

# Longitudinal Patterns in Water Quality at Shelburne Farms

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## Introduction

At the request of Shelburne Farms administration, I examined the impact of a large composting operation on a small watershed within Shelburne Farms, in Shelburne Vermont. The farm prides itself on being a low ecological impact producer of dairy products, and is constantly trying to learn more about the effects of its farming processes on its environment. The runoff of phosphorus (P) was of major concern to the farm, as high levels of phosphorus in the lake cause eutrophication, and can lead to a failure to meet EPA standards, potentially allowing costly lawsuits against the state by environmental activist groups. Another concern was coliform bacteria, in particular *Escherichia coli*, runoff from the compost, as the presence of these bacteria indicates fecal contamination in the lake, which poses a health risk to humans and lake fauna alike, and depresses tourist activity. Both contaminants can render the lake unswimmable.

This is only a small study in a series of studies commissioned by Shelburne Farms, and there are more underway. The sites set up for this study were used throughout the fall, and will be again when the weather permits. The data collected by those who continue the effort will be more extensive, and perhaps useful, than mine. However, my data can help provide a picture of the challenges faced by ecologically aware dairy farms.

This study does not seek to provide solutions to the ever-present ecological threat posed by agricultural runoff, it seeks only to help guide a more in-depth investigation, involving more detailed analysis, and possible management practices.

## Methods and Materials

- ❖ Install ISCO automated water samplers at two sites on Shelburne Farms.
- ❖ Sample during storm events between late June and early August.
- ❖ Run samples for total suspended solids, total phosphorus, soluble reactive phosphorous, and E. coli.
- ❖ Examine relationship between TP and SRP.

Two sites were set up in a ditch that carries most of the water in the small Orchard Cove watershed on Shelburne Farms. One site, “Shel Upper,” was situated above the compost lot, and the other, “Shel Below,” was near the outlet to the lake, after runoff from the lot enters the ditch..

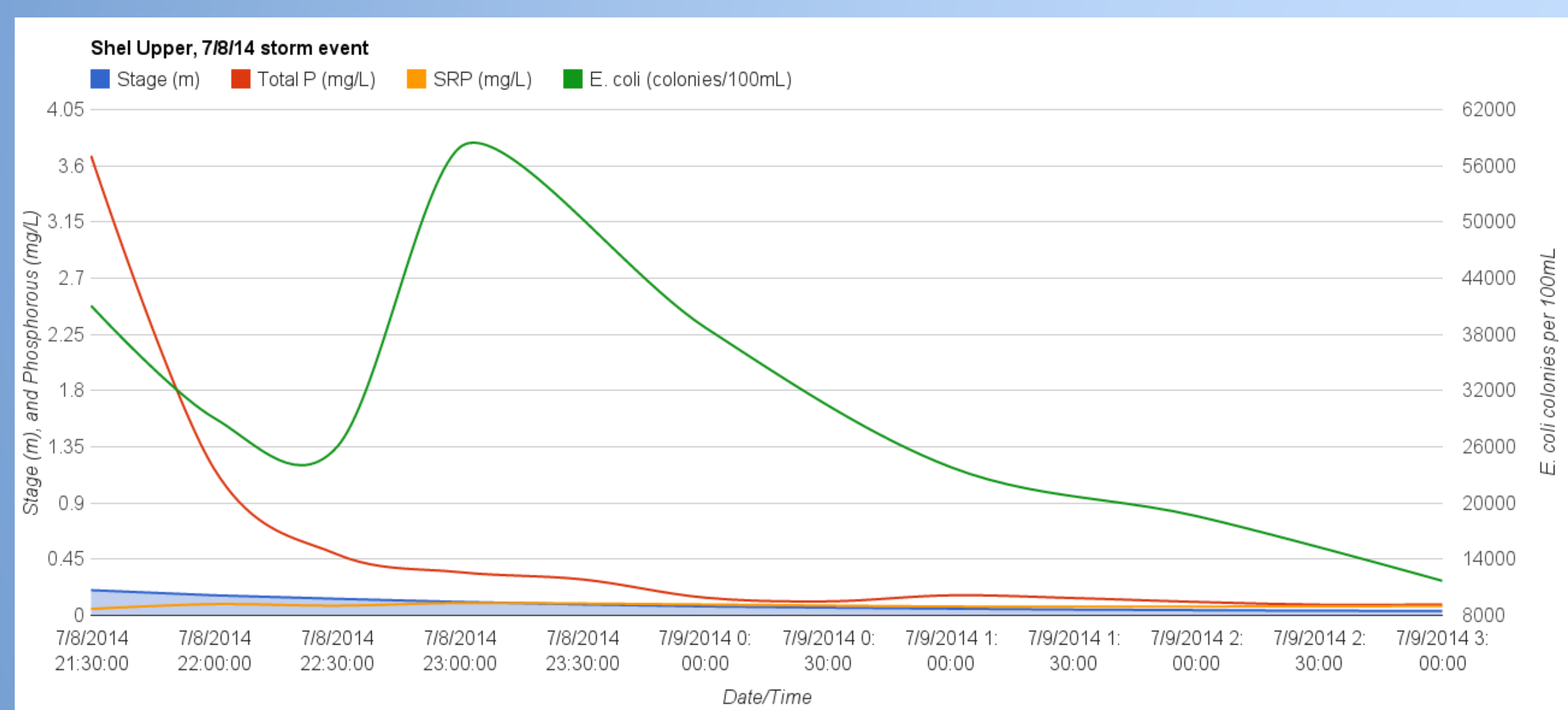
Water samples were collected by Teledyne ISCO model 6712 automated water samplers.

Samples were analyzed for total phosphorus and soluble reactive phosphorus at UVM’s Agricultural and Environmental Testing Laboratory, using a Lachat QuikChem 8000 FIA+ for colorimetric analysis.

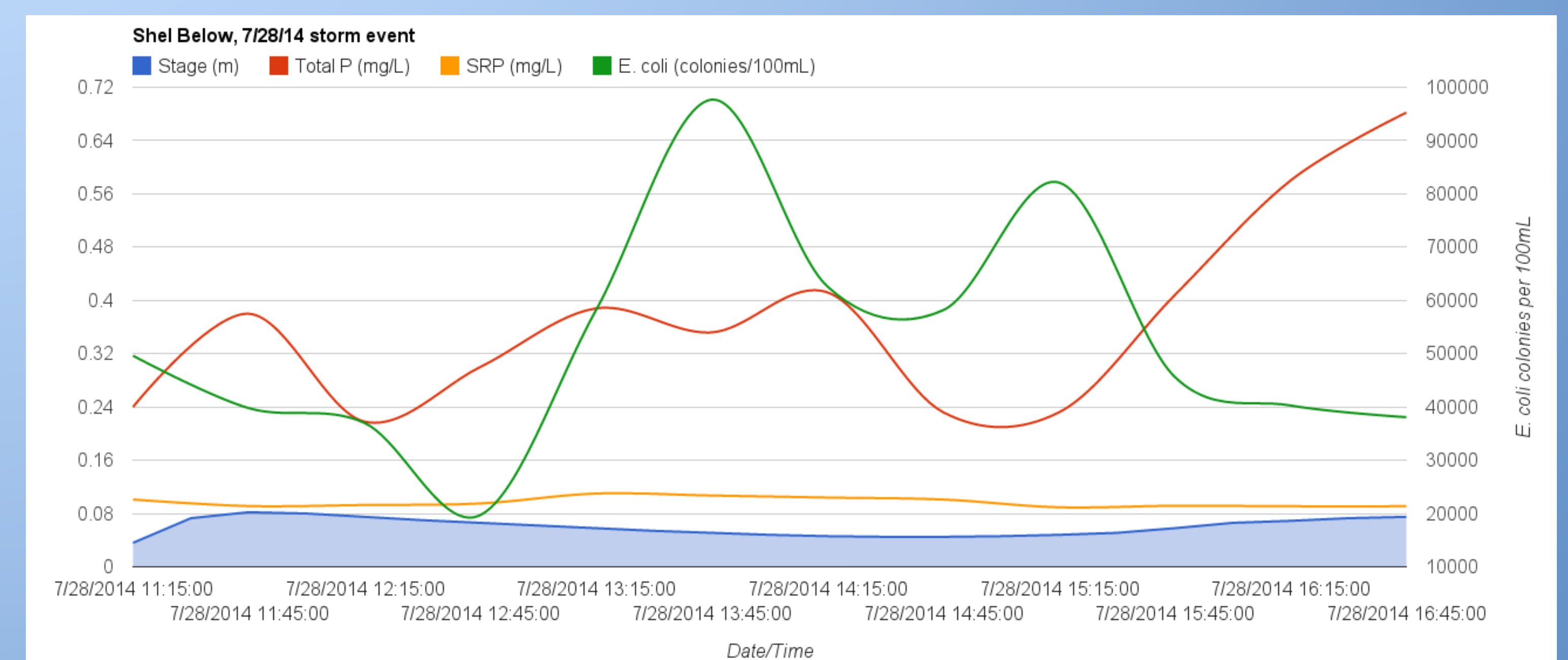
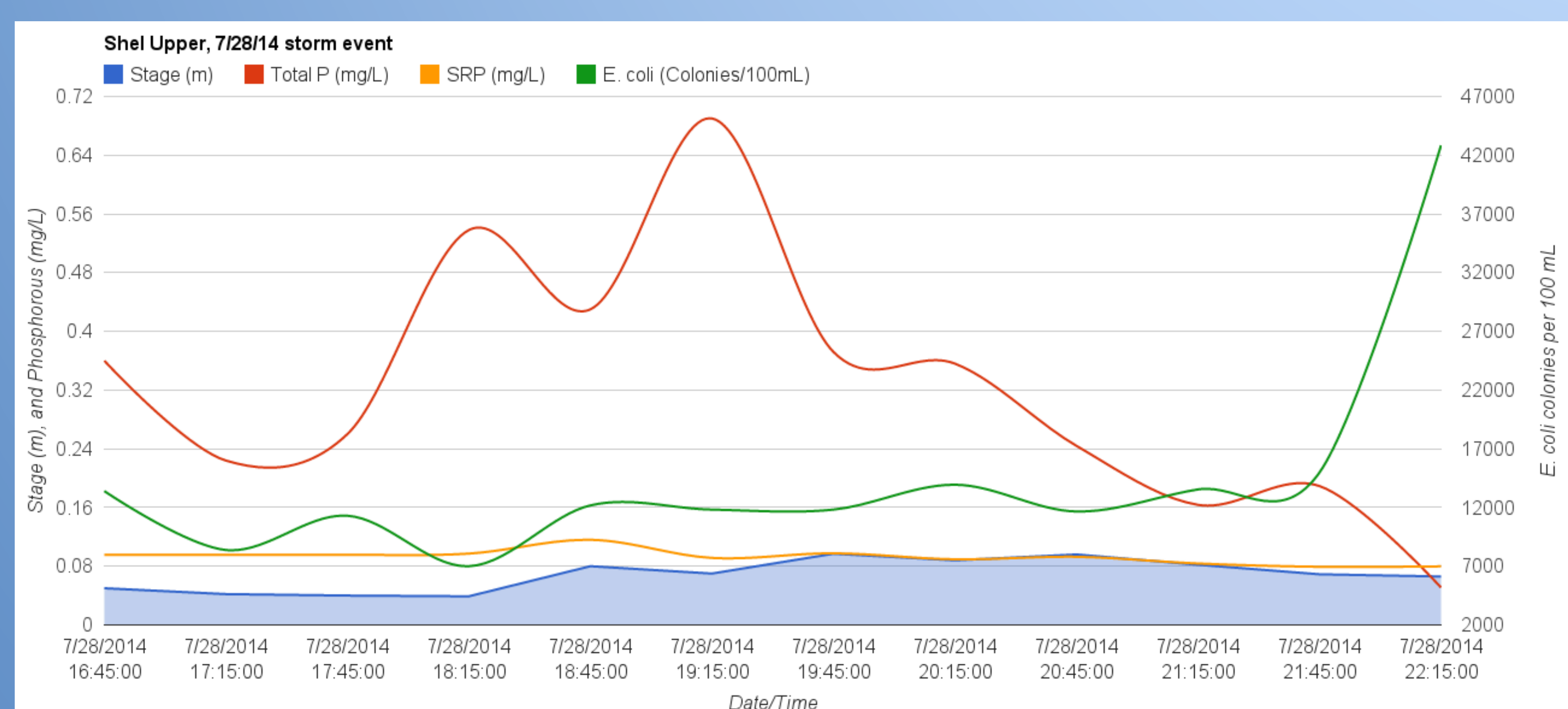
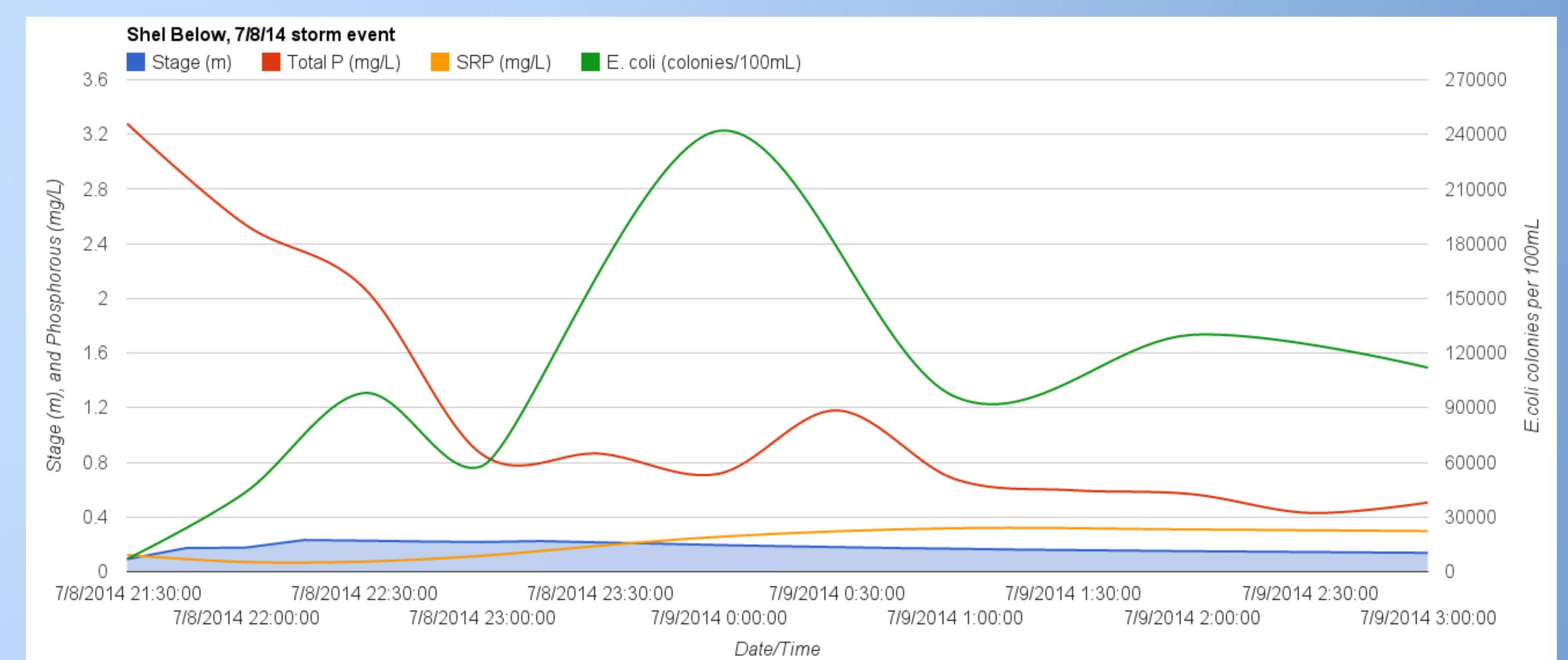
The most probable number (MPN) of Coliform bacteria and *E. coli* colonies in each sample was obtained by using IDEXX Colilert and Quanti-Tray®/2000, an EPA approved procedure for water tests. A 100x dilution was used on the samples from 7/8/14, but the results were somewhat inconclusive, sometimes yielding greater than the maximum detectable number of colonies. A 200x dilution was used for the 7/28/14 samples, yielding good, usable numbers.

## Results

The two storm events as recorded by the Shel Upper ISCO



The two storm events as recorded by the Shel Below ISCO



## Discussion

Total phosphorus levels varied greatly throughout the storm events, while soluble reactive phosphorus remained consistently low during both events at both sites, indicating that the majority of phosphorus that makes it into the lake is being carried on solid debris. This would suggest that filtration practices like those used elsewhere on the farm might be effective in controlling phosphorus runoff from the composting site in question.

The EPA allows a maximum phosphorus concentration of 0.014 mg/L for Shelburne Bay. While the phosphorus concentration in the ditch in no way reflects the concentration in the bay, the implications are clear: this is a real threat to water quality in Lake Champlain.