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NUTRIENT EXPORT FROM A PROXIMAL, INTERMITTANT STREAM DRAINING ECU MEADOWBROOK FARM, MADISON COUNTY, KY

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Agricultural activities contribute significant amounts of nutrients that contaminate surface and subsurface water. Eastern Kentucky University (EKU) Meadowbrook Farm (Madison County, Kentucky) seeks to decrease its export of nutrients to Muddy Creek using sequestration techniques. The first step in the overall process is to determine nutrient export at present, before sequestration efforts take place. Here we estimate the export of phosphate, nitrate, and ammonium during Tropical Storm Cindy (July 22 to 24, 2017) from a proximal, intermittent stream, named the BRC. This stream drains a representative portion the Farm, receiving water from a dairy complex, pasture, and cropland.

To estimate nutrient export, both discharge and nutrient concentration must be determined. We have built a V-notched weir across the BRC drainage equipped with a datalogger that measures water elevation behind the dam, and an autosampler that captures water samples during rain events. Water level and discharge over the dam are proportional, so that discharge can be calculated during rain events. Nutrient concentration is measured for each water sample using accepted colorimetric methods: ascorbic acid (phosphate), cadmium reduction (nitrate), and sodium hypochlorite (ammonium).

Once discharge and nutrient concentrations are measured for the rain event, total nutrient mass can be calculated from the resultant curves (Fig. 1). Discharge and concentration data were parsed into 30-second time steps over the course of the entire, 72-hour rain event, and we used a cubic spline application (grafted into *MS Excel*) to produce a continuous function for each parameter. The area under the discharge and concentration curves yielded total solute mass for the Cindy event.

Based on these data and using the cubic spline technique, we estimate that the export of phosphorus was 3.1 kg P occurring as dissolved orthophosphate, and 6.3 kg N occurring as dissolved nitrate (5.3 kg) and ammonium (1.0 kg) during Cindy. We also intend to determine the amount of total phosphorus (orthophosphate, other forms of dissolved phosphorus, P contained within dissolved organics, and P adsorbed onto fine particulates) exported during Cindy, as well as estimating nutrient export for five other rain events captured during 2017.

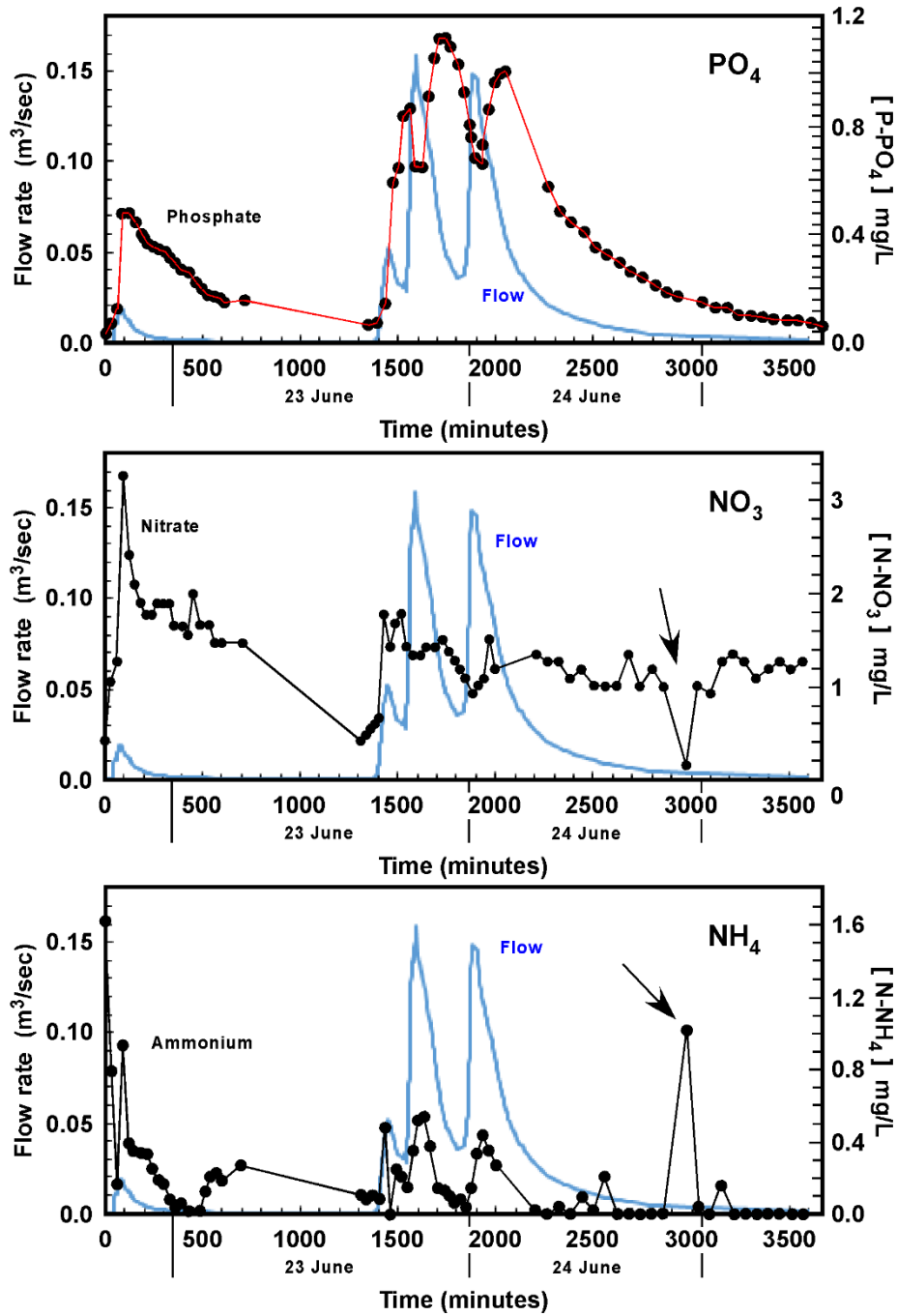


Fig 1. Graphs of water flow and nutrient concentration during Tropical Storm Cindy. These data were used to make export estimates for each dissolved nutrient during the rain event.