MILONE & MACBROOM

AHEAD OF THE STORM
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SHELBURNE • CHARLOTTE • HINESBURG
Stormwater Resilience Demonstration Site

Ahead of the Storm's Wholistic Stewardship Approach

LEWIS CREEK ASSOCIATION

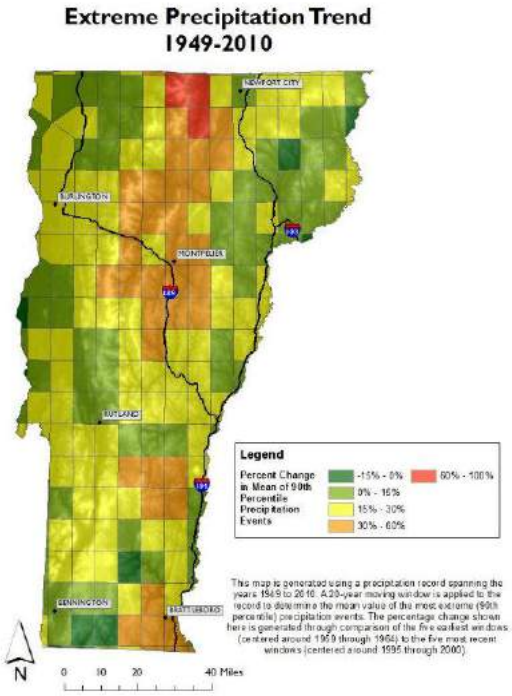
Presented By: Jessica Louisos, MS, PE





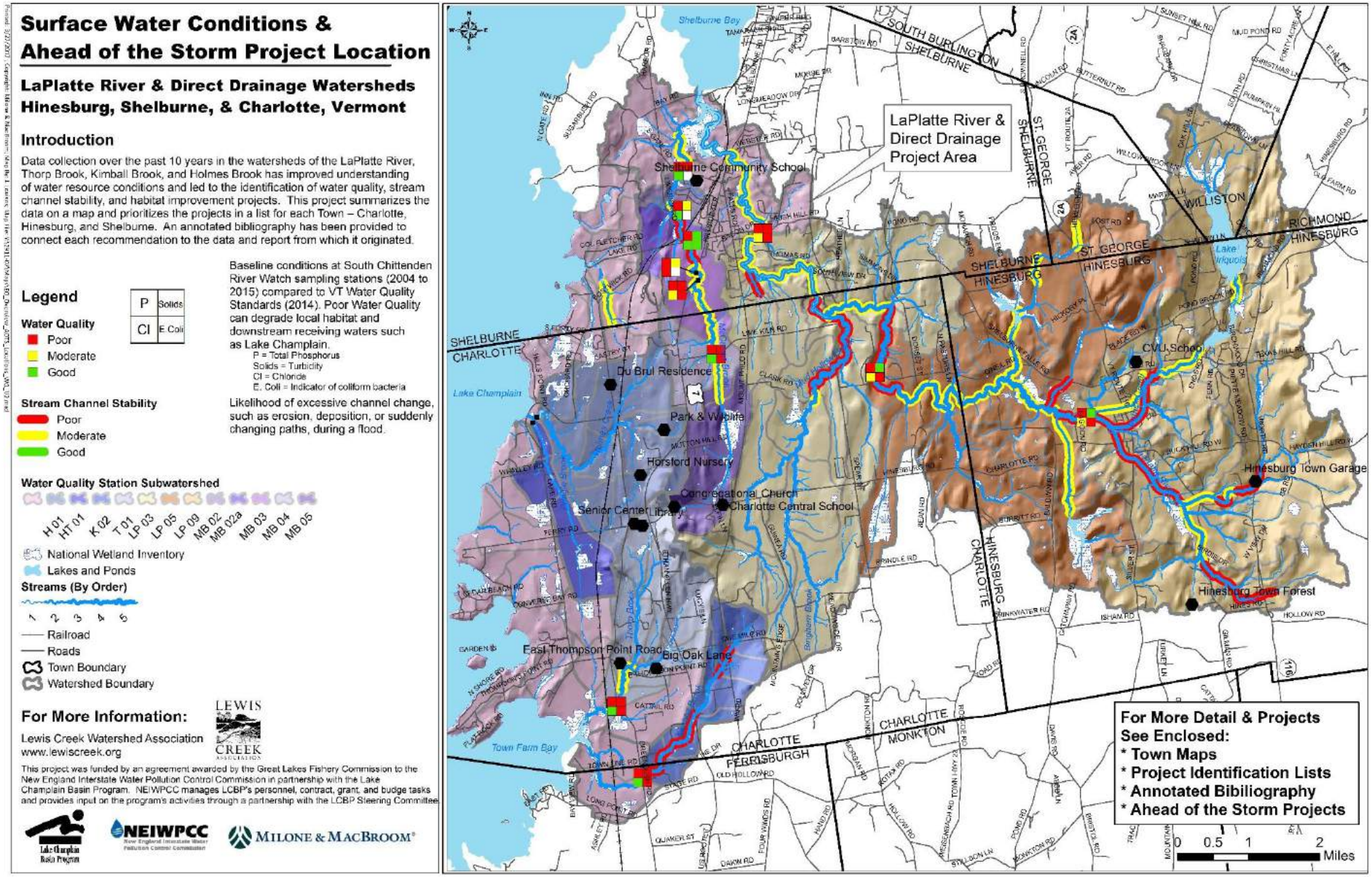
Ahead of the Storm

- Water Quality stewardship program
- Naturalize stormwater runoff across the land
- Enhance flood resiliency
- Protect water quality
- Incorporate effects of climate change – look to future



Water Quality Monitoring

Ahead of the Storm Sites



Optimal Conservation Practice

SLOW IT DOWN

Increase Roughness of Land Surfaces

Decrease Slopes

Dissipate Energy

SPREAD IT OUT

Disperse Flow Paths

Interrupt Flow Paths

Direct to Infiltration

SOAK IT IN

Increase Infiltration

Minimize Disturbance

Minimize Impervious Surfaces & Soil Compaction

GUIDING PRINCIPLES IN DESIGNING OCPS FOR WATER QUALITY PROTECTION & FLOOD RESILIENCY

- ✓ Slow the rate of water flow
- ✓ Increase the amount of infiltration
- ✓ Reduce soil movement and erosion
- ✓ Enhance the capacity of naturally vegetated land to trap sediment
- ✓ Maintain water quality even during storm events
- ✓ Consider stream stability and water quality of the greater river system
- ✓ Reverse cumulative impacts from multiple problem areas
- ✓ Use practices known to reduce phosphorus-rich runoff
- ✓ Use practices that are cost-effective and feasible for landowners
- ✓ Go beyond the minimum design requirements to achieve OCPs

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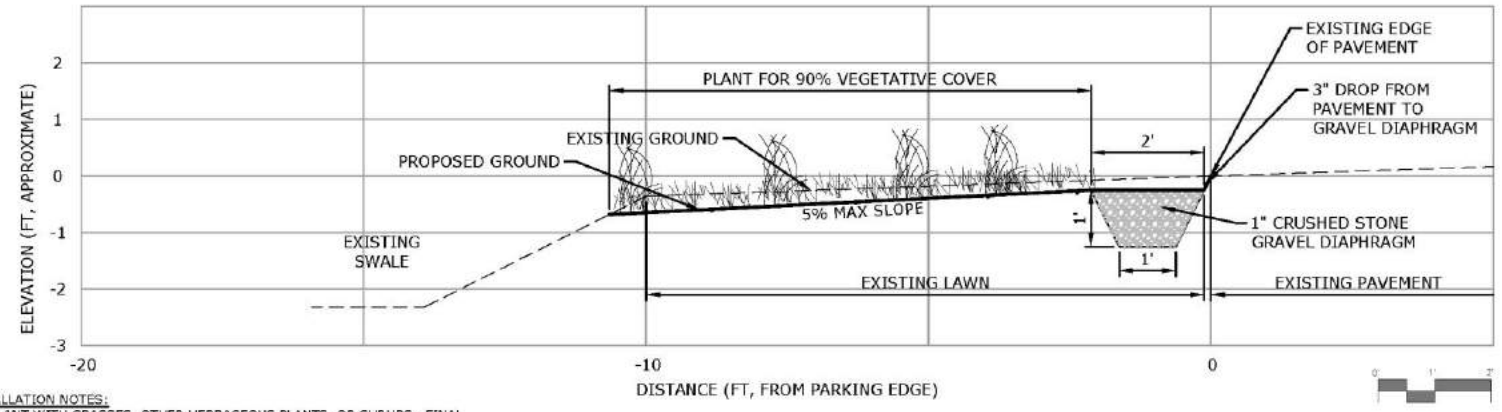
Site Assessment

May 5, 2016

Design



INSTALLATION NOTES:
1. PLANT WITH GRASSES, OTHER HERBACEOUS PLANTS, OR SHRUBS. FINAL SPECIES AND PLANTING PLAN TO BE DETERMINED BY LANDOWNER. A MINIMUM OF 90% VEGETATIVE COVER IS REQUIRED.
2. AFTER PLANTING COVER WITH EROSION CONTROL BLANKET.
3. DO NOT COMPACT SOILS DURING CONSTRUCTION

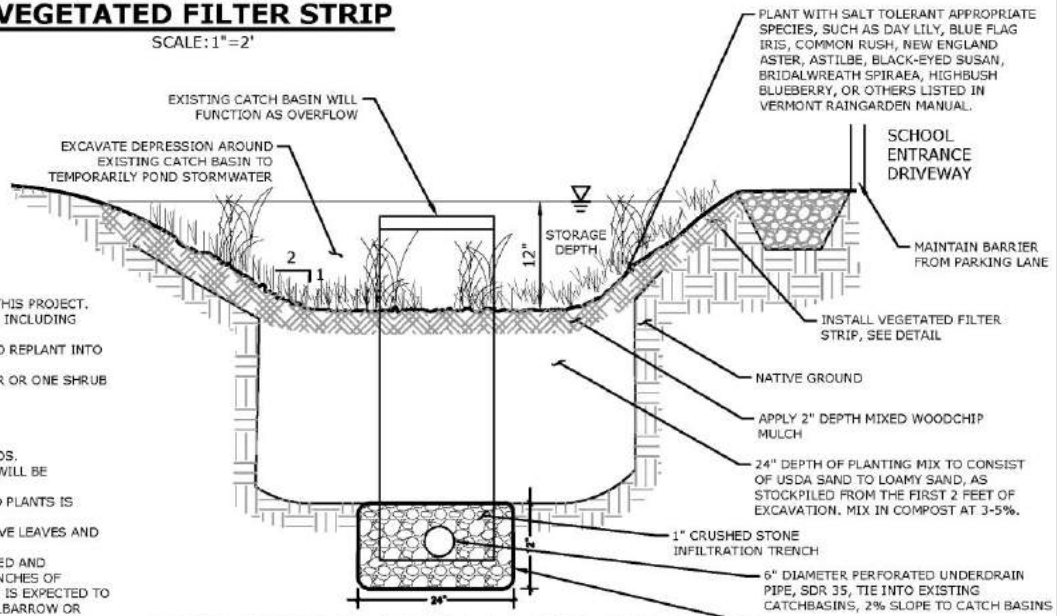
OPERATION AND MAINTENANCE NOTES:
1. AT THE END OF EACH GROWING SEASON, IF NOT MAINTAINED AS A GARDEN, BRUSH-HOG
2. ANNUALLY INSPECT TO MAKE SURE FLOWS ARE NOT CONCENTRATED, VEGETATIVE COVER STILL EXCEEDS 90%, SEDIMENT IS CLEANED OUT OF THE GRAVEL DIAPHRAGM, AND NO INVASIVE SPECIES ARE PRESENT.
3. REPLACEMENT OF THE GRAVEL DIAPHRAGM IS EXPECTED APPROXIMATELY EVERY 10-YEARS.

VEGETATED FILTER STRIP

SCALE: 1"=2'

INSTALLATION NOTES:
1. THE VERMONT RAINGARDEN MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL INCLUDING ADDITIONAL APPROPRIATE PLANT SPECIES.
2. IT IS RECOMMENDED TO SAVE SOME OF THE PLANTS EXISTING IN THE LANDSCAPED BEDS TO REPLANT INTO THE COMPLETED BIO-RETENTION AREA.
3. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER.
4. THE UNDERDRAIN WILL TIE INTO EXISTING CATCH BASIN.

OPERATION AND MAINTENANCE NOTES:
1. MAINTENANCE OF THE BIO-RETENTION AREA IS VERY SIMILAR TO PLANTED LANDSCAPED BEDS. REPLACEMENT OF SOME MULCH MAY BE REQUIRED IN THE SPRING. OCCASIONAL WEEDING WILL BE REQUIRED TO MAINTAIN THE SELECTED PLANTS AESTHETICALLY PLEASING.
2. DURING THE FIRST YEAR OF OPERATION, WATERING, WEEDING, AND REPLACEMENT OF DEAD PLANTS IS IMPORTANT FOR PROPER ESTABLISHMENT.
3. PERIODICALLY, INCLUDING AFTER LARGE STORMS AND REGULARLY DURING THE FALL, REMOVE LEAVES AND DEBRIS ACCUMULATED AT CATCH BASINS.
4. THE ACCUMULATION OF SEDIMENT WITHIN THE BIO-RETENTION AREA SHOULD BE MONITORED AND INSPECTED A MINIMUM OF ONCE ANNUALLY. REMOVE SEDIMENT AFTER APPROXIMATELY 3 INCHES OF SEDIMENT HAS ACCUMULATED OR RAKE AWAY WHEN DOES NOT DRAIN WITHIN 1 DAY. THIS IS EXPECTED TO OCCUR APPROXIMATELY EVERY TWO YEARS AND BE DONE WITH A HAND SHOVEL AND WHEELBARROW OR BUCKETS.
5. ANNUALLY INSPECT MAKE SURE NO INVASIVE SPECIES ARE PRESENT.
6. REPLACMENT OF THE GRAVEL STRIP IS EXPECTED APPROXIMATELY EVERY 10-YEARS.



RAIN GARDEN / BIO-RETENTION AREA

NOT TO SCALE

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REVISIONS
10/22/2018 MLK,CH

FINAL DESIGN

DETAILS

SHELBURNE COMMUNITY SCHOOL RAIN GARDEN
COMPLETED AS PART OF THE AHEAD OF THE STORM PROJECT

340 HARBOR ROAD
SHELBURNE, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

VARIES

OCTOBER 17, 2017

3462-25

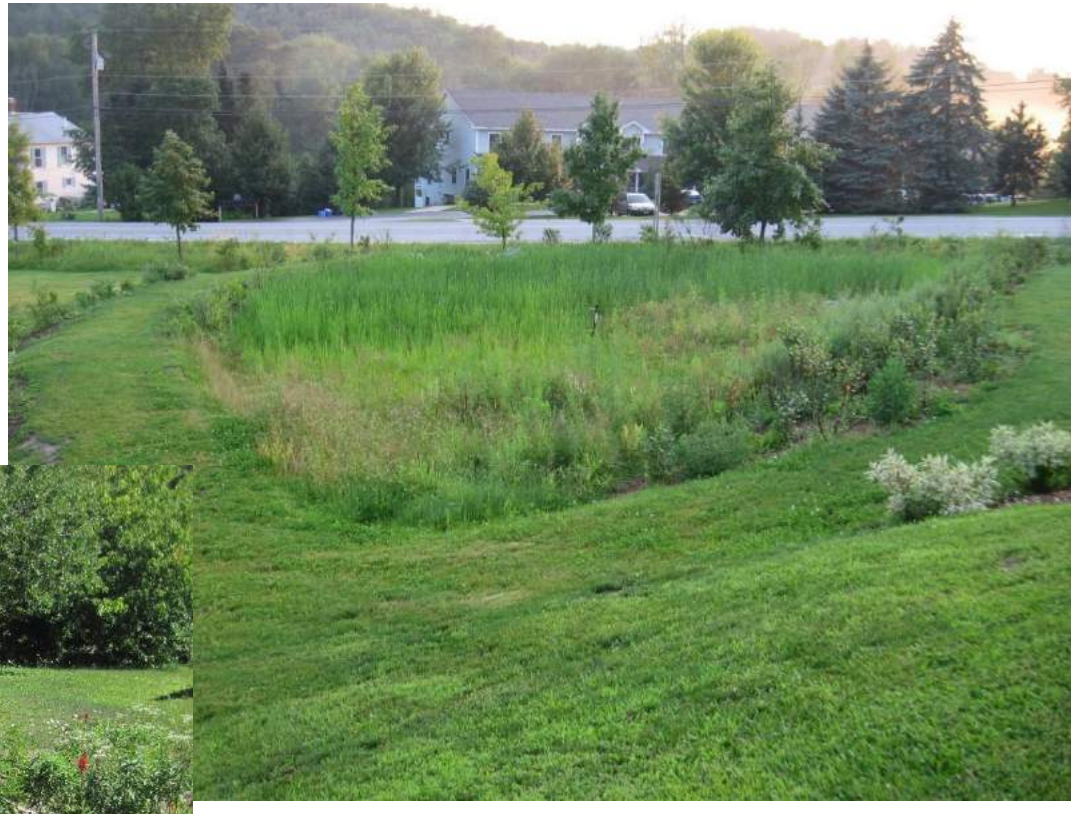
07

Construction

June 19, 2019

Construction Completed = Maintenance Begins

Raingarden / Bio-Retention



Town Property, Silver Street, Hinesburg, Summer 2014

A Family's Home, Charlotte, Summer 2018

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Vegetated Swales

Reconstructed grass swale, East Thompson Point Road, Charlotte, Vermont, Summer 2016

Swale with Raingarden, Woodbine Road, Shelburne, 2017

Grass-line if Slope < 5%

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Disconnection to Vegetated Buffer or Filter Strip

Hinesburg Town Garage
November 2018

Infiltration Basin

Protect Existing Resources - Floodplains

LaPlatte Floodplain – November 1, 2019

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Riparian Buffer Planting / Reforestation

Lewis Creek
Starksboro, Vermont
Terry Dinnan, 2005

Floodplain Reconnection

Education is Key to Stewardship

Charlotte Central School
November 7, 2019
LCA

Charlotte Central School
November 8, 2019
K. Kelley, LCA

AOTS OUTREACH MATERIALS

Ahead of the Storm

Shelburne Community School Rain Garden

345 Harbor Road, Shelburne

Introduction

Ahead of the Storm (AOTS) grew out of a group of citizens from Charlotte, Hinesburg, and Shelburne who were concerned about the serious decline of Lake Champlain's health and water quality. Stormwater runoff from driveways, fields, parking areas, and lawns is a major factor in the deterioration of our water quality. Most impervious surfaces were created before regulations requiring water quality treatments were in place or fall below regulatory thresholds. Therefore, runoff is not managed to remove pollutants or slow flows and soils and phosphorus are mobilized and end up in Lake Champlain. AOTS helps communities change the way stormwater is managed on properties to reduce water pollution and be more prepared for extreme weather events and impacts of climate change. Fifteen municipal, educational, and private properties have been selected to become demonstration sites to showcase more optimal conservation practices in a variety of landscape settings. Monitoring and stewardship over time is crucial to successfully addressing water quality issues.

Why here?

Stormwater runoff from Shelburne Community School flows into McCabe's Brook, which drains to Shelburne Bay. Water quality sampling results note very high phosphorus, turbidity, and E. coli in this watershed. Currently runoff from the roof, parking lots, driveways, playgrounds, and fields is collected in a series of swales, catch basins, and pipes that drains to the west and into McCabe's Brook. Three Optimal Conservation Practices (OCPs) are recommended to treat runoff from a portion of the existing impervious cover to improve water quality protection and flood resiliency by slowing runoff, reducing erosion, and enhancing vegetation. The treatment will take place in the front entrance island of the school which is highly visible to students and visitors. Students are directly involved in this project, and the rain garden will continue to be used as an educational tool for years to come.

Students gather to inspect catchbasin in front entrance island of school

Front entrance island (future rain garden site), which drains parts of the parking lot and roof

Catchbasin which drains directly to McCabe's Brook, untreated

Take a tour of the AOTS locations at lewiscreek.org!

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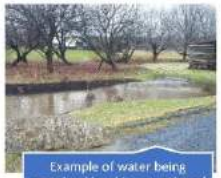
Design: how can we filter the water?

In order to treat the water running off the roof, sidewalks, and parking lot, a bio-retention area, or rain garden, was designed by engineers at Milone & MacBroom. The rain garden will be depressed so water around it will drain to it. Once in the rain garden, the water and nutrients will be either soaked up by the plants in the garden, or percolate through well-drained soil, gravel, and sand where it will be naturally filtered. Then, the clean water will enter pipes to drain into McCabe's Brook. During a large rain or snow melt event, the rain garden will be able to hold a lot of water and act as a pond, allowing pollutants to settle out before running off to the Brook.

Implementation

Implementation is set to occur in Spring 2019. An excavator will remove approximately 2 feet of soil in the front entrance island, and replace it with well-draining soils, gravel, and perforated pipes at the bottom. Native water-loving plants will be planted in the new garden by the SCS fifth-grade class. The garden will be planted and managed by students and teachers at Shelburne Community School.

Students learn about water movement through an interactive activity



Example of water being contained in a bio-retentioned area after rain event

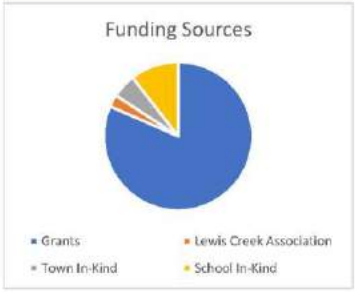
Water-loving plants such as lilies and witch hazel will be planted

How much did it cost?

Funding for this project occurred in phases:

- Concept Design $7,500
- Final Design $5,000
- Implementation $24,500
- Outreach $1,000

Total $38,000



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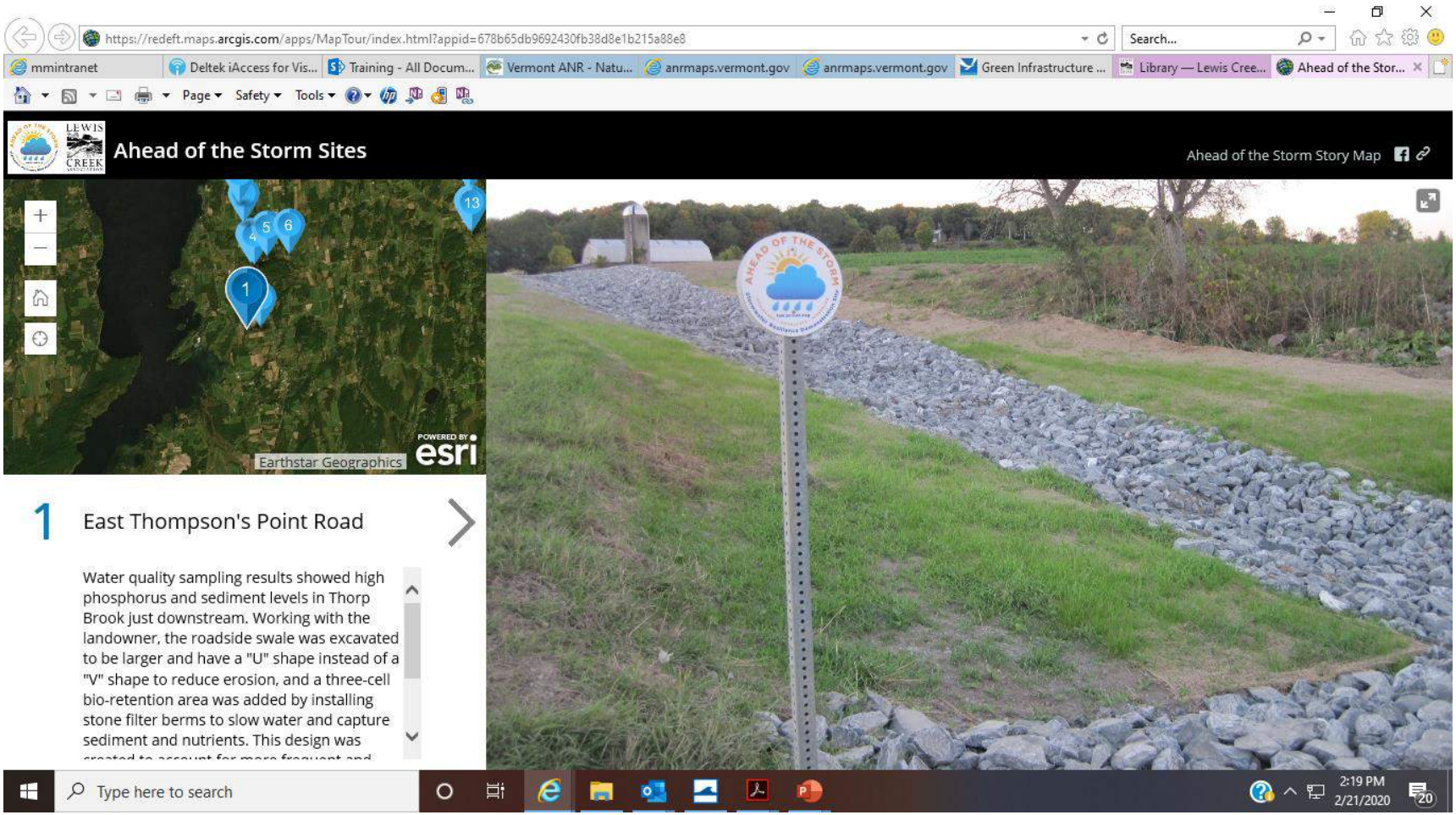
Ahead of the Storm – View the Storymap



- 15 locations designed
- Optimal Conservation Practices
- www.lewiscreek.org