

Rain Garden Efficacy in Treating Stormwater Runoff and the Public Opinion of Their Use

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Overview

Global climate change and increased urbanization have led to greater amounts of runoff due to larger, more frequent storm events and less permeable surfaces. Rain gardens are an innovative way to combat the effects from both of these. They are able to reduce runoff into a stream, remove impurities, cool water, and reduce water velocity- all while being visually appealing. One of the most distinct advantages of rain gardens is the fact that they are made to stand out. This allows members of the community to maintain interest in and awareness of water quality issues. In addition to all of this, rain gardens are relatively small, cheap, easy to install, and can be altered in design to fit nearly anywhere.



A rain garden at Essex High School in the Indian Brook watershed.

The function of a rain garden is determined by its design. Grass swales and gravel inlets slow water as it enters the garden. This both preserves the garden from erosion at the intake and begins the process of removing suspended solids from the water. Even more suspended solids are removed as the water forms a temporary pond in the garden and its velocity is completely reduced. This allows the storm water to permeate into the soil of the garden where it can then enter the groundwater. The plants in the garden aid in removing water, nutrients, sediments, and pollutants. Rain gardens are able to remove phosphorus which could lead to decreased loads of nearby streams. Decreasing the phosphorus loads of streams decreases the total phosphorus load of Lake Champlain. This is important for Mallett's Bay, an area that is above its target load of phosphorus by 1.1 mt/yr.

Design, Implementation, and Results of Q3 Rain Garden Survey

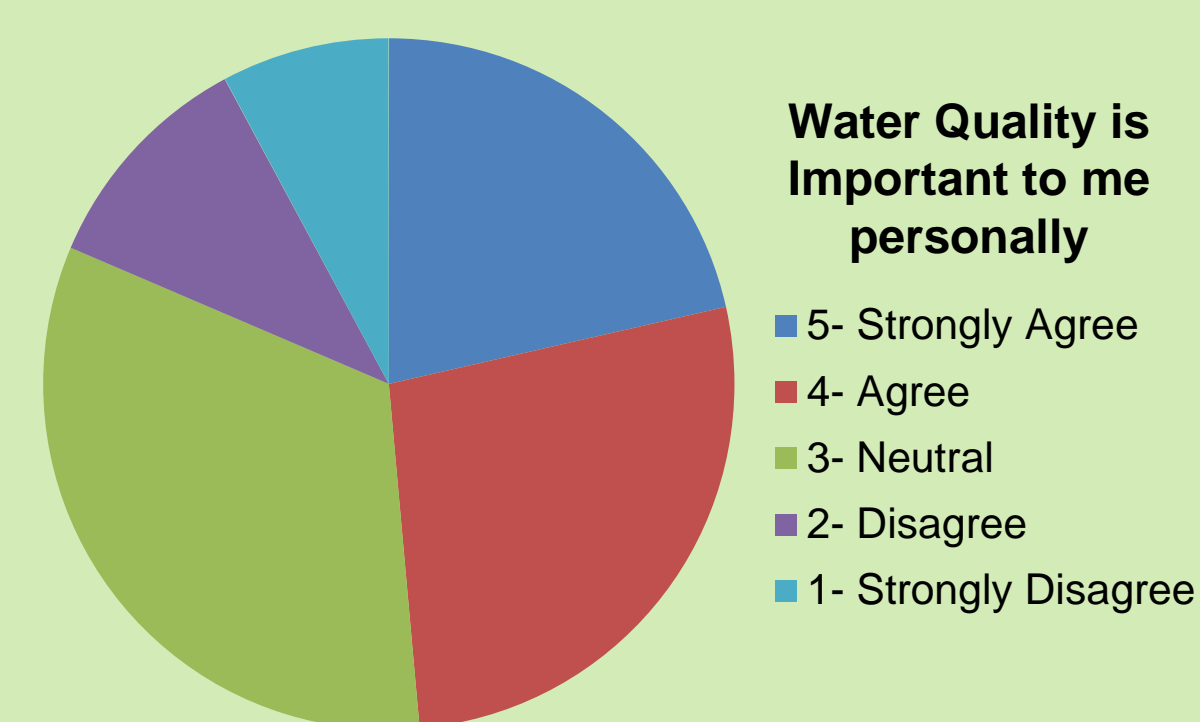
Methods:

A survey regarding rain gardens and water quality was sent out to the students, faculty, and staff of Colchester High School (CHS). The survey was sent via email and completed online. It was completely anonymous.

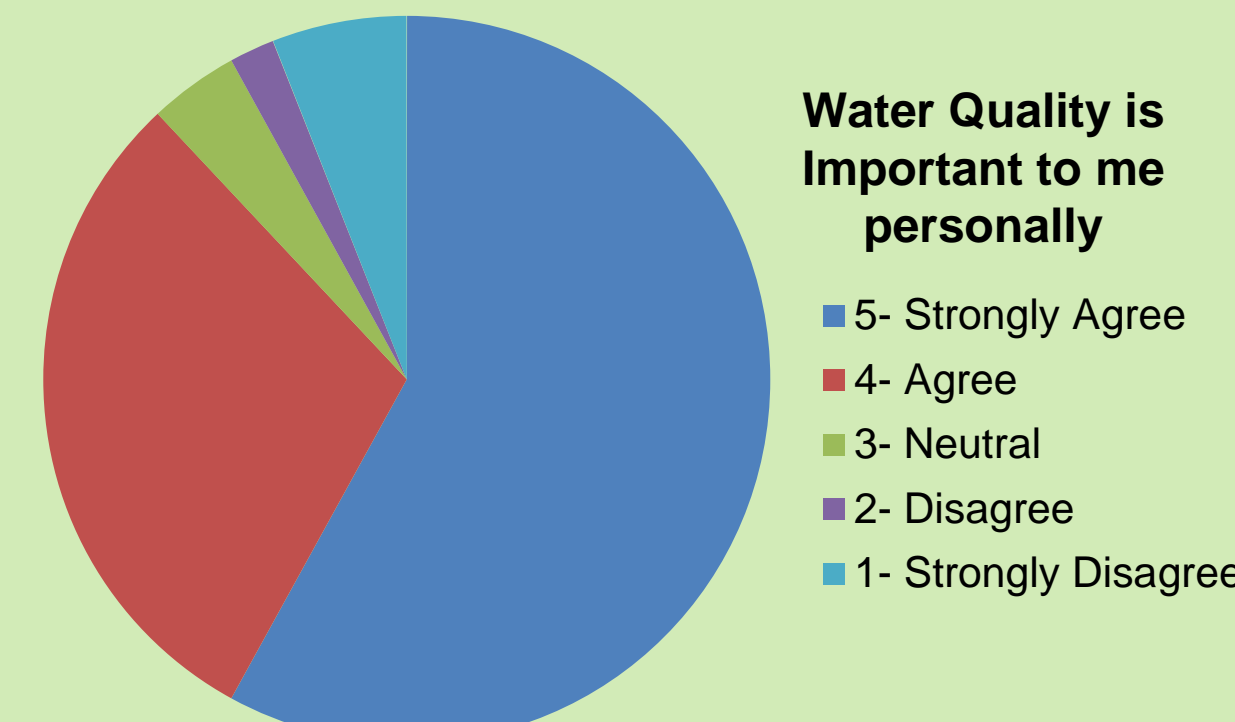
In making the survey, the objective was to discover how the students, faculty and staff of Colchester High School (CHS) feel about water quality and to assess their knowledge of rain gardens. The survey was designed to meet Institutional Review Board (IRB) standards under the supervision of Dr. Steve Scheinert, a RACC Q3 researcher. The questions had no right answers, simply asking for opinions and the level of the participant's knowledge on the subject.



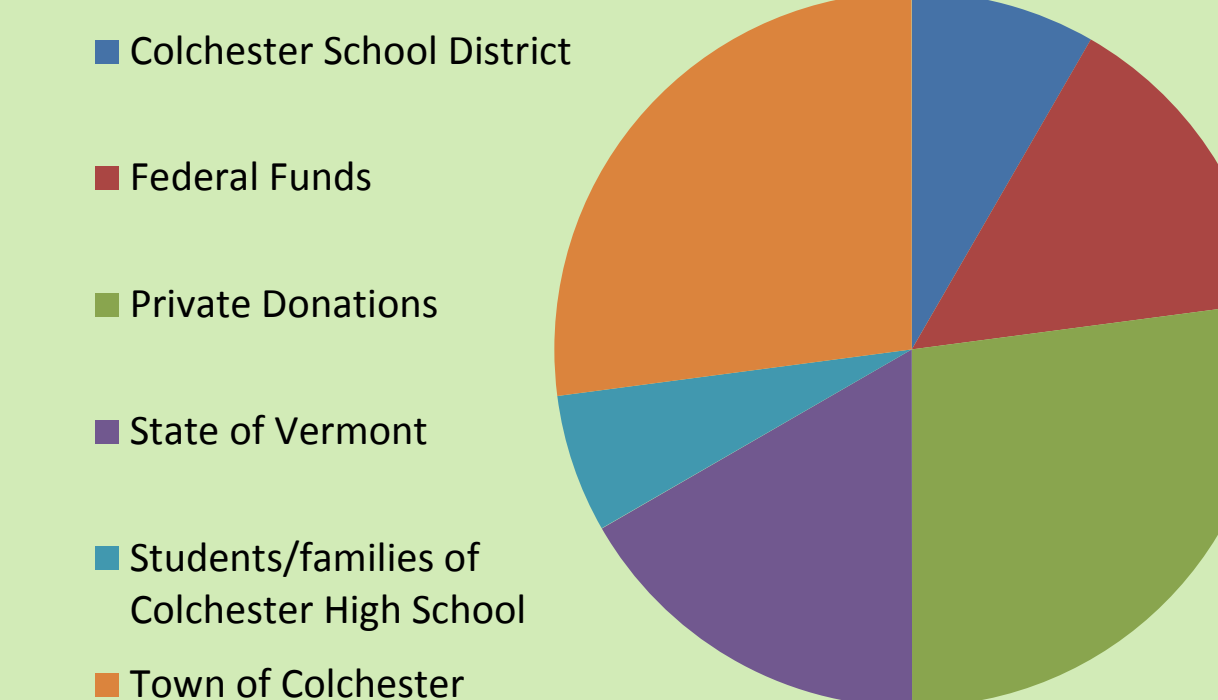
Opinions of CHS Students on the Importance of Water Quality



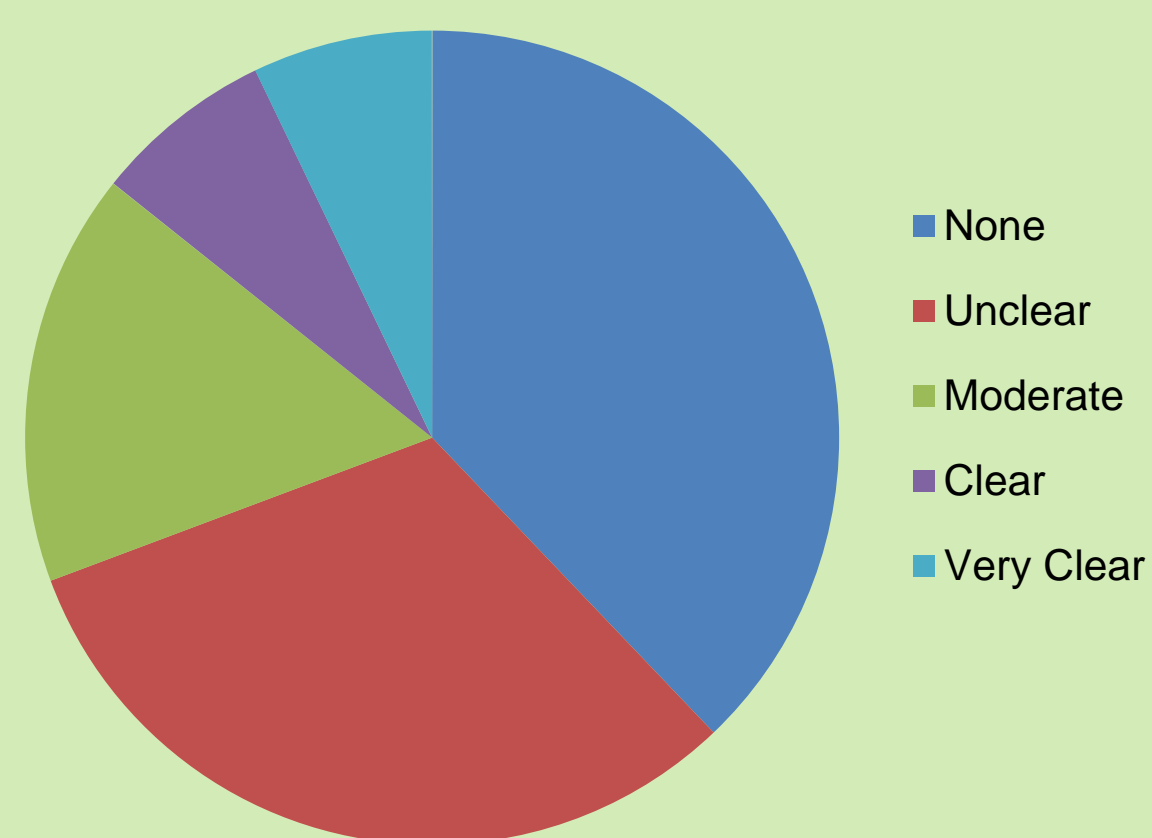
Opinions of CHS Faculty and Staff on the Importance of Water Quality



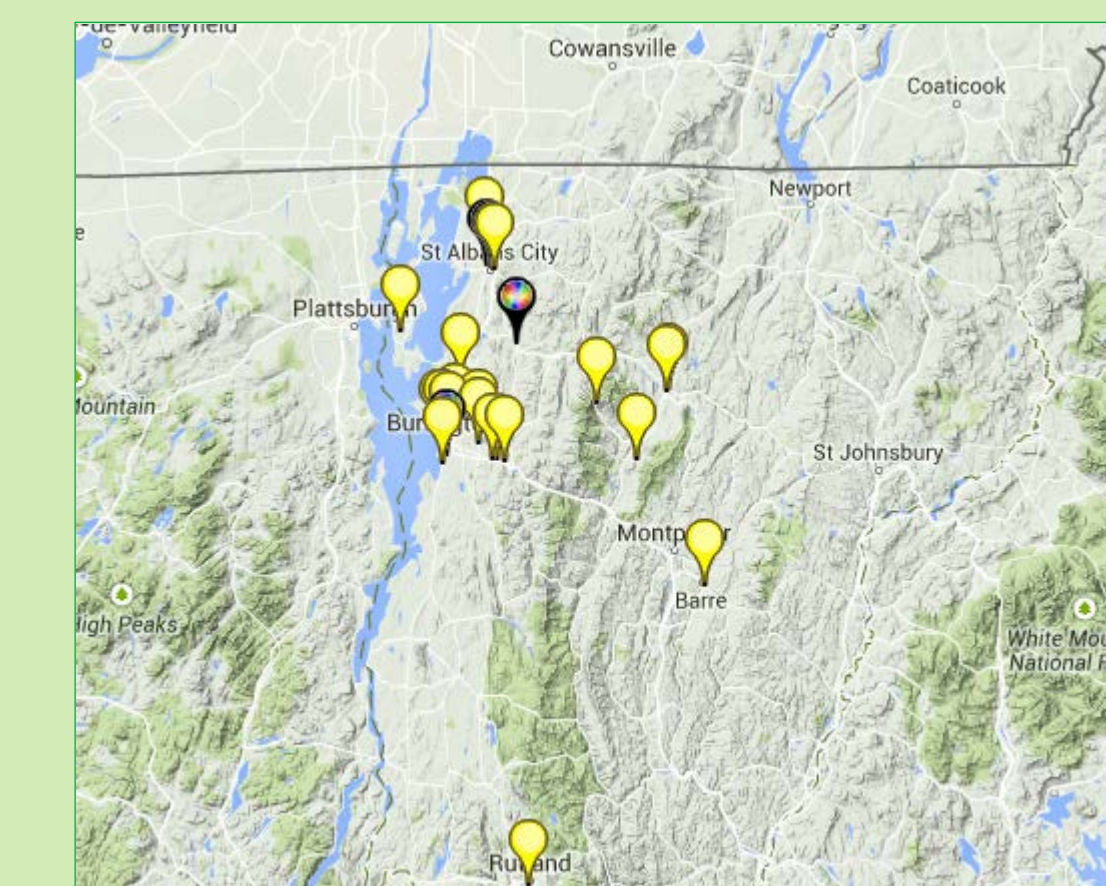
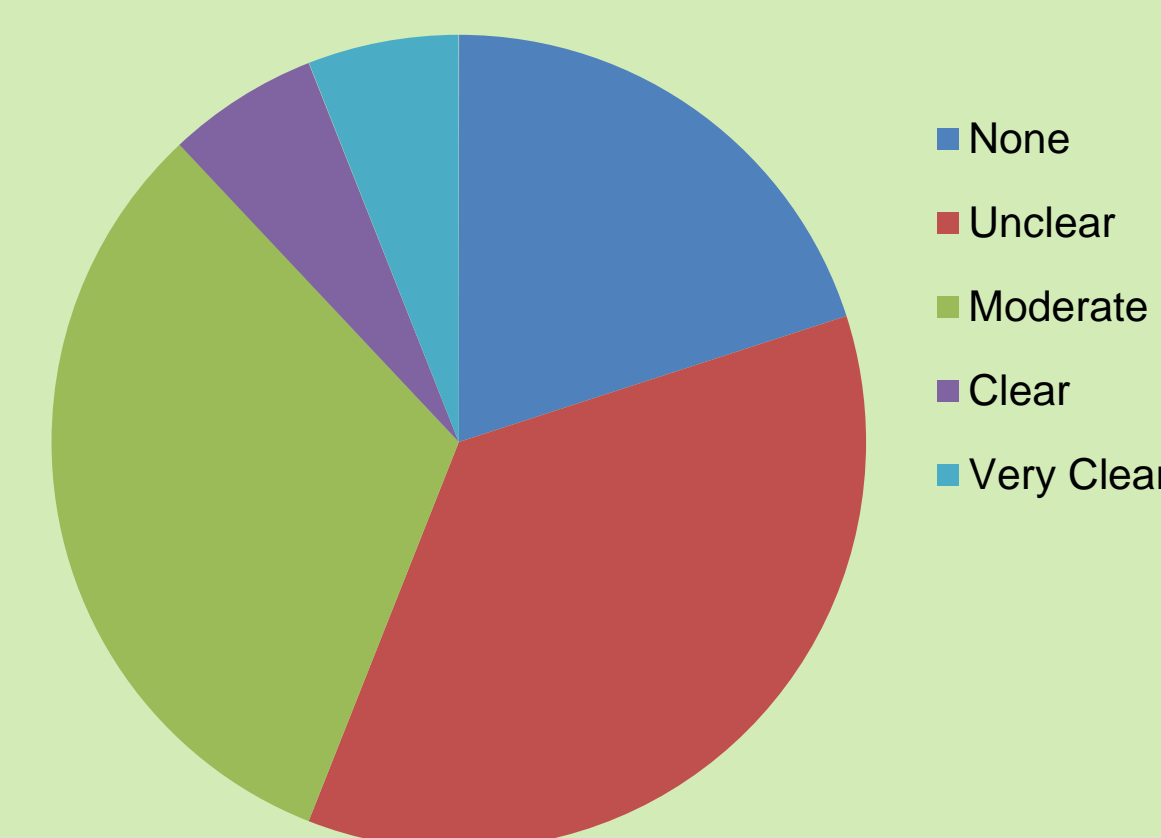
The Opinions of CHS Faculty and Staff on Where Funding for a Rain Garden at CHS Should Come From



Student Understanding of Rain Gardens



CHS Faculty and Staff Understanding of Rain Gardens



The locations of some current rain gardens in Vermont.

Results:

- 49 percent of students surveyed agreed or strongly agreed with the statement "Water quality is important to me personally."
- 88 percent of faculty and staff surveyed agreed or strongly agreed with the same statement.
- 31 percent of students surveyed cited having a moderate to very clear understanding of rain gardens.
- Of that percentage of students, 86 percent were in support of installing a rain garden at CHS.
- 44 percent of faculty and staff reported having a moderate to very clear understanding of rain gardens.
- Of that percentage of faculty and staff, 95 percent were in support of installing a rain garden at CHS.

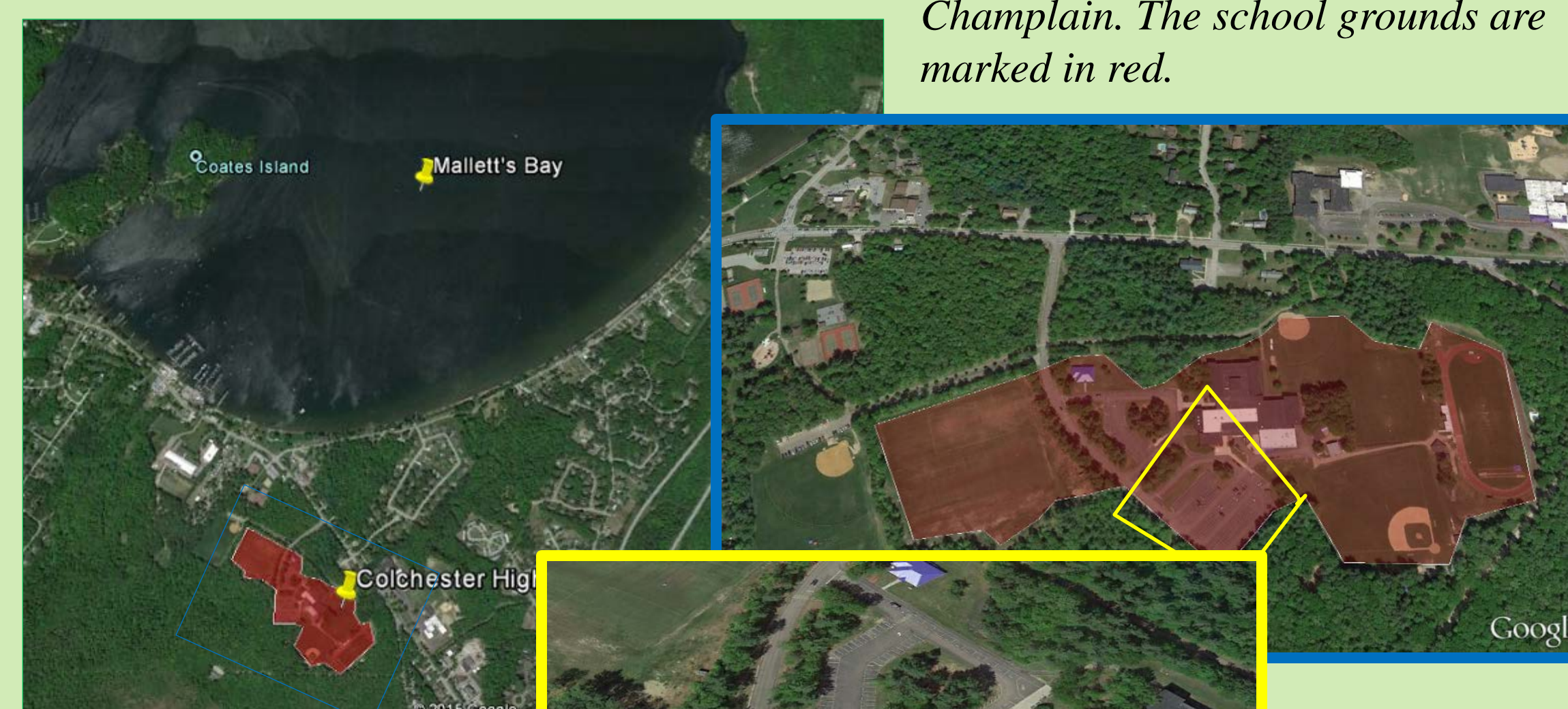
One of the most important conclusions drawn from the survey is that, overall, the students, faculty and staff at CHS are concerned with water quality, but lack an understanding of a simple measure to manage phosphorus loads, and therefore improve water quality.

Phosphorus Loads and Potential Reductions

The CHS grounds are composed of the school, a parking lot, and several athletic fields. At a total of 28.7 acres, the grounds contain 7.9 acres of impervious surfaces. The area drains to both Mallett's Bay directly and to the Winooski River. An estimate of the phosphorus draining from this area was made according to Environmental Protection Agency (EPA) protocol. It was found that approximately 23 pounds of phosphorus run off of the property each year.

The student parking lot occupies an area of 1.7 acres and contributes an estimated 3.9 pounds of phosphorus to the school's total load. The parking lot drains to a storm drain in its northeast corner which leads to a catch basin further north on the property. This brings the water across the watershed boundary line into an area the drains into Mallett's Bay directly. There is a tentative plan to place a rain garden in the grassy barrier along the north side of the parking lot. With a phosphorus removal rate of 70-85% (Davis, 2006) a rain garden could remove 2.7 to 3.3 pounds of phosphorus per year. This is a reduction of 12 to 14 percent in phosphorus load from the entire property.

Maps showing CHS in relation to Lake Champlain. The school grounds are marked in red.



Yellow shows the student parking lot that drains towards the tentative rain garden site which is also marked.

The watershed boundary between Mallett's Bay and the Winooski River is marked by the purple line.

Recommendation

Rain gardens hold several distinct benefits over more traditional stormwater control practices. They are ideal for towns, businesses, and homeowners alike to do their part in creating a better environment because they are attractive, effective, and relatively inexpensive. They have the added benefit of educating members of the community about stormwater and runoff issues by drawing in the attention of the public. It is clear that the students, faculty, and staff of CHS are concerned with the current condition of water quality, but are unaware of how they can make a difference. Installing a rain garden is an excellent way to encourage others to take measures to improve water quality.

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