data used was collected in the Missisquoi River drainage when there was at least .1" of precipitation on the previous day(s).
- Phosphate data and storm data was use for dates between October 2009 and October 2012.
- Phosphorus change was compared to a baseline (Phosphate level in stream when there was no precipitation) to storm intensity (total precipitation on the consecutive days of the storm prior to the date of phosphorus collection divided by the number of days).

Discussion

- We thought phosphate levels would increase as storm duration and intensity increased.
- In general phosphate amounts increased as storm intensity increased. Three of the sites showed an increase, one site showed little change, and another site had too few data points to draw conclusions.
- Increasing the number of data points would provide a clearer picture regarding phosphate level and storm intensity.
- How does the phosphate get into the water?
- Precipitation does not carry phosphorus, therefore phosphorus comes from areas around watershed.
- A possible explanation for the MR_MdCrk_997 data showing little change in phosphate level with increased storm intensity might be related to the type of substrate which may effect its ability to absorb and or transport phosphorus.

Black Creek, North Fairfield, VT