Village of
Essex Junction
The economic engine of Vermont.

Village Manager's Office
2 Lincoln Street
Essex Junction, VT 05452

Office: (802) 878-6944
Fax : (802) 878-6946
www.essexjunction.org

March 25, 2016

Ms. Christy Witters
Vermont DEC
Watershed Management Section
1 National Life Drive
Montpelier, Vermont 05620-3522

Re: 2015 Report of General Activity
General Permit 3-9014
NPDES VTR 040000

Dear Ms. Witters:

Please accept this report of permit related activity for calendar year 2015 in compliance with the Village of Essex Junction MS4 Discharge Permit. Additional information above and beyond what is enclosed is available upon request.

Respectfully submitted,

James L. Jutras
Water Quality Superintendent

cc: Pat Scheidel, Village Manager

2015 ANNUAL COMPLIANCE REPORT
VILLAGE OF ESSEX JUNCTION
STORMWATER MANAGEMENT
PHASE 2 MS4
GENERAL PERMIT 3-9014
NPDES-VTR 040000

The Village of Essex Junction Notice of Intent was submitted in 2012 under General Permit 3-9014 issued on December 5, 2012. This report of activity is submitted in accordance with the terms and conditions of the permit and covers activity ranging from January 1, 2015-December 31, 2015 for the six minimum measures.

4.H.1 Public Education and Outreach & 4.H.2 Public Involvement/Participation

- Chittenden County Regional Stormwater Education Program (RSEP) and Chittenden County Stream Team (CCST) member.
    - RSEP Payment: $5,000 CCST Payment: $1,800
- Chair of RSEP and Co-Chair of CCST are Village staff.
- RSEP helped sponsored Connecting the Drops 3.0 event in Williston.
- RSEP "Slow the Flow" campaign encouraging residents to practice stormwater BMP's was published in the Essex Reporter.
- Water Quality Table at the Village Annual Meeting had 7 visitors
- Quarterly water bills sent to residents provide a link to SmartWaterWays.org.
- WWTF tours: 15 WWTF Virtual tour: 1 Stormwater Presentation: 3
    - Tours include: a) discussion on BMP's for stormwater runoff, pet waste control, toxic chemical disposal, fertilizer use, yard waste disposal and car washing b) awareness to the connection between personal practices and responsibility in protecting regional water quality c) how wastewater and stormwater management improve water quality d) discussion on the Lake Champlain watershed and how our actions directly affect its' water quality e) renewable energy in relation to water quality f) Lake Champlain TMDL.
- Total Number of pet waste rolls of bags distributed: 4,200
    - 48 rolls distributed at Village's Annual Meeting
    - Bags are purchased jointly and distributed through the Town of Essex (Town) and Village's Offices with the highest volume given out during annual pet registration.
    - 2,000 bags were purchased to refill the dog waste station on the Village recreation path located in the Countryside neighborhood.
- Illicit Discharge brochures are maintained in public display racks at the Village offices. A total of 23 were distributed (***See Appendix A).***
- "Erosion and Stormwater Runoff Control for Residential Construction Projects" brochure are handed out with development permits issued. A total of 51 were distributed (***See Appendix B).***
- Village newsletters sent via email provide information on water quality issues when appropriate and are distributed to about 950 people. The March newsletter mailed to homes and posted on the Village website included links to the smartwaterways and CCST websites (**See *Appendix C***).
- Water quality and stormwater management is noted in the Water Quality Reports printed annually as part of the Village Annual Report.

- Friends of Winooski in collaboration with CCST continued to perform water quality sampling on Indian Brook. Turbidity, total phosphorus, and chloride were measured ***(See Appendix D).***
- The Village in conjunction with the Town worked with two classes from Colchester and Essex High Schools to suggest water quality sample sites on Indian Brook, run E.coli samples and answer questions regarding water quality efforts. Staff also presented to students about stormwater LID's and MS4 permit requirements.
- VT Low Impact Development Guides are included with relevant permits are issued by the Village.
- On behalf of the RSEP/CCST members The Chittenden County Regional Planning Commission (CCRPC) accepted a 2014 "Stormy Award" from the New England Stormwater Collaborative for "Regional Collaboration Efforts to Achieve Better Water Quality" (**See *Appendix E).***

Appendix F and G summarize education and outreach efforts. General compliance detail for public involvement is available from the Village of Essex Junction Water Quality Superintendent upon request.

4.H.3 Illicit Discharge Detection and Elimination

- Total number of IDDE complaints or discoveries: 7
- Number of IDDE door tags distributed: 4
- 2 out of the 7 illicit discharge discoveries were motor oil sheens in catch basins (CB's) and occurred on Rivendell Dr., and Fairview Dr. All surrounding CB's were checked. Proper oil absorbing devices were placed in the CB, checked periodically and removed once the sheen was gone.
- 2 of the 7 illicit discharge discoveries were people draining potentially chlorinated water into CB's from pool and RV drinking tank cleaning. These discoveries occurred on Brownell Dr. and Rivendell Dr. The homeowners of both cases were spoken to and unaware how their actions could affect water quality. "Only rain down the drain" door tags were given to each homeowner. Alternative ways to drain their systems that are better for water quality were discussed.
- A private contractor performing brick restoration work at Lincoln Hall washed their grout equipment and buckets into a CB in the parking lot. Village staff met with the contractor and explained how it is not an acceptable practice. The CB was vacuumed out by Village staff before any contaminated water could spread.
- A citizen witnessed a landscaper washing out their hydro seeder over a CB behind Northern Oil Co. Village staff investigated and discovered that material had made it through the system to the outfall near Franklin Street but was retained in a grass swale near the outfall. Village staff met with the landscaping company owner on-site. Owner confirmed staff was washing equipment on the pavement near CB. We directed the owner to wash their equipment on their large grass/gravel lot next to the paved area and away from the CB to prevent and keep excess fertilizer from entering the waterways.
- CB 689 on Locust Ln appeared to have grout-like substance dumped in it. Evidence remained on the cover but there was no evidence of the dumping in the CB or surrounding infrastructure. "Only rain down the drain" door tag was distributed to the house directly behind the CB.
- Summer interns discovered a hose buried in grass that was leading to a CB on Waverly St. It was an overflow hose for a rain barrel. Although this is not technically an illicit discharge the interns wanted to use the opportunity to educate the homeowners about the proper use of a rain barrel. Unfortunately no one answered the door at the time.

4.H.4 Construction Site Stormwater Runoff Control

- See ***Appendix H*** for summary of construction site permits.
- The Planning Department, Water Quality Superintendent and Village Engineer review permit applications for potential impacts of site runoff and to ensure stormwater management is incorporated. A total of 5 major projects were reviewed.
- Site visits by Planning Staff are part of every construction permit and certificate of occupancy processes.
- Architectural Waste Summary & FAQ's sheet (Act 175), and the Chittenden Solid Waste District (CSWD) Construction and Demolition Disposal Option sheets are included with every permit issued.
- # of "Erosion and Stormwater Runoff Control for Residential Construction Project" pamphlets given out: 48
- # of projects disturbing greater than 1 acre land: 6
- # of projects disturbing less than 5 acres of land with greater than 1 acre impervious surface: 2
- # of erosion control site visits and inspections: 50
- Other major construction projects included the Maple Street culvert repair, Main Street infrastructure improvements, Hillcrest Drive infrastructure improvements, The Village Walk Development on Kiln Ext and Maple St, Village at Autumn Pond Development on Autumn Pond Way and Riverside in the Village on Franklin St. In addition, condos at Whitcomb 2 & 3 continue to be built on existing planned infrastructure.
- Major projects (like the ones listed above) are reviewed periodically for site stability. Any issues are brought to the attention of responsible parties.

4.H.5 Post Construction Stormwater Management

- Stormwater management files are maintained for all valid & expired permitted sites in the Village.
- Post construction stormwater management and future maintenance requirements are inherent in the design review provided by the Village staff.
- Staff performed construction engineer's inspection and as-built verification for all infrastructure annually. Maintenance and repairs are scheduled along with work required in permit areas.
- Monitoring and inspection for erosion control measures at Whitcomb 2/3 developments continues during construction. The Village has accepted this infrastructure, understanding there will be incremental site development in accord with the original permit and that site modifications as directed by the Village.
- Champlain Water District contacted Village staff about bank erosion near one of their water transmission mains that feeds IBM/Global Foundries located behind Riverside in the Village. Village staff inspected the area confirming an erosion problem there. The property manager of Riverside in the Village was notified and told to come up with a solution.
- Watershed Consulting Associates LLC. Conducted their annual stormwater site inspection at Handy Suites stormwater permit # 6358-9020, submitting copies of the report to the Village and DEC.

4.H.6 Pollution Prevention/Good Housekeeping for Municipal Operations

- The Joint Stormwater Coordinating Committee formed between the Village and Town continues to work cooperatively on MS4 permit requirements and other emerging stormwater permit needs from the pending TMDL release. Continued work includes FRP project development, expired permit and joint ordinance/design standards review.

- Work continues annually on updating and improving CB, water line, sewer manhole and sewer line repair maps. These digitized maps are available for use in the field.
- Comprehensive system inspections of all CB's were performed by staff and summer Town/Village interns. Emphasis was on system integrity, identification of map conflicts, maintenance/repair and cleaning CB's as necessary. Findings were verified by the Water Quality Superintendent or Environmental Technician.
    - Approximate # of CB inspected: 850
    - # of CB cleaned: 145
    - All CB's on Main St., Pearl St., Park St., Lincoln St. and Maple St. were inspected in detail and cleaned (except 5 Corner intersection to RR crossings) in anticipation of being paved in 2016.
    - Amount of tailings collected from CB: 3 cubic yards or 0. 81 tons
    - CB tailings are collected, stockpiled and properly managed at a state approved waste management area.
    - # Storm drains marked: approx. 600. of the approx. 850 CB inspections (230 CB were missing markers). No missing markers were replaced this year.
- Fleming School requested the Village clean all CB on property. 1 cubic yard or 0.24 tons of material was removed from the CB's.
- The VorTech swirl separator units' installed at Five Corners North, Brookside Dr. and Fairview Farms Hawthorn Circle are periodically inspected (30+/- times) by staff and regular preventative maintenance occurs. The units are cleaned annually. A total of 2 cubic yard or 0.5 tons were removed.
- Oil removing device or 'PIG" was replace at the discharge of the Five Corners North stormwater system. It is used as a preventative effort to stop stormwater runoff (which may contain synthetic oil) from the densely populated portion of the Village from entering Indian Brook.
- # of outfalls inspected: 187
    - Of the 192 mapped outfalls in the Village, 187 were found, photographed and inspected by summer interns showing more ground truthing of maps is needed.
- # of stormwater ponds inspected: 6
    - All Village owned pond inlets, overflows, outfalls and related structures were inspected and photographed (Total: 4 stormwater ponds)
    - Two private stormwater ponds were inspected: 1) Champlain Valley Expo (CVE) and 2) Essex High School
- All public roads are swept several times a year with street sweeper.
    - # of road miles swept: 71 lane miles
    - Estimated amount of material removed: 620 cubic yards or 167.4 tons
    - 440 cubic yards of the total 620 cubic yards removed was during the Fall months
- # Site plan reviews for stormwater management: 5
- Main St from 81 (Town of Essex offices) to Taft St had stormwater infrastructure improved to better manage stormwater and reduce erosion. Improvements included: angle of road shoulder, increasing culvert size, stone lining ditch and curb cutting CB's.
- The Wastewater Facility (WWTF) maintains a Sewage Spill Prevention Plan (SSPP) for the community in compliance with state regulation and is subject to periodic review.
- Public Works and WWTF maintained Exempt Small Quantity Generator Status for hazardous materials and disposal. This year fluorescent light bulbs and oily rags were disposed of.
- The WWTF continues with monitoring and reporting for Tier 2 regulatory requirements for "Community Right to Know" compliance, for all Village Departments.

- Sewer line maintenance continues. All sewer backups and causes are tracked. Problem areas are proactively monitored to prevent release of raw sewage to the waters of the State.
- The Village continues with liquid land application of certified biosolids with the Whitcomb Farm using subsurface injection equipment, as part of their nutrient management plan. The fertilizer (including manure) is injected into the root zone for stable fertilizer application and minimization of runoff. This leads to more efficient operations and reduced nutrient runoff potential into the Winooski River and Lake Champlain.
- Our WWTF biosolids land application program and farm partner, Whitcomb Farm, were featured in two magazines this year; TPO (Treatment Plant Operator) and BioCycle.
- Green-Up Day 2015: 4 tires and 0.56 tons of trash collected.
- # of stormwater erosion complaints or issues by residents: 6
    - All resident complaints related to stormwater were investigated and resolved.
- Culvert #1007 on Warner Ave was reported to be plugged with debris in July. Public works removed the debris (pine needles & large branches) restoring flow through culvert.
- The Village and Town hired Watershed Consulting Associations LLC. in conjunction with Aldrich & Elliott to compile the Flow Restoration Plans for Indian and Sunderland Brook which were submitted for State review prior to the October 1, 2016 completion deadline.
- The Village in partnership with Town hired 2 summer interns to perform work related to MS4 permit requirements. Projects included inspections and justification of infrastructure, outfalls and expired permit areas.
- The Village also hired an additional summer intern who helped with further field assessment of stormwater infrastructure and water quality testing.
- Nine employees participated in RSEP sponsored municipal workshop training on "Low Impact Development" resulting in 2 hours of training.
- Employees attended an informational meeting regarding the new Water Quality Standards adopted by ANR and the inclusion of chloride in those standards.
- Village/Town purchased two conductivity meters/data loggers (1 portable & 1 long-term stationary) to perform in-stream water quality testing for chloride. Interns conducted regular testing during the summer to help establish baseline levels in both stormwater impaired Indian and Sunderland Brooks. See ***Appendix I*** for their report.
- The Village continues to encourage green stormwater infrastructure into project designs and has successfully maximized infiltration/stormwater control on every major project brought before the Village in 2015.
- Village staff attended numerous stakeholder meetings and presentation regarding the upcoming release of the TMDL.
- The Homeowner's Condominium Association in permit area 3547-9010R have placed three Scoop the Poop signs along the streets as there is a large dog population in that area.
- Village staff have been meeting with expired stormwater permit holders in an effort to bring those permits into compliance as required by the MS4 permit. A Expired Stormwater Ordinance was created and adopted by both the Village and Town to allow for a mechanism for the permits to be brought into compliance
- Stormwater program operating budget was combined into the Town operating budget in July 2015. As a result it is hard to estimate the total Village stormwater budget for 2015. The estimated program operating budget for 2015 is $72,000. The combined FY2016 budget for the Town and Village is $282,269.
- ***Appendix J*** is "Chittenden MS4 Municipal Stormwater Program Accomplishments" as tracked by Jim Pease from the VT DEC.
- ***Appendix K*** is "The Village of Essex Junction 2015 MS4 Municipal Stormwater Program Indicators"

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Dated at Essex Junction, Vermont this 25th day of March, 2016.

Signature: _____

Pat Scheidel, Village Manager
Village of Essex Junction

Signature: _____

James L. Jutras, Water Quality Superintendent
Village of Essex Junction

Appendix A

Reporting of Illegal Dumping or Suspicious Discharges

We rely greatly on the public in reporting suspicious activity. We cannot catch all illicit discharges on our own.

If you observe illegal dumping or pollutants in any storm drain or stream, please contact the Village of Essex Junction at 802-878-6944 or use our online form at www.essexjunction.org. Your identity is not disclosed.

Reporting of illicit discharges is the right thing to do and it's the law! See the Village of Essex Junction Illicit Discharge Detection and Elimination Ordinance available at www.essexjunction.org. (Land Development Code Ch. 7 Sec. 713)

Other Resources

CSWD CHITTENDEN SOLID WASTE DISTRICT | 802.872.8111 | info@cswd.n
Responsible Resource Management for Chittenden County, Verm

SMART Water WAYS
Add Up to Cleaner Water

Chittenden County STREAM TEAM

Village of Essex Junction

2 Lincoln Street
Essex Junction, VT 05452

www.essexjunction.org

Illicit Discharge Detection and Elimination

Village of Essex Junction

Keep our streams clean!

Only rain down the drain!

Village of Essex Junction

Tel: 802-878-6944

What is an Illicit Discharge?

"...Any discharge to the municipal separate storm sewer system that is not composed entirely of storm water..." (EPA)

Illicit discharges occur from improper disposal of material down the storm drain by homeowners or from illegal connections to the storm drain system from a home, business or commercial property.

Illicit discharge examples:

- Untreated sewage
- Car wash wastewater
- Motor oil disposal
- Laundry wastewater
- Leaves and yard waste
- Household cleaners
- Pesticides and fertilizers
- Pet waste
- Trash
- Construction debris
- Home improvement waste

In our community these discharges enter the storm drain system via a catch basin and flow **UNTREATED** to Indian Brook, Sunderland Brook, Winooski River and into Lake Champlain.

Ways to Keep Illicit Discharges Out of Our Waters

- Washing your car: Go to a commercial car wash facility or wash your car on the lawn to prevent runoff into the road.

- Household products: Products such as paints, florescent light bulbs, and used auto fluids can be recycled for free at the CSWD Environmental Depot, 1011 Airport Parkway, South Burlington, VT. For a full alphabetical list of items and disposal location please visit this website: http://www.cswd.net/recycling/a-z/

- Washing machines: Make sure your washing machine drains into the sanitary sewer system.

- Construction debris: Debris, such as concrete and mortar, can be disposed of at some CSWD drop-off locations or by dumping surplus in trash and washing container in sink. Visit this website for more information http://www.cswd.net/. DO NOT dump any debris down the storm drain!

- Scoop the Poop! Pick up after your pet by using a bag or scooper and disposing of the waste in the trash or flush it unwrapped. The Village of Essex Junction and the Town of Essex municipal offices have free disposable pet waste bags.

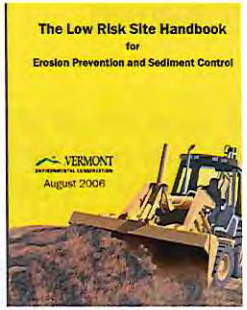
- Yard debris: Debris such as grass clippings, leaves and brush can be disposed of for free at any CSWD drop off center, Green Mountain Compost or McNeil Wood and Yard Waste Depot.
For more information visit: http://www.cswd.net/recycling/a-z/#yard.

Appendix B

Free Helpful Handbooks

- The Low Risk Site Handbook for Erosion Prevention and Sediment Control: http://www.vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf
- Vermont Low Impact Development Guide for Residential and Small Sites:http://ecvermont.org/wp/wp-content/uploads/2012/12/LIDGuide.pdf
- The Small Sites Guide for Stormwater Management: http://www.vtwaterquality.org/stormwater/docs/swimpairedwatersheds/sw_rda_small_sites_guide.pdf

Other Resources



SMART Water WAYS

Add Up to Cleaner Water

Chittenden County STREAM TEAM

Village of Essex Junction

2 Lincoln Street
Essex Junction, VT 05452
www.essexjunction.org

Erosion and Stormwater Runoff Control for Residential Construction Projects

Why it is important to keep soil on your property during an at-home construction project.

Village of Essex Junction

Village of Essex Junction

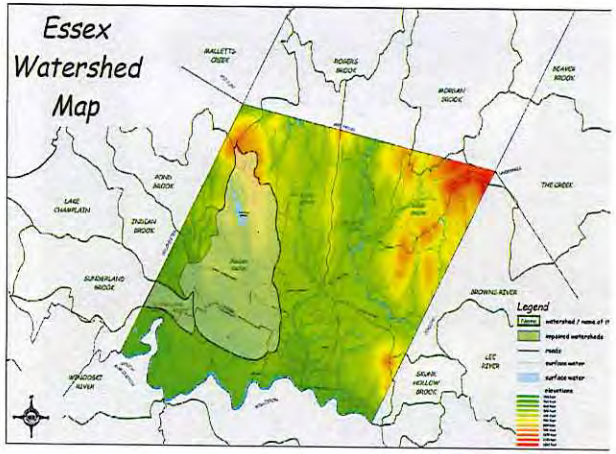
Tel: 802-8787-6944

Why Control Erosion & Stormwater Runoff?

Erosion and stormwater runoff control measures are important at any construction project. Erosion control protects the water quality of our streams and lakes, your soil and saves money.

Stormwater runoff contains soil, debris and nutrients (like phosphorus) which can result in algae blooms in our streams and lakes.

REMEMBER your property may be small but it is part of the bigger picture. Collectively your home along with others can represent a significant source of soil erosion and pollution into our waterways!



Tips To Reduce Erosion & Stormwater Runoff

- Keep soil & sediment off of driveway or other hard surfaces. Cover soil piles that are not in use with a tarp.

- Cover bare and exposed surfaces with mulch, hay or other similar materials.

- Establish permanent ground cover such as grass and plants as soon as possible

Source: http://www.titanalaska.net/Landscaping/Hydroseed/HydroseedErosion.html

- Downspout extenders can be used to protect temporarily stabilized areas from roof runoff by directing water from rain gutters to paved or grass areas. Once permanent ground cover is established remove the extenders.

Source: http://www.parkrangeconstruction.com/drainage-improvements/

Appendix C

Chelsea Mandigo

From: Village of Essex Junction <darby=essexjunction.org@mail76.atl51.rsgsv.net> on behalf of Darby Mayville
Sent: Monday, May 11, 2015 7:02 AM
To: Chelsea Mandigo
Subject: Weekly Village News

Weekly Village News

Events & Activities

Monday, May 11th

- There is no school today for Freshman and Seniors.
- Town Meadow will be holding Breakfast for Seniors at 8:30 AM.
- The Senior Center will be holding Mah Jongg Lessons at 10 AM.
- The Senior Center will be offering Mah Jongg at 10 AM
- Essex Free Library will be holding Drop-In Storytime at 10:30 AM.
- Covenant Community Church will be holding a Senior Meal at noon.
- Sweet Clover Market will be holding a Granny Blossom Specialty Food Tasting at noon.

- EJRP will be holding a Tennis Play Day on Saturday.
- The FriendCHIPS 5k Race for Mentoring will be held on Saturday.
- The Senior will be having an Art Show Reception on Saturday.
- The Darkroom Gallery will be holding an artist's reception for "Semblance" on Sunday from 5 PM-7 PM.
- The Darkroom Gallery will be holding an Artists Talk/Book Signing:Ed Rubin: Vermont: An Outsiders Inside View at 5 PM.
- Essex Parks & Recreation will be scheduling a senior trip to see "The Tempest" on Sunday.
- The Living Room will be having a Gallery Reception for Emily Mitchell on Sunday.

News & Information

- The Essex Junction Senior Center is sponsoring a trip to the Winnipesaukee Playhouse in Meredith, NH on Thursday, July 16 aboard a luxury Premiere Coach! $75 ($67 for members of the Center or Essex Senior Citiziens, Inc.) includes a wonderful show called "Table Manners", lunch at Canoe Restaurant, and transportation. Please call Lou Ann at 876-5087 for more information or to purchase your ticket!
- The the Essex Junction Land Development Code: Garage Sales, Yard Sales. Within any Residential Zoning District, garage sales or yard sales of common household goods and appliances may be approved upon submittal of a Temporary Use permit application pursuant to Section 502(d). Temporary sales for the above purposes shall be permitted for a period of three (3) days. No more than four (4) permits for any one location may be issued in any calendar year. A garage sale permit can be found here.
- On behalf of nine municipalities and three organizations, the Chittenden County Regional Planning Commission (CCRPC) recently accepted a 2014 Best Stormwater Idea in New England "Stormy Award" from the New England Stormwater Collaborative. The award for "Regional Collaboration for Enhanced Stormwater Program Efficiency" recognizes the combined and coordinated efforts of the municipalities of Milton, Colchester, Winooski, Essex, Essex Junction, Williston, Burlington, South Burlington and Shelburne plus Burlington International Airport, the University of Vermont and the Vermont Agency of Transportation in creating and operating regional public awareness programs that aim at reducing the impacts of stormwater runoff. To read the press release click here. For more information about these programs visit http://ccstreamteam.org/ and http://smartwaterways.org/.

This newsletter is a new and evolving document for the Village! If you have ideas on how it could be improved, or know of events that you would like to be included in next week's newsletter, please reply to this e-mail and let us know! Please reply to this e-mail if you would like to unsubscribe.

Chelsea Mandigo

From: Village of Essex Junction <darby=essexjunction.org@mail76.atl51.rsgsv.net> on behalf of Darby Mayville
Sent: Monday, March 16, 2015 7:01 AM
To: Chelsea Mandigo
Subject: Weekly Village News

Weekly Village News

Events & Activities

Monday, March 16th

- All ETSD Schools will be off today.
- Taxes are due today.
- Town Meadows will be holding Breakfast for Seniors at 8:30 AM.
- The Senior Center will be holding Mah Jongg Lessons at 10 AM.
- The Senior Center will be holding Mah Jongg today and Friday at 10 AM.
- Essex Free Library will be holding Drop-In Storytime at 10:30 AM.
- CVAA will be holding a Senior Meal at Covenant Community Church at noon.

- The Essex Skating Facility will be holding a Public Skate on Sunday.
- Green Mountain Harley will be holding a HOG Appreciation Dinner on Sunday.
- The Living Room will be holding Parent & Child Yoga on Sunday.
- The Darkroom Gallery will be holding an artist's reception for the exhibit "Lines" on Sunday.

News & Information

- The VFW is hiring a Canteen Manager.
- EJRP is hiring for the summer.
- From Chapter 5 of the Essex Junction Municipal Code, Regulation of Dogs:

SECTION 501:
No person shall keep a dog that becomes a public nuisance by excessive barking, howls, or any other manner. No person who owns a dog or is responsible for the keeping or control of a dog shall permit the dog to roam freely out of such person's control. "Control" is defined as being on the owner's property or being on a leash of the owner, agent or guardian of the dog. (Amended Sept. 8, 1998)
SECTION 502:
A person who owns a dog or is responsible for the keeping or control of a dog shall be responsible for cleaning up after the dog when the dog is off such person's property.
SECTION 503:
A person whose dog defecates off the owner's property or in the public right-of-way shall be required to pick up any fecal matter and properly dispose of it in a trash container. (Amended 6/24/03)
SECTION 504:
Dogs accompanied by an owner, agent or guardian shall be permitted to be off-leash within the confines of the fenced-in dog park located at 111 West Street, according to the regulations for use of the park as adopted and enforced by the Essex Junction Recreation Department. (New Section 504 adopted 1/31/12)

This newsletter is a new and evolving document for the Village! If you have ideas on how it could be improved, or know of events that you would like to be included in next week's newsletter, please reply to this e-mail and let us know! Please reply to this e-mail if you would like to unsubscribe.

Appendix D

Chittenden County STREAM TEAM

2015 Volunteer Water Quality Monitoring Report

The Monitoring Team

The Chittenden County Stream Team (CCST) is a program to engage citizens across an eight-town area to implement projects to reduce non-point source pollution and stormwater volume at the local level. The participating towns are Burlington, Essex, Essex Junction, Milton, Shelburne, South Burlington, Williston, and Winooski. The project is managed by the Chittenden County Regional Planning Commission, and run by the Winooski Natural Resource Conservation District and the Friends of the Winooski River. This report describes the results of the forth year of a stream water quality monitoring effort by the CCST.

When, Where, and What We Monitor

During the summers of 2012-2015, the CCST has collected biweekly water quality samples at fourteen sites on eight area streams. These urban or suburban streams suffer from sedimentation, excessive nutrient loads, high temperatures, bacteria, and other pollutants. In 2015, samples were collected on a total of six sampling dates and analyzed for turbidity, total phosphorous, and chloride. These parameters were also sampled at five of the sites during a rain event on 8/11. The specific sampling sites and their locations are listed in Table 1 and a map of the sites is shown in Figure 1.

Table 1. Chittenden County Stream Team 2015 Water Quality Sampling Sites

Location	Waterbody	Site ID	Lat / Long
Grove Street in Burlington	Centennial Brook	Cent 10	44.48453 / -73.18423
Champlain School Comm. Gardens	Englesby Brook	Englesby 10	44.45627 / -73.21394
Essex High School	Indian Brook	Indian 10	44.49668 / -73.11093
Lang Farm in Essex	Indian Brook	Indian 20	44.50442 / -73.09190
McMullen Road	Malletts Creek	Milton 10	44.60779/ -73.20103
Route 7 and Bay Road	Monroe Brook	Monroe 10	44.38987/ -73.21730
Spear & Webster Intersection	Monroe Brook	Monroe 20	44.38984 / -73.20103
Landry Park Winooski	Morehouse Brook	Morehouse 10	44.50037 / -73.19370
River Cove Road in Williston	Muddy Brook	Muddy 10	44.47293 / -73.13505
Marshall Avenue in South Burlington	Muddy Brook	Muddy 20	44.45340 / -73.13833
Van Sicklen Road in Williston	Muddy Brook	Muddy 30	44.42823 / -73.14622
Kindness Court in South Burlington	Potash Brook	Potash 10	44.44572 / -73.21348
Farrell Street in South Burlington	Potash Brook	Potash 20	44.44660 / -73.20415
Dorset Street in South Burlington	Potash Brook	Potash 30	44.45150 / -73.17849
Wheeler Nature Park, S. Burlington	Potash Brook Trib	Wheeler 10	44.44188 / -73.16740

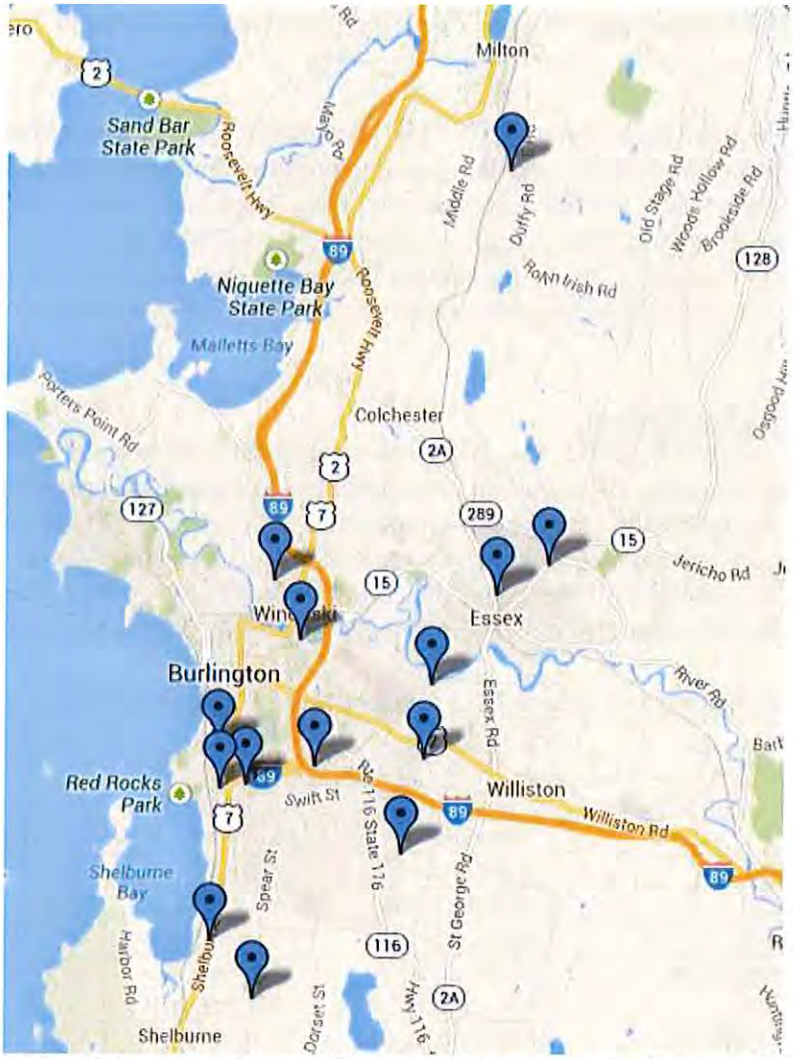


Figure 1. Chittenden County Stream Team water quality monitoring sites.

2015 Water Quality in Chittenden County Streams

All of the monitoring sites were sampled on each of the biweekly sampling dates during both rainy and dry conditions. The only regular biweekly sampling date that was not dry was on 6/23. Rain was falling at most sites during the sampling on this date, and most streams' flow categories were described as "freshets". On all other dates (with the exception of a designated rain event sampling on 8/11), stream flows were categorized as "baseflow" at all sites, with medium or low flow levels. Since stormwater runoff has a great affect on water quality, we analyzed the sampling data in two ways: one method in which only the dry weather, baseflow conditions are included, and another where only rain event data are included. In the case of chloride data, an overall mean was also calculated because Vermont's standards for chloride levels in streams do not consider flow levels.

The 2015 results are similar to those obtained in 2012-2014, and indicate that all Chittenden County streams sampled have phosphorus levels well above the Vermont standard. Chloride levels also exceed the standard on several streams. Tubidity levels, however, are below state standards on all streams sampled.

Chittenden County STREAM TEAM

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Chloride Results

A summary of 2015 chloride data for CCST streams is shown in Table 2. Mean chloride levels were high in Centennial, Englesby, and Potash Brooks, where they exceeded the proposed state standard of 230 mg/L. While a low level of chloride in streams can originate from natural sources, higher levels are usually due to the use of road salt. Chloride levels in Chittenden County streams were generally highest during dry conditions. This is a typical pattern seen in streams affected by chloride in the groundwater with rain having a diluting effect resulting in lower chloride readings. Raw chloride data can be found in Appendix C.

Site ID	Min Chloride	Mean Chloride	Mean Chloride, Dry Conditions Only	Mean Chloride, Rain Events	Max Chloride
Centennial 10	433.8	520.5	525.5	508.0	582.3
Engelsby 10	99.9	278.5	314.3	99.9	423.5
Indian 10	45.7	161.2	182.0	109.0	286.2
Indian 20	11.7	67.1	77.8	13.4	183.6
Milton 10	17.6	30.7	33.3	17.6	48.4
Monroe 10	43.9	79.5	85.8	48.1	152.9
Monroe 20	18.0	27.9	29.4	20.0	43.0
Morehouse 10	42.3	80.8	84.1	72.7	103.0
Muddy 10	54.1	77.2	79.7	65.0	111.8
Muddy 20	49.3	68.8	70.1	65.7	104.5
Muddy 30	23.9	25.5	25.6	25.1	27.5
Potash 10	185.0	327.8	380.0	185.0	424.0
Potash 20	205.7	339.6	361.9	315.1	424.4
Potash 30	161.8	260.3	291.5	161.8	313.2
Wheeler 10	21.1	50.6	56.5	21.1	68.6

Table 2. 2015 CCST Chloride Results Summary: Minimum, mean, and maximum chloride levels in Chittenden County Streams. Mean values are given for all samples, samples taken only during dry, low flow conditions, and samples taken during rain events. Overall mean values exceeding the Vermont chronic chloride standard of 230 mg/L are highlighted in orange. Note that the mean rain event values were calculated based on only one or two samples.

Chloride levels in Chittenden County Streams 2012-2015

A comparison of the mean levels of chloride at each of the sampling sites for sampling years 2012-2105 are shown in Figure 2. Centennial and Potash Brooks had mean chloride levels that exceeded the EPA chronic criterion of 230 mg/L in all years. In 2014 and 2015, mean chloride levels exceeded this standard in Englesby Brook as well. Chloride levels in these three problem streams were higher in 2014 than in other years, likely due to the drier summer that year. None of the individual samples for any of the CCST monitoring sites in any year had chloride levels that exceeded the EPA's acute standard, which is 860 mg chloride/L.

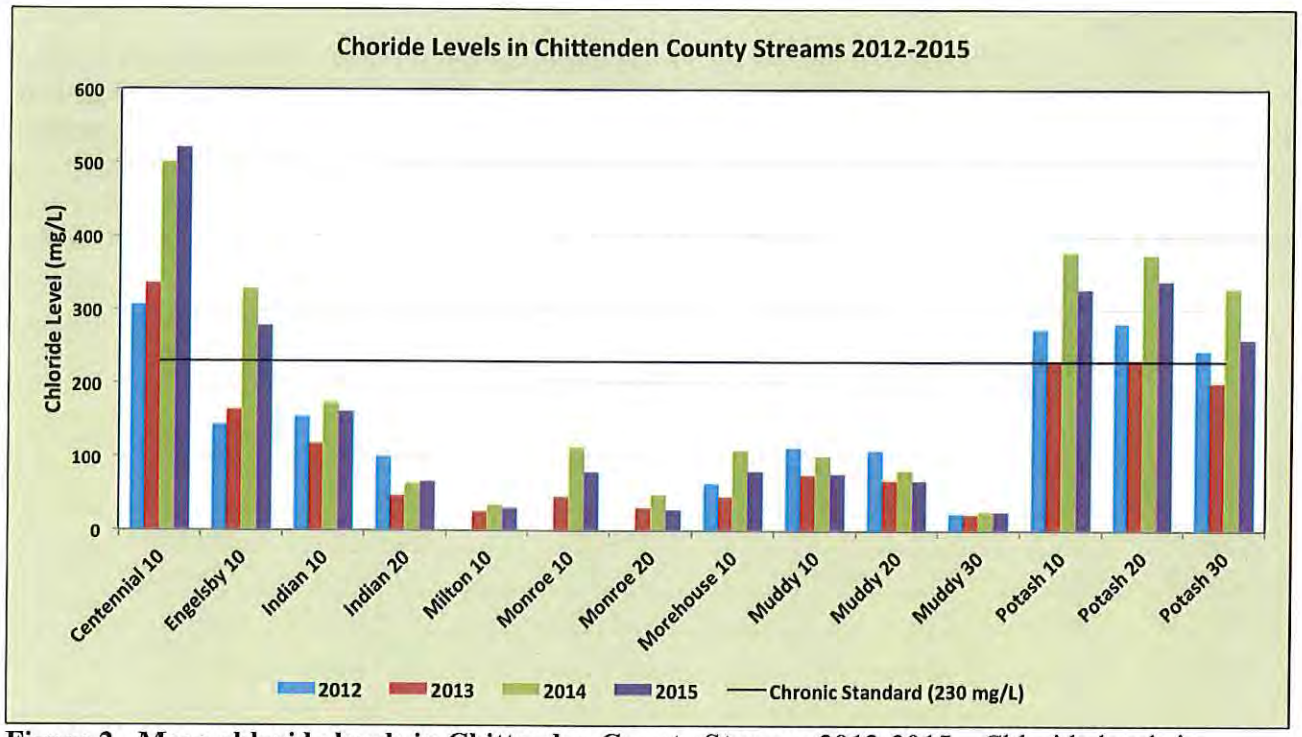

Figure 2. Mean chloride levels in Chittenden County Streams 2012-2015. Chloride levels in samples collected in all weather conditions were used to calculate the mean. The EPA and Vermont standard for 4-day average chloride levels (230 mg/L) is shown by the dotted line. This is the concentration of chloride above which chronic health effects have been observed in of aquatic species.

The high chronic levels of chloride in Centennial, Potash, and Engelsby Brooks are of major concern since sustained elevated chloride can interfere with the survival and reproduction of freshwater aquatic organisms. The EPA, when recommending the 230mg/L criterion, stated, "Freshwater aquatic organisms and their uses should not be affected unacceptably if the four-day average concentration of dissolved chloride, when associated with sodium, does not exceed 230 mg/L more than once every three years on the average." In 2015 Centennial Brook had the highest average chloride value of all four years of sampling by the CCST. Of the 26 samples the CCST has collected in Centennial Brook over the past four years, only 3 have had chloride levels below 230mg/L. Potash and Englesby Brook are similarly affected, and while their chloride levels are somewhat lower than those of Centennial Brook, most of the samples collected from both brooks in 2014 and 2015 are well over 230mg/L, and chloride levels in these streams appears to be on an upward trend.

Phosphorus Results

A summary of the 2015 phosphorus results in shown in Table 3. Mean phosphorus levels exceeded the proposed Vermont state standard of 27ug/L in all samples at all sites in 2015 and were especially high on Muddy Brook. All streams had total phosphorus levels well above 10ug/L, the target phosphorus concentration for Lake Champlain (Main Lake). Raw data is presented in Appendix C.

Site ID	Min Phosphorus	Mean Phosphorus	Mean Phosphorus, Dry Conditions Only	Mean Phosphorus, Rain Event(s)	Max Phosphorus
Centennial 10	65.7	94.1	84.7	117.4	164.0
Engelsby 10	41.7	106.6	56.6	357.0	357.0
Indian 10	32.7	47.9	38.7	71.0	78.5
Indian 20	26.9	44.7	43.3	51.4	62.7
Milton 10	23.5	35.1	35.0	35.9	47.2
Monroe 10	37.0	48.0	45.6	59.8	59.8
Monroe 20	38.2	75.0	50.2	199.0	199.0
Morehouse 10	27.4	65.1	31.3	149.8	208.0
Muddy 10	66.4	79.2	75.7	96.5	96.5
Muddy 20	57.4	90.8	92.1	87.7	114.0
Muddy 30	56.7	106.7	116.2	58.9	165.0
Potash 10	23.5	39.7	30.7	83.1	83.1
Potash 20	26.6	35.5	31.7	46.5	58.3
Potash 30	50.9	56.3	57.6	56.8	67.4
Wheeler 10	35.3	56.5	46.1	108.0	108.0

Table 3. 2015 CCST Phosphorus Results Summary: Minimum, mean, and maximum phosphorus levels in Chittenden County Streams. Mean values are given for all samples, samples taken only during dry/low flow conditions, and samples taken during rain events (freshet flows). Overall mean values exceeding the Vermont chronic chloride standard of 27 ug/L are highlighted in orange. Note that the mean rain event values were calculated based on only one or two samples.

Phosphorous Levels in Chittenden County Streams 2012-2015

The state of Vermont's base-flow phosphorous standard is 27 ug/L for class B, "warm water medium-gradient streams" and 15 ug/L for "medium (sized) high-gradient streams." We are assuming most of the streams monitored by the CCST would fall under the first category, although the streams monitored are not listed as warm-water streams in the 2014 Vermont Water Quality Standards. This concentration is indicated by a dotted line in Figure 3, which shows a comparison of the mean phosphorus levels during dry conditions for all four years of CCST monitoring.

Mean phosphorous levels in dry, base-flow conditions at the majority of the sites sampled were well above the 27ug/L standard. 2014 and 2015 phosphorus levels were generally lower than in 2012 and 2013, probably because both years were relatively dry, and phosphorus enters streams when fertilizers, animal waste, sediment, etc., get washed into streams via surface runoff. Muddy Brook, which forms the border between South Burlington and Williston, had particularly high levels in all years, especially at the most upstream site (Muddy 30). The Muddy Brook watershed upstream from Muddy 30 includes the Vermont National Country Club, Shelburne Pond, agricultural farmland, and suburban development.

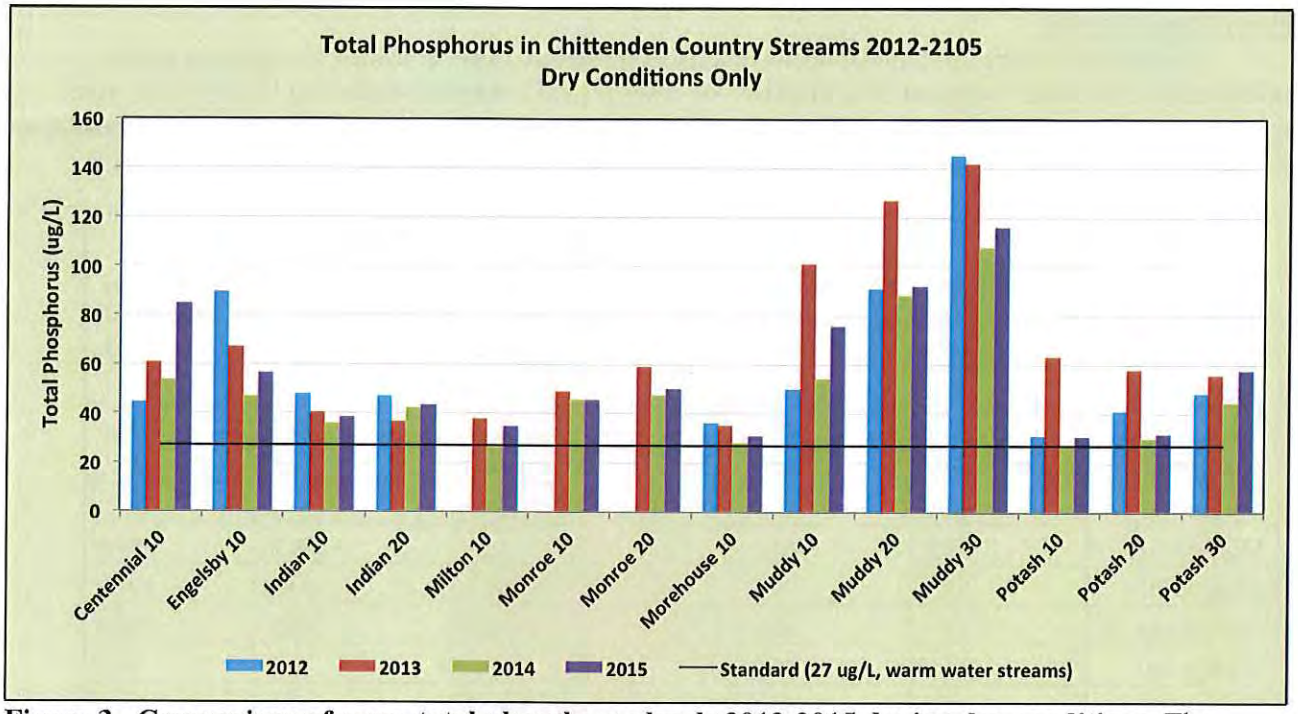

Figure 3. Comparison of mean total phosphorus levels 2012-2015 during dry conditions. The standard proposed by the State of Vermont for mean total phosphorus at base-flow in medium gradient, warm water streams (27 ug/L) is indicated by the dotted black line.

Turbidity Results

None of the 2015 mean turbidity values from any of the sampled streams exceeded the VT Water Quality standard for turbidity of 25 nepholometric units (NTU) for warm-water fish habitat. However, average turbidity levels in Centennial, Indian, and Muddy Brooks were above the 10 NTU standard for cold-water fish habitat, and turbidity levels at some sites were quite high after rain events.

Site ID	Min Turbidity	Mean Turbidity	Mean Turbidity, Dry Conditions Only	Mean Turbidity, Rain Events	Max Turbidity
Centennial 10	7.0	24.4	21.1	32.5	58.0
Engelsby 10	5.0	22.5	6.7	101.4	101.4
Indian 10	6.8	9.5	7.5	14.4	20.3
Indian 20	4.6	12.0	10.8	17.7	19.5
Milton 10	3.2	6.1	5.9	7.1	8.2
Monroe 10	3.8	8.6	8.0	11.5	11.5
Monroe 20	3.9	10.4	6.0	32.5	32.5
Morehouse 10	3.2	27.5	5.9	81.7	137.2
Muddy 10	6.6	14.4	11.1	30.8	30.8
Muddy 20	8.4	11.8	10.9	14.0	15.9
Muddy 30	4.6	7.8	8.0	6.7	12.3
Potash 10	2.6	5.0	2.7	15.8	15.8
Potash 20	1.3	3.1	1.9	6.6	10.6
Potash 30	6.3	7.3	7.6	6.8	9.3
Wheeler 10	2.9	8.8	4.6	29.8	29.8

Table 4. 2015 CCST Phosphorus Results Summary: Minimum, mean, and maximum phosphorus levels in Chittenden County Streams. Mean values are given for all samples, samples taken only during dry/low flow conditions, and samples taken during rain events (freshet flows). Note that the mean rain event values were calculated based on only one or two samples, while the dry condition values are based on 5 data points.

Turbidty Levels in Chittenden County Streams 2012-2015

Figure 4 shows a comparison of turbidity levels from all four years of CCST sampling. Mean values in all four years fell below the VT standard for warm-water streams of 25 NTU (Nephelometric Turbidty Units) but exceeded the standard for cold-water streams at several sites.

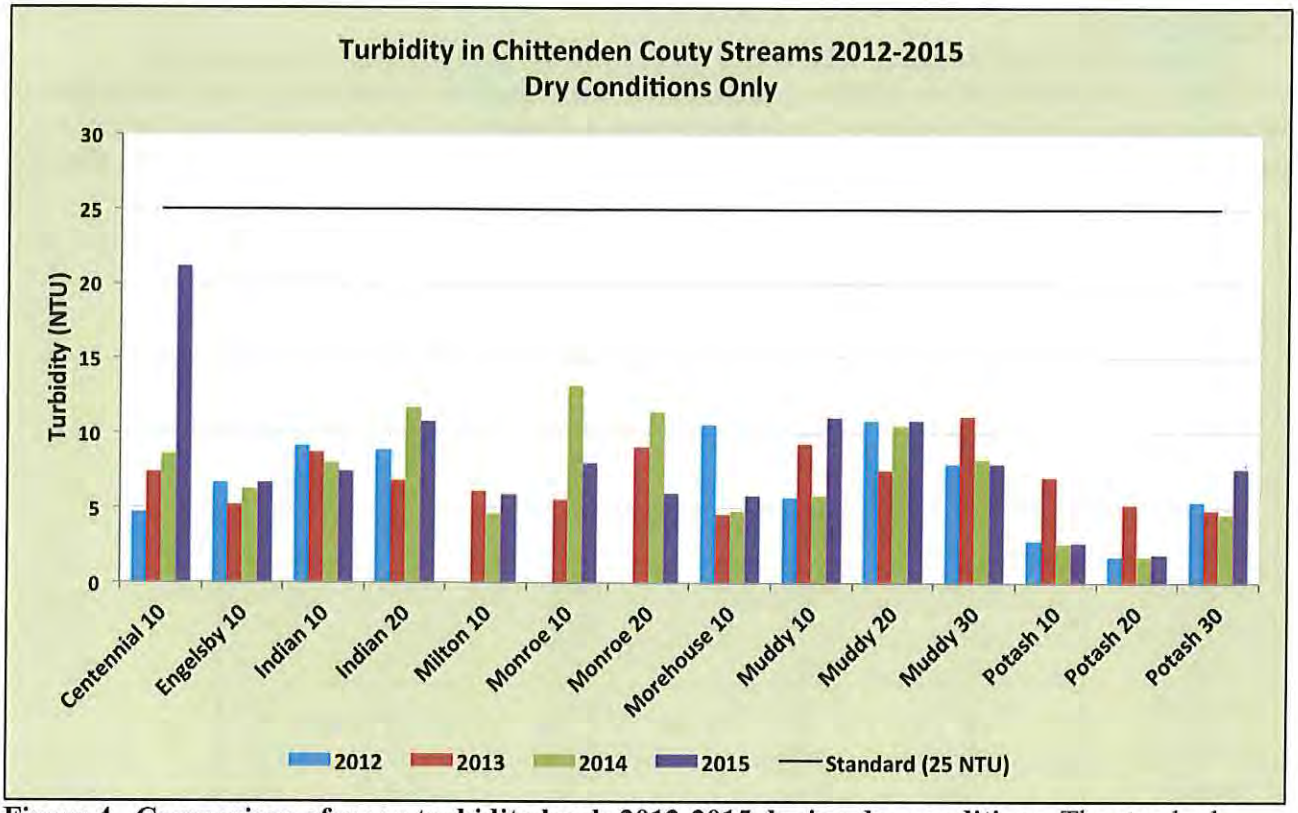

Figure 4. Comparison of mean turbidity levels 2012-2015 during dry conditions. The standard proposed by the State of Vermont for mean turbidity at base-flow in medium gradient, warm water streams (25 NTU) is indicated by the dotted black line.

E. coli Results

The presence of *E. coli* in surface waters is used as an indicator of fecal contamination. Sources of fecal matter in streams include leaks or overflows from sewer or septic systems, pet waste, and wildlife. While not necessarily a health hazard per se, the presence of *E. coli* is often associated with the presence of pathogenic bacteria or viruses that can cause illness in humans. In 2015 the Chittenden County Stream Team began *E. coli* sampling at Wheeler Brook at the request of one of its volunteers. The results of the 2015 *E. coli* sampling is shown in Table 5.

The Vermont standard for *E. coli* is a geometric mean of <126 mpn/100mL over a 60-day "representative period", with no more than 10% of samples above 235 mpn/100mL. The geometric mean levels of *E. coli* at the Wheeler Brook sampling site in 2015 was 594 mpn/mL, and 83% of the samples had E. coli counts of over 235 mpn/mL– well over the standard with both criteria.

Site ID	Min *E.coli*	Geometric Mean, All Conditions	GeoMean *E.coli*, Dry Conditions Only	Max *E.coli*	% of samples above 235 mpn/100mL
Wheeler 10	98.4	750.6	594.0	>2419.6	83

Table 5. 2015 CCST *E. coli* Results Summary: Minimum, geometric mean, and maximum *E. coli* levels in Chittenden County Streams. Geometric mean values exceeding the Vermont chronic *E. coli* standard of 126 mpn/mL are highlighted in orange.

Conclusion

The Chittenden County Stream Team has monitored chloride, phosphorus, and turbidity in Burlington area streams for the past four years (2012-2015). Phosphorus levels in these mainly urban and suburban streams are consistently above the 2014 Vermont water quality standard of 27 ug/L, even in dry summers like that of 2014. Muddy Brook had especially high levels, with one site averaging concentrations of over 100 ug/L in all sampling years. Centennial and Englesby Brooks also had particularly high phosphorus concentrations.

Chloride levels are also a problem in several streams, most notably Centennial, Engelsby, and Potash Brooks. 2014 and 2015 Chloride levels in these streams were significantly higher than in the past two years of CCST monitoring, and are likely to be causing a negative impact on aquatic organisms in those streams. Turbidity levels, while slightly elevated in Indian, Monroe, and Muddy Brooks, do not seem to be as much of a concern. As expected, concentrations of phosphorus were much higher during rain events, especially in Centennial, Englesby, Monroe, and Morehouse Brooks, perhaps indicating that these streams are more susceptible to the effects of stormwater runoff.

Appendix A. Quality Assurance Measures for Phosphorous, Chloride, and Turbidity Sampling in 2014

Site ID	Date	Sample Type	Relative Percent Difference Between Duplicate Pairs (RPD)
Centennial 10	6/23/15	Chloride	3.8 %
		Phosphorus	40.7 %
		Turbidity	8.5 %
Wheeler 10		*E. coli*	43.6%
Englesby 10	7/7/15	Chloride	1 %
		Phosphorus	0.7%
		Turbidity	4 %
Wheeler 10		*E. coli*	19.6%
Indian 10	7/21/15	Chloride	2%
		Phosphorus	1 %
		Turbidity	1.7 %
Wheeler 10		*E. coli*	0%
Morehouse 10	8/4/15	Chloride	0.1 %
		Phosphorus	2.1 %
		Turbidity	1.9 %
Wheeler 10		*E. coli*	35.2%
Muddy 20	8/11/15	Chloride	0.8 %
		Phosphorus	0 %
		Turbidity	4.2 %
Muddy 20	8/18/15	Chloride	0.5 %
		Phosphorus	0 %
		Turbidity	0.9 %
Wheeler 10		*E. coli*	0%
Potash 10	9/1/15	Chloride	1.4 %
		Phosphorus	38.5 %
		Turbidity	14.1 %
Wheeler 10		*E. coli*	23.1%
Mean Relative Percent Difference (Mean RPD)		**Chloride**	**1.1%**
		Phosphorus	**11.9%**
		Turbidity	**5.0%**
		E. coli	**20.2%**

Target RPD for duplicate field samples:
Chloride ≤5%, Phosphorus ≤30%, Turbidity ≤15%, *E. coli* ≤50%

Appendix B– Project Completeness

Parameter	Number of Samples Anticipated	Number of Valid Samples Collected & Analyzed	Percent Complete *
Chloride	102	109	107
Total phosphorus	116	108	93
Turbidity	116	109	94
E. coli	18	18	100

Appendix C – Individual Sample Results

Sample Number	Location	Date	Chloride (mg/L)	Final E. Coli.(mpn/100ml)	TP(ug P/L)	Turbidity (NTU)
150346-01	Cent 10	6/23/15	433.75		70.8	7
150346-03	Cent 10 - Blank	6/23/15	2		5	0.2
150346-02	Cent 10 - Duplicate	6/23/15	450.4		107	7.62
150347-01	Cent 10	7/7/15	481.5		65.7	12.2
150532-01	Cent 10	7/21/15	528.25		68.5	16.8
150635-01	Cent 10	8/4/15	565.5		101	29.6
140539-01	Cent 10	8/11/15	582.25		164	58
150695-01	Cent 10	8/18/15	500.75		99.9	24.3
150699-01	Cent 10	9/1/15	551.5		88.6	22.8
150346-04	Engelsby 10	6/23/15	99.93		357	101.4
150347-02	Engelsby 10	7/7/15	187.02		57.8	4.95
150347-04	Engelsby 10 - Blank	7/7/15	2		5	0.2
150347-03	Engelsby 10 - Duplicate	7/7/15	185.08		58.2	5.15
150532-02	Engelsby 10	7/21/15	254		61.5	5.41
150635-02	Engelsby 10	8/4/15	337.75		67.3	9.57
150695-02	Engelsby 10	8/18/15	369		54.5	6.95
150699-02	Engelsby 10	9/1/15	423.5		41.7	6.71
150346-05	Indian 10	6/23/15	45.74		78.5	20.3
150347-05	Indian 10	7/7/15	55.1		32.7	7.35
150532-03	Indian 10	7/21/15	123.8		39.6	7.45
150532-05	Indian 10 - Blank	7/21/15	2		5	0.2
150532-04	Indian 10 - Duplicate	7/21/15	124.1		40	7.58
150635-03	Indian 10	8/4/15	202		38.1	6.8
140539-02	Indian 10	8/11/15	172.32		63.5	8.54
150695-03	Indian 10	8/18/15	243		40.6	7.28
150699-03	Indian 10	9/1/15	286.2		42.6	8.6
150346-06	Indian 20	6/23/15	13.39		51.4	17.7
150347-06	Indian 20	7/7/15	11.72		26.9	4.55
150532-06	Indian 20	7/21/15	29.46		62.7	15.2
150635-04	Indian 20	8/4/15	64.46		52.5	19.5
150695-04	Indian 20	8/18/15	99.82		41.7	7.8
150699-04	Indian 20	9/1/15	183.6		32.8	7.11
150346-16	Milton 10	6/23/15	17.6		35.9	7.14
150347-16	Milton 10	7/7/15	17.62		23.5	3.23
150532-16	Milton 10	7/21/15	26.97		33.3	8.22
150635-16	Milton 10	8/4/15	34.95		32.6	6.49
150695-16	Milton 10	8/18/15	38.7		47.2	4.07
150699-16	Milton 10	9/1/15	48.4		38.3	7.69
150346-14	Monroe 10	6/23/15	48.05		59.8	11.5
150347-14	Monroe 10	7/7/15	43.89		38	7.98
150532-14	Monroe 10	7/21/15	53.75		54.9	11.2
150695-14	Monroe 10	8/18/15	94.46		51.4	6.33
150699-14	Monroe 10	9/1/15	152.9		37	3.83
150346-15	Monroe 20	6/23/15	20.02		199	32.5
150347-15	Monroe 20	7/7/15	18.03		38.2	3.93
150532-15	Monroe 20	7/21/15	26.755		52.3	7.94
150635-15	Monroe 20	8/4/15	28.854		49.7	6.36
150695-15	Monroe 20	8/18/15	30.45		66.4	5.74
150699-15	Monroe 20	9/1/15	42.98		44.5	6.08

150635-14	Montore 10	8/4/15	84.04		46.7	10.8
150346-07	Morehouse 10	6/23/15	42.34		91.6	26.1
150347-07	Morehouse 10	7/7/15	70.51		30.4	7.45
150532-07	Morehouse 10	7/21/15	87.05		27.4	3.49
150635-05	Morehouse 10	8/4/15	85.87		28.2	3.72
150635-07	Morehouse 10 - Blank	8/4/15	2		5	0.2
150635-06	Morehouse 10 - Duplicate	8/4/15	85.79		28.8	3.79
140539-03	Morehouse 10	8/11/15	103		208	137.2
150695-05	Morehouse 10	8/18/15	80.45		31.2	3.2
150699-05	Morehouse 10	9/1/15	96.66		39.1	11.5
150346-08	Muddy 10	6/23/15	65.03		96.5	30.8
150347-08	Muddy 10	7/7/15	58.56		66.4	11.1
150532-08	Muddy 10	7/21/15	54.05		86.7	15
150635-08	Muddy 10	8/4/15	70.23		80.2	8.98
150695-06	Muddy 10	8/18/15	103.7		77.1	6.63
150699-06	Muddy 10	9/1/15	111.8		68.1	13.8
150346-09	Muddy 20	6/23/15	65.1		72.3	15.9
150347-09	Muddy 20	7/7/15	53.23		57.4	8.38
150532-09	Muddy 20	7/21/15	49.3		86	10.7
150635-09	Muddy 20	8/4/15	61.75		105	10.8
140539-04	Muddy 20	8/11/15	66.26		103	12.1
140539-05	Muddy 20 - Blank	8/11/15	2		< 5	0.6
140539-06	Muddy 20 - Duplicate	8/11/15	66.78		103	11.6
150695-07	Muddy 20	8/18/15	81.6		114	11.2
150695-09	Muddy 20 - Blank	8/18/15	2		8.15	0.2
150695-08	Muddy 20 - Duplicate	8/18/15	81.22		114	11.3
150699-07	Muddy 20	9/1/15	104.5		98	13.3
150346-10	Muddy 30	6/23/15	25.095		58.9	6.72
150347-10	Muddy 30	7/7/15	23.91		56.7	4.57
150532-10	Muddy 30	7/21/15	23.9		98.4	6.73
150635-10	Muddy 30	8/4/15	26.28		110	8.15
150695-10	Muddy 30	8/18/15	26.16		151	8.26
150699-08	Muddy 30	9/1/15	27.5		165	12.3
150346-11	Potash 10	6/23/15	185		83.1	15.8
150347-11	Potash 10	7/7/15	234.4		51	6.29
150532-11	Potash 10	7/21/15	315.8		45	2.67
150635-11	Potash 10	8/4/15	419.25		25	2.71
150695-11	Potash 10	8/18/15	361		29.1	2.55
150699-09	Potash 10	9/1/15	424		23.5	2.7
150699-11	Potash 10 Blank	9/1/15	2		5	0.2
150699-10	Potash 10 Duplicate	9/1/15	430		34.7	3.11
150346-12	Potash 20	6/23/15	205.7		58.3	10.6
150347-12	Potash 20	7/7/15	252.8		32.5	3.07
150532-12	Potash 20	7/21/15	299.4		28.4	1.73
150635-12	Potah 20	8/4/15	422.25		26.6	1.33
140539-07	Potash 20	8/11/15	424.4		34.6	2.52
150695-12	Potash 20	8/18/15	369.8		41.4	1.3
150699-12	Potash 20	9/1/15	402.5		26.6	1.33
150346-13	Potash 30	6/23/15	161.8		56.8	6.83
150347-13	Potash 30	7/7/15	261.8		32.6	3.75
150532-13	Potash 30	7/21/15	263.4		56	7.48
150635-13	Potah 30	8/4/15	313.2		50.9	7.14
150695-13	Potash 30	8/18/15	295.8		67.4	6.68

150699-13	Potash 30	9/1/15	293.4		55.9	9.27
150346-17	Wheeler 10	6/23/15	21.07	2419.57	108	29.8
150346-18	Wheeler 10 - Blank	6/23/15		1		
150346-19	Wheeler 10 - Duplicate	6/23/15		1553.12		
150347-17	Wheeler 10	7/7/15	45.33	98.42	35.3	2.93
150347-18	Wheeler 10 - Blank	7/7/15		1		
150347-19	Wheeler 10 - Duplicate	7/7/15		119.83		
150532-17	Wheeler 10	7/21/15	51.45	365.4	41.8	4
150532-19	Wheeler 10 - Duplicate	7/21/15		365.4		
150532-18	Wheeler 10 - Blank	7/21/15		1		
150635-17	Wheeler 10	8/4/15	68.63	980.39	40	3.33
150635-18	Wheeler 10 - Blank	8/4/15		1		
150635-19	Wheeler 10 - Duplicate	8/4/15		686.67		
150695-17	Wheeler 10	8/18/15	64.25	2419.6	76.3	7.04
150695-18	Wheeler 10 - Blank	8/18/15		1		
150695-19	Wheeler 10 - Duplicate	8/18/15		2419.6		
150699-17	Wheeler 10	9/1/15	52.95	866.44	37.3	5.89
150699-18	Wheeler 10 - Blank	9/1/15		1		
150699-19	Wheeler 10 - Duplicate	9/1/15		686.67		

My Watershed
Events & Workshops
Volunteer Opportunities
Team Leaders
Stream Monitoring
Centennial Brook
Englesby Brook
Indian Brook
Muddy Brook
Potash Brook
Morehouse Brook
Munroe Brook
Malletts Creek
Adopt A Rain Garden
River Cleanups
River Restoration
Resources
Stream Monitoring
Build A Rain Barrel
Steering Committee Agendas & Minutes

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Indian Brook

The stormwater impaired portion of the Indian Brook watershed is located in Chittenden County in the Town of Essex and in the Village of Essex Junction. The headwaters in Essex originate in the undeveloped vicinity of the Indian Brook Reservoir from which the stream flows southward beneath the major roads of Rts. 289 and 15 as it enters the more developed areas of Essex Junction and then ultimately flows to Lake Champlain via the large wetland complex associated with Mallets Creek and Mallets Bay.

The entire stream portion and its tributaries within the impaired reach are Class B waters designated as cold water fish habitat pursuant to the Vermont Water Quality Standards. The total watershed area of the impaired section is approximately 4,580 acres. The land use breakdown of the watershed draining to the impaired reach is 39% developed lands, 18% agricultural or open lands and 43% forested or wetlands.

Indian Brook is designated as impaired on the 2006 Vermont 303(d) List due to non-support of aquatic life designated uses. Since all tributaries and the upstream main stem drain to the impaired lower portion of the stream, the entire Indian Brook watershed upstream from river mile 5.8 is considered to contribute to its impairment. The source of the impairment is multiple impacts associated with excess stormwater runoff.

Currently, the Stream Team is monitoring two sites along Indian Brook with the help of volunteers. Water samples are being taken twice monthly throughout the summer and are tested for phosphorous, nitrogen, chloride, and turbidity.

Location	Date	Chloride (mg/L)	Nitrogen, Total – Persulfate (mg/L)	Phosphorus – Total (TP) (µg/L)	Turbidity (NTU)
Indian 10	9/1/2015	286.2	--	42.6	8.6
Indian 20	9/1/2015	183.6	--	32.8	7.11
Indian 10	8/18/15	243	--	40.6	7.28
Indian 20	8/18/15	99.82	--	41.7	7.8
Indian 10	8/4/2015	202	--	38.1	6.8
Indian 20	8/4/2015	64.46	--	52.5	19.5
Indian 10	7/21/2015	123.8	--	39.6	7.45
Indian 20	7/21/2015	29.46	--	62.7	15.2
Indian 10	7/7/2015	55.1	--	32.7	7.35
Indian 20	7/7/2015	11.72	--	26.9	4.55
Indian 10	6/23/2015	45.74	--	78.5	20.3

Indian 20	6/23/2015	13.39	--	51.4	17.7
Indian 10	10/21/2014	122	--	32.1	2.63
Indian 10	8/19/2014	116	--	30.2	4.62
Indian 20	8/19/2014	28.6	--	30.7	5.4
Indian 10	8/5/2014	126	--	42.2	15.7
Indian 20	8/5/2014	31.7	--	39.7	12.8
Indian 10	7/22/2014	238	--	33.8	7.57
Indian 20	7/22/2014	132	--	44.9	9.72
Indian 10	7/8/2014	165	--	36.1	4.88
Indian 20	7/8/2014	44.2	--	42.5	10.9
Indian 10	6/24/2014	224	--	37.4	7.4
Indian 20	6/24/2014	87.9	--	53.6	19.6
Indian 10	10/6/2013	161	1.33	54.60	5.52
Indian 10	9/10/2013	85	1.07	71.7	7.86
Indian 10	8/27/2013	163	1.34	53.4	16.6
Indian 20	8/27/2013	99.4	0.4	35.6	6.42
Indian 10	8/13/2013	179	1.61	40.5	5.04
Indian 20	8/13/2013	77.6	0.43	59	4.64
Indian 10	8/7/2013	150	1.25	31.3	4.05
Indian 20	8/7/2013	43.7	0.36	37.2	9.06
Indian 10	7/9/2013	52.9	0.78	36.5	5.65
Indian 20	7/9/2013	9.51	0.37	37.8	5.05
Indian 10	6/24/2013	39.6	0.65	52.3	7.71
Indian 20	6/24/2013	9.65	0.35	39.9	4
Indian 10	9/11/2012	110	0.93	33.3	5.46
Indian 20	9/11/2012	34.4	0.41	32.5	4.9
Indian 10	8/21/2012	219	1.35	45.2	8.74
Indian 20	8/21/2012	161	0.49	49.9	10.3
Indian 10	8/7/2012	258	1.21	65.1	11.5
Indian 20	8/7/2012	211	0.53	57.8	8.82
Indian 10	7/24/2012	50.3	0.79	115	35.6
Indian 20	7/24/2012	21.7	0.71	92.2	15.1
Indian 10	7/10/2012	176	1.23	47.5	10.7
Indian 20	7/10/2012	73.9	0.53	48.6	11.4
Average 2012		**131.53**	**0.82**	**58.71**	**12.25**
Average 2013		**89.20**	**0.83**	**45.02**	**6.92**
Average 2014		**119.58**	**--**	**38.47**	**9.20**
Average 2015		**113.19**	**--**	**45.01**	**10.80**

We are also monitoring Indian Brook during storm events. The data from summer rain storms are listed below.

Location	Date	Chloride (mg/L)	Nitrogen, Total – Persulfate (mg/L)	Phosphorus – Digested (µg/L)	TSS (mg/L)	Turbidity (NTU)
Indian 10	8/11/15	172.32	--	63.5	--	8.54
Indian 10	8/12/12	66.80	0.82	91.00	32.40	--
Indian 10	8/28/12	211.00	1.30	48.30	3.20	--

All of the data collected by Chittenden County Stream Team volunteers is shared with the State of Vermont Department of Environmental Conservation (VT DEC). The DEC shares all state-wide data with the Environmental Protection Agency.

State-wide Vermont water quality data can be found here: **https://anrweb.vermont.gov/dec/dec/VolunteerMonitoriing.aspx**

National water quality data can be found here: **http://www.epa.gov/storet/**

Appendix E

STORMY Awards Elevate New England Stormwater Efforts

Co-Chairs Zach Henderson, Rob Robinson, and Ginny Roach of the New England Stormwater Collaborative

On April 1, the New England Stormwater Collaborative presented its inaugural STORMY Awards, which recognize communities and utilities for their best stormwater ideas that increase efficiency, funding, or political support. Of 14 submissions, the collaborative recognized five organizations. Winners included the Town of Lexington, Massachusetts Department of Public Works — Engineering Division, which increased the efficiency of its municipal illicit discharge detection and elimination program through volunteer monitoring. The City of Bristol, Connecticut was awarded for a proactive strategy to provide and fund long-term maintenance of stormwater controls. Finally, three regional coalitions received awards, including the Northern Middlesex Stormwater Collaborative in Massachusetts, the Chittenden County Regional Planning Commission in Vermont, and the Central Massachusetts Regional Stormwater Coalition. Through the establishment of common programs, these coalitions are addressing water quality issues beyond community boundaries and sharing resources, enabling them to reduce duplicate efforts, increase training tools, and spread consistent public outreach messages.

In selecting the winners, judges looked at the simplicity and resourcefulness of programs as well as their relevance and transferability to other communities. Learn more about the winner's best stormwater ideas.

Why the STORMY Awards

In 2013, members of the New England Water Works Association, New England Water Environment Association, and the New England chapter of the American Public Works Association formed the New England Stormwater Collaborative. A year later, this newly formed collaborative conducted a survey of municipal managers, consultants, and staff to understand their stormwater management needs and issues. Of the 408 respondents from across New England, 56% noted that stormwater runoff and drainage management was of "very high concern." The single most important issue to respondents was source water protection (20%), followed by Municipal Separate Storm Sewer System (MS4) permit requirements (17%).

Given the concern for stormwater issues and lack of political support, attention, and dedicated funding, members of the collaborative recognized the need to increase awareness of successful stormwater ideas. Through the STORMY Awards, the collaborative is drawing attention to case studies that highlight effective and affordable steps communities can take to address stormwater management challenges.

The awards also advance the collaborative's threefold objective of: Increasing understanding of stormwater issues by providing a forum for information and exchange; educating the sector about ongoing efforts adopted by other communities to address stormwater issues; and advocating for action on sound stormwater management practices.

"The group's goal is to highlight the importance of collaboration and advocate for solutions that reach beyond city and state boundaries while promoting local ideas," said Mary Barry, NEWEA executive director. "The STORMY Awards put a spotlight on New England stormwater success stories with best ideas for improving program management that can be duplicated here and throughout the country."

Award-Winning Municipal Programs

Volunteers Expand Monitoring of Illicit Discharges

The Town of Lexington, Massachusetts Department of Public Works—Engineering Division won a STORMY Award for increasing efficiency by utilizing university student volunteers to improve illicit discharge detection and elimination (IDDE).

In the fall of 2011, Lexington's engineering and conservation divisions piloted a volunteer water quality program to assist the town with identifying illicit discharges and improving the area's stream health. Building on the success of the volunteer program, the Engineering Division developed a municipal partnership with the University of Massachusetts (UMass) Lowell. Lexington engineering staff worked directly with UMass Professor Edward Hajduk, who helped connect the town with student volunteers and ensured that program content met the needs of student interns' curriculum. Town staff met with the student interns to discuss what their objective would be, why it was important, and how to accomplish their tasks safely.

The outfall monitoring program consisted of four separate trainings and 20 days of fieldwork. The town provided student volunteers with field kits, and they inventoried and monitored 80 outfalls over a two-year period, which included 141 samples collected for laboratory analysis and 47 samples screened for ammonia concentration using field test kits.

This program added 244 person-hours to the Town of Lexington's IDDE program with little cost to the town. The students gained valuable field experience as well as mentoring from engineering professionals. The program's success was founded on solid training and written health and safety protocols and has resulted in an ongoing internship program with the university. The program provides valuable data used by the Town of Lexington for IDDE and permit compliance. The program also is providing a research opportunity to compare the results of ammonia test strips and ammonia lab testing.

City Trust Ensures Long-term Maintenance of Stormwater Controls
The City of Bristol, Connecticut received a STORMY Award for its proactive strategy to ensure and fund long-term maintenance of stormwater controls.

With significant development increases in the 1980s, the City of Bristol needed to increase maintenance of its stormwater control structures. The city created a fiscal entity called the Storm Water Control Trust, which requires organizations that propose stormwater control structures to specify a long-term ownership and maintenance plan. The proposers have three options: They can turn the structure over to the city with a monetary deposit for long-term maintenance, create a homeowner's association that would coordinate maintenance, or relinquish ownership and maintenance responsibility to another entity.

Since its inception, homeowner associations have assumed responsibility for the long-term maintenance of five stormwater control systems, and three remain in private ownership. The trust has accepted 22 systems, and at the time of the award, three systems were pending deposit or construction.

After construction and once the municipal trust takes ownership of a stormwater control, the developer is no longer liable for that system, and the city monitors it. The trust keeps a detailed inventory of properties and inspects the systems three times a year. The trust also is the fiscal entity that receives funds, controls expenditures for the sole purpose of maintaining or repairing the systems, and oversees the investment portfolio to grow its endowment.

With an annual inspection and maintenance program, the stormwater control systems remain viable, and the program provides an effective means of controlling post-construction runoff, one of the minimum control measures of the city's MS4 permit.

Regional Collaborative Efforts to Achieve Better Water Quality

Three entities received STORMY Awards for their regional collaborative efforts to improve stormwater program efficiency: The Northern Middlesex Stormwater Collaborative, the Chittenden County Regional Planning Commission, and the Central Massachusetts Regional Stormwater Coalition.

In New England, a town is the basic unit of local government and has a well-established home rule form of governance, which provides municipalities with maximum authority to govern themselves. Municipalities are often small — between 5 and 52 km^2 (2–20 mi^2) — but are still the primary regulated entity under the MS4 general permit program. In New England, more than 440 individual municipalities are regulated under the MS4 permit program. This creates obvious redundancies and unique challenges for effective regional initiatives.

Joining Forces Improves Program Efficiency

The Northern Middlesex Council of Governments established the Northern Middlesex Stormwater Collaborative (NMSC) in 2013, and it is now comprised of 13 regional communities. The NMSC's regional approach to meeting MS4 requirements is a more effective, watershed-based model. Additionally, it enables NMSC to enhance the quality of service provided to residents while minimizing costs through resource sharing among local governments.

Through the establishment of common programs, each community has reduced its responsibility for creating, implementing, maintaining, and managing separate but similar programs. In the past two years, the NMSC implemented a common public outreach and education program; regionalized stormwater-mapping activities; is acting to coordinate regional procurement for contracted stormwater services; and developed workshops and training sessions for municipal staff, boards, and officials.

NMSC was established using funds from two Community Innovative Challenge grants, administered by the Massachusetts Executive Office for Administration and Finance.

Cooperative Creates Public Awareness through One Message, One Outreach Effort

In northwest Vermont — with the support of the Chittenden County Regional Planning Commission — twelve MS4s have worked since 2003 to pool resources to engage the public in a one message, one outreach effort. They first conducted a public opinion survey to benchmark current public understanding in order to create measurable public outreach improvement goals. They then hired a social marketing firm to implement a combination of television, radio, and online advertisements to encourage residents to visit the program's website. Online, visitors can engage with messages linked to specific stormwater problems, such as pet waste, car washing, and excessive runoff. More recently, the MS4s also have contracted with a regional Natural Resources Conservation District to engage the public in hands-on projects, including rain barrel workshops and rain garden planting.

These cooperative efforts, known as the Chittenden County Regional Stormwater Education Program and Chittenden County Stream Team, fulfill the MS4's public education and outreach and public participation and involvement permit responsibilities in an affordable and efficient manner. More importantly, these programs have established regional public awareness of the need for individual action on stormwater problems.

Through Cooperation, Coalition Increases Staff Training and Resources

Formed in November 2011, the Central Massachusetts Regional Stormwater Coalition is a group of 28 Massachusetts communities. The coalition's purpose is to address common priorities related to municipal stormwater management and to share solutions with other groups and organizations.

Also using funding from the state's competitive Community Innovation Challenge grant program, the coalition has created many products and purchased tools that enable its members to meet MS4 requirements.

Coalition programs and educational materials include staff training on inspection practices for stormwater infrastructure, the development of a Stormwater Pollution Prevention Plan template and training modules, as well as training on the

use of salt calibration tools and water quality field test kits and meters. The coalition also has developed educational materials focusing on several target audiences and an online mapping and inspection platform enabling members to see infrastructure in adjacent communities.

Future Engagement

The New England Stormwater Collaborative's 2014 survey also indicated that additional work is needed to adequately increase political support and funding for stormwater management programs. Among respondents, 63% said that funding as their primary obstacle — 44% had no specific budget to address stormwater management, and 37% had annual budgets of less than $100,000. These responses indicate that New England may be far behind its Mid-Atlantic peers where funding studies show average non-capital stormwater spending is $35 per capita. Additionally, 61% of respondents had not considered implementation of a dedicated fund and entity for delivery of stormwater management services. The survey ranked general awareness of stormwater issues second as a barrier to executing an effective stormwater management program.

The collaborative aims to become a platform for the dissemination of great, simple ideas that improve a community's stormwater management level of service with the ultimate goal of increasing municipal leadership's understanding of the need for sound stormwater management and a willingness to invest in successful practices.

The STORMY Awards are one way to increase stormwater awareness by the public and elected officials. Despite limited political support and funding, STORMY Award winners created resourceful solutions that increased their efficiency and effectiveness at meeting permit requirements. These communities show that investing in stormwater services can produce smart and sustainable programs that increase public engagement and improve water quality. With additional resources, these and other stormwater programs could create an even bigger positive impact.

Appendix F

SMART WaterWays

Add Up To Cleaner Water

Chittenden County Regional Stormwater Educational Program

Annual Review: 2015 Calendar Year Summary

2015 was a maintenance year for RSEP, utilizing 2014's *"Slow the Flow"* campaign creative around rain barrels and rain gardens and also the creative informing people about the best time to fertilize (if at all). In 2015, we saw strong results, with the second-highest website visits on record. (Only 2014 was higher.) We continued to use data from past campaign performance to tweak media buys and try some different ad formats, consistently working to reach more people.

In 2015 we also continued to improve our website, focusing on cleaning up links, developing stronger verbiage, and deleting outdated content. Building on the design refresh of 2014, the website is now technically and visually more modern, more clearly written, and easier to navigate.

Spring Advertising Campaign

During the Spring campaign we utilized some new ad formats with *Xfinity*, specifically a home page takeover and Comcast Video Plus, which allowed us to advertise on *Comcast* partner sites. Compared with Table 2: Fall 2015 Online Campaign Results, it's clear that the traditional pre-roll ads (ads that run prior to watching a video) prove to be more effective than these new ad opportunities.

The online portion of the advertising budget accounts for 36% of the overall expenditure of $19,855. The remainder covers radio, television and print advertising. Media beyond online ads raises awareness and allows consumers additional impressions, but the vast majority of web clicks come from online ads, driven by the ease by which people can access the Smart Waterways site from an online ad.

Prepared by J Andrews Marketing

Table 1: Spring 2015 Online Media Results

	Impressions	Clicks	Cost	Cost per Click
WCAX	90,000 impressions	198	$990	$5.00
Xfinity*		373	$1,725	$4.62
	video pre-roll, 16,300 impressions	252		
	home page takeover	33		
	Comcast Video Plus, 26,300 impressions	88		
Front Porch Forum	210,000 impressions	253	$1,500	$5.93
Google ad network	pay-per-click	382	$1,398	$3.66
Seven Days	100,000 impressions	116	$1,093	$9.42
TOTAL		**1695**	**$6,706**	**$3.96**

Fall Advertising Campaign

For the Fall campaign we focused back on the issue of not using fertilizer in the spring. In order to use past material, we worked with local Fox television affiliate *WFFF* to remake the old television spot (which was not digital and looked grainy) in an HD format. This spot can now be used into the foreseeable future.

In addition, as mentioned above, based upon what we learned using the t *Xfinity* ad formats, we decide to revert back to using pre-roll ads only, driving down the cost per click. Even with the high cost per click for *WFFF/ABC 22* ads, our overall cost per click was very low at $3.07, as shown below in Table 2. The online portion of the advertising budget was 51% of the overall expenditure of $9,940.

Table 2: Fall 2015 Online Campaign Results

	Impressions	Clicks	Cost	Cost per click
WCAX	120,000 impressions RSS feed	316	$600	$1.90
Xfinity	55,000 video pre-roll impressions	832	$1,980	$2.38
Front Porch Forum	50,000 impressions	77	$750	$9.74
Google ad network	pay-per-click	329	$860	$2.61
WFFF/ABC 22	90,000 impressions	38	$700	$18.42
TOTAL		**1,592**	**$4,890**	**$3.07**

Traffic to Program Website (www.smartwaterways.org)

Presented below in Figure 1 and Table 3 is the website visitor information for 2015, compared to preceding years.

The site had 4,659 visits during 2015, not as strong as 2014 but still the second highest on record. Website traffic increases correlate with media campaigns. The Chittenden County' Stream Team's *Connecting the Drops* program ran in Williston during the June timeframe, keeping web traffic high in between campaigns.

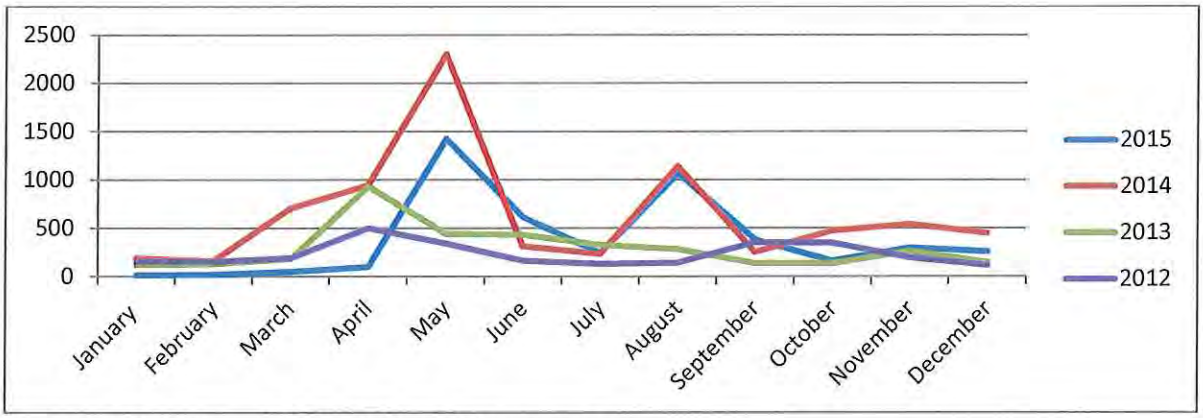


Figure 1: Total Internet Traffic to SmartWaterways.org

Table 3: Total Internet Traffic to Smartwaterways.org

YEAR	TOTAL
2015	4,659
2014	7,728
2013	3,542
2012	2,817
2011	2,859

Appendix G

Chittenden County Stream Team
Summary of Activities January-December 2015

This report summarizes CCST activities in the 2015 calendar year. Demographic data about participant numbers from each town is presented in tabular form following the narrative.

Social Media

Facebook

- 120 total "likes"-- a 15% increase in likes from 2014 annual report numbers (104 total likes)
  Facebook 'likes' can't be isolated by year; only total numbers over time can be counted.
- 20% of the people who like CCST are from Burlington (23 people)
- 41% of the people who like CCST live in CCST member towns (49 people)

CCST Website

Google Analytics provides website traffic data from: January 1, 2015to December 31, 2015

- 1,773 website visits, spending an average of 1 minute and 53 seconds on the website per visit. The number of visits is up 22% from 2014 (1,454 visits)
- 3,603 page views, similar to the 2014 quantity (3,683)
- 80.5% of visitors were new visitors to the site.
- The highest spike in page views occurred on April 2nd, with 39 visits, which coincided with the announcement that the Chittenden County Regional Planning Commission was recognized by The New England Water Environment Association with a *Stormy Award* for "Regional Collaboration for Enhanced Stormwater Program Efficiency." Website traffic remained relatively high through April and May as the Connecting the Drops display was planned and installed. There were also spikes in July around the time of the rain barrel give-away and two rain barrel workshops. On average, the busiest months for web traffic were April, May, June and July.

Newsletter and e-correspondence

- In 2015, there were 459 subscribers to the CCST newsletter, up 55% from 295 in 2014.
- A spring newsletter was sent out in May with a 37.1% open rate. A fall newsletter was sent out in October with a 42.1 % open rate. CCST E-News open rate is high; the typical open rate for similar industries is between 20-25% according to research completed by Mail Chimp.
- The Mail Chimp email list was used throughout the year to announce rain barrel workshops and to request volunteers for water quality monitoring.

Chittenden County Stream Team
Summary of Activities January-December 2015

Organizational Partnerships

The Chittenden County Stream Team partnered with nine different organizations in 2015; CCST partnered with 12 organizations in 2014.

- A local gardener donated plants for the Stream Team's rain gardens. In 2015, Ann Pearce provided CCST with dozens of iris, lobelia and native grasses for multiple rain gardens (Chamberlin School, South Burlington and Williston Town Hall Annex, Williston).
- CCST worked with multiple schools and school groups this year for hands-on events and for outreach opportunities. The Stream Team partnered with teachers from South Burlington High School, Winooski High School and the Winooski Teen Center. Additionally, students from Champlain Valley Union High School decorated two of the rain barrels for the Connecting the Drops 3.0 display.
- CCST partnered with towns and other local organizations to host two rain barrel workshops. CCST partnered with the South Burlington Natural Resources Committee, the South Burlington Department of Public Works and the Town of Williston Public Works Department to hold the rain barrel workshops.
- During the 2015 Connecting the Drops outreach campaign and events, CCST partnered with the Let it Rain program (administered by Winooski Natural Resources Conservation District and UVM's Lake Champlain Sea Grant) to develop outreach materials and to manage the events. Lake Champlain Sea Grant staff member Becky Tharp recruited the artists for the displayed rain barrels and coordinated press and advertising. CCST partnered with the Town Williston to provide outreach for Connecting the Drops, display the barrels and engage citizens.
- CCST worked with the Milton Conservation Commission to provide outreach to the community and to build-up future ideas for hand-on participation in the town.

Media

The Chittenden County Stream Team had six media appearances this year, and increase from 4 in 2014. Copies of each article are archived in the CCST 3-ring binder housed at the office of the CCST chair (if applicable).

- Water Environment Federation (WEF) Stormwater Report May 5, 2015 (Stormy Award recognition) http://stormwater.wef.org/2015/05/stormy-awards-elevate-new-england-stormwater-efforts/
- Milton Independent: May 7, 2015. The Stream Team is not mentioned in the linked article, but there was a picture of CCST tabling at Milton's Green-Up Day and a caption in the print edition. http://www.miltonindependent.com/retro-rubbish/
- Williston Observer: May 21, 2015 http://www.willistonobserver.com/artsy-stormwater-management-i-89-northbound-rest-stop-gets-new-rain-barrel/
- Williston Observer: July 30, 2015 http://www.willistonobserver.com/photos-building-a-rain-barrel/b Photos of the Connecting the Drops rain barrel workshop
- The Citizen: May 14, 2015: http://www.thecitizenvt.com/2015/05/14/partnership-offers-rain-barrel-workshop-june-7/
- Shelburne News: May 6, 2015: http://www.shelburnenews.com/2015/05/06/build-your-own-rain-barrel-june-7/

Outreach

Chittenden County Stream Team
Summary of Activities January-December 2015

Outreach events include tabling and the distribution of educational materials or information. There were nine outreach events in 2015 in which the Stream Team interacted with 324 people. See Table 1 below for detailed outreach audience information. An additional 36 people clicked on Front Porch Forum advertisements about the Connecting the Drops 3.0 outreach campaign, bringing total outreach numbers to 360.

- Milton Green-Up Day (5/2/2015, 36 people reached)
- Connecting the Drops 3.0 ribbon cutting ceremony in Williston (5/18/15, 35 people reached)
- Presentation to Milton Conservation Commission (6/23/15, 7 people reached)
- Williston Independence Day Celebration (7/3/15, 35 people reached)
- Burlington farmers Market (8/1/15, 46 people reached)
- Water Works Fair in Burlington (8/9/15, 26 people reached)
- Summervale in Burlington (8/20/15, 28 people reached)
- Shelburne Farmers Market (9/12/15, 33 people reached)
- Shelburne Harvest Festival (9/19/15, 88 people reached)

Event-Driven Tasks

There were nine hands-on events held and the continuation of on-going tasks including, rain garden adoption and maintenance, and water quality monitoring in 2015. Detailed participation data is provided in Table 2.

- Rain Barrel Painting for Connecting the Drops 3.0 Display (April/May 2015)
    - Partnered with Champlain Valley Union High School's Art club to decorate two rain barrels for the Connecting the Drops 3.0 display in Williston
    - Six students and one teacher worked to paint two display barrels
- Rain Garden Adopters are Supplied with Plants and Mulch for work days in mid-May (May2015)
    - Rain garden adopters worked to maintain the gardens at Williston Town Hall Annex, Chamberlain Elementary School in South Burlington and at the Coast Guard Station in Burlington.
    - Donated rain garden plants were planted in the Chamberlin School garden in South Burlington, the Williston Town Hall Annex garden, and in the Coast Guard Station garden in Burlington. Other volunteers maintained the gardens but were not in need of supplies.
- Volunteer Water Quality Monitoring Training/Sampling and Volunteer Thank You (6/16/2015)
    - Interest in the water quality monitoring program was high; 28 people contacted CCST to find out more information about volunteering. Of those who contacted CCST, 22 volunteers participated in the water quality monitoring training session. Sampling occurred on five scheduled dates (6/23, 7/07, 7/21, 8/04, 8/18, 9/1)
    - Sampling was expanded this year to include e. coli sampling at Wheeler Park in South Burlington
    - Volunteers were recognized for their dedication with pizza and appreciation during the water quality monitoring training event.
    - Analyzed sampling data was uploaded to the CCST website.
- Rain Barrel Decorating at the Williston Independence Day Celebration (7/3/2015)
    - 17 Williston residents participated in rain barrel decoration during the Connecting the Drops 3.0 rain barrel give away at the Independence Day Celebration; most of these people also signed up to win a rain barrel.
- South Burlington Rain Barrel Workshop (7/7/2015)

  - Partnered with South Burlington's Natural Resources Committee and the South Burlington Department of Public Works to hold a rain barrel workshop
  - 32 participants built 29 barrels. All participants received outreach materials about rain barrels and stormwater.
- Connecting the Drops 3.0 Rain Barrel Workshop (7/25/2015)
  - Partnered with the Town of Williston's Public Works Department and Lake Champlain Sea Grant to prepare and advertise for the event.
  - 32 participants built 26 rain barrels. All participants received outreach materials about rain barrels and stormwater.
- Potash Brook Stream Clean-Up with South Burlington High School (9/20/2015)
  - Partnered with South Burlington High School Environmental Science class
  - 21 students and 1 teacher participated in the clean-up, removing four bags of trash from Potash Brook.

CCST Outreach and Event Demographic Impacts

Since participation numbers for Milton and Shelburne were low in 2014 and because CCST had not focused on Burlington in some time, these towns were identified as the outreach target towns in 2015. Displayed in the table below, 2015 outreach efforts in these towns were a success and all workplan goals were met. Hands-on events are planned for these 3 towns in 2016.

Table 1: Participation in Outreach Activities by CCST Member Town

		Participant Town									
Activity	Location	Burlington	South Burlington	Essex	Essex Jct	Milton	Shelburne	Williston	Winooski	Other/ Unkown	Total
Facebook 'Likes'	N/A	23	10	0	4	2	2	4	4	71	120
Website Visits	N/A	236	42	58	0	4	7	27	5	1,394	1773
e-news Mailing List	N/A	56	40	10	34	30	13	71	25	180	459
Green-Up Day	Milton	0	0	1	0	32	0	0	0	3	36
Milton Conservation Commission	Milton	0	0	0	0	7	0	0	0	0	7
CtD 3.0 Ribbon Cutting Ceremony	Williston	3	0	3	0	0	1	18	0	0	25
Independence Day Celebration	Williston	0	0	5	2	0	0	28	0	0	35
Farmers Market	Burlington	25	8	0	2	2	1	0	3	5	46
Summervale	Burlington	18	1	0	3	0	0	0	3	3	28
Water Works Fair	Burlington	19	2	1	3	0	0	0	0	1	26
Harvest Festival	Shleburne	35	0	3	0	0	5	11	9	25	88
Farmers Market	Shelburne	0	0	0	0	0	28	0	1	4	33
Front Porch Forum CtD 3.0 Ad 'clicks'	Williston	0	0	0	0	0	0	36	0	0	36
	Total	415	103	81	48	77	57	195	50	1686	**2712**

**Colchester represents a portion of the "other" participants, with 51 Colchester residents engaged with CCST outreach events (See Table 3 for details).

Hands-on participation events in 2015 were targeted to the towns of Williston, Winooski and South Burlington. The workplan goals for participation were met and exceeded in all three towns. There were a total of 188 event participants in 2015, surpassing the workplan goal of 100 participants. Outreach towns for the following year are selected from end-of-year event participation numbers and frequency of targeting a town. Based on the participation numbers from 2015 and the inclusion of Colchester into CCST, the towns that will be targeted for outreach in 2016 are: Colchester, Essex and Essex Junction.

Table 2: Participation in Hands-On /Event-Driven Projects

		Participant Town									
Activity	Location	Burlington	South Burlington	Essex	Essex Jct	Milton	Shelburne	Williston	Winooski	Other/ Unkown	Total
Adopt-a Rain Garden Maintenance Days	Multiple	7	12	0	9	0	0	4	0	0	32
WQ Monitoring Training and Volunteer appreciation	Williston	7	5	1	2	0	1	4	2	0	22
WQ Monitoring Volunteers	Multiple	5	4	0		0	1	3	1	0	14
Stream Clean-Up	Winooski	0	0	0	0	0	0	0	10	0	10
Painting Barrels for CtD Display	Hinesburg (CVU)	0	0	0	0	0	1	3	0	3	7
Rain Barrel Workshop	South Burlington	9	14	0	0	0	3	0	0	6	32
Rain Barrel Decorating	Williston	0	0	0	0	0	0	17	0	0	17
Rain Barrel Workshop	Williston	0	3	1	1	3	0	22	0	2	32
Stream Clean-Up	South Burlington	0	22	0	0	0	0	0	0	0	22
		28	60	2	12	3	6	53	13	11	188

Other Vermont towns that are not part of the Chittenden County Stream Team participate in CCST activities. The chart below identifies towns with significant participation (Table 3).

Table 3. Participation in CCST Activities from Non-Member Towns

CCST Outreach and Event Participation Beyond Participating MS4 Towns									
	Huntington	Jericho	Richmond	Hinesburg	Charlotte	Colchester	Montpelier	St. Albans	Total
Facebook likes	1	4	0	3	0	7	4	4	23
e-news	1	2	4	3	1	12	0	2	25
website visits	0	2	1	6	1	26	48	8	92
Green-Up Day tabling in Milton	0	0	0	0	0	3	0	0	3
Burlington Farmers Market	0	0	0	0	0	2	0	0	2
Burlington's Summervale	0	0	0	0	1	0	0	0	1
Water Works Fair (BTV)	0	0	0	0	0	1	0	0	1
Shelburne Harvest Fest	0	0	0	0	0	0	2	2	4
Shelburne Farmers Market	0	0	0	2	0	0	0	0	2
	2	8	5	14	3	51	54	16	153

Connecting the Drops 3.0

In 2013, the Winooski Natural Resources Conservation District received a grant from the Ecosystem Restoration Program, VT DEC, for Let it Rain, a technical and financial assistance program aimed at supporting landowners in the installation of low impact development practices, and subsequently received funding from the Lake Champlain Basin Program to support this initiative with funding for outreach and education to landowners about stormwater. Connecting the Drops emerged from Let it Rain as an art and education installation about stormwater, featuring rain barrels, in downtown Burlington in the summer of 2013. WNRCD received a $40,000 grant from ECOS to develop Connecting the Drops. RSEP provided an additional $12,500 to leverage the exhibit's exposure for logo placement on print and web ads, signage, website, fliers, and verbal recognition at public events associated with the exhibit.

Chittenden County Stream Team
Summary of Activities January-December 2015

Based on the successful outcomes of the 2013 campaign, RSEP members requested a proposal for a second year of the Connecting the Drops Project, known as Connecting the Drops 2.0 (CtD 2.0). With a significantly smaller scope, Lake Champlain Sea Grant (LCSG) worked with The Chittenden County Stream Team (CCST) to develop a "traveling" version of the Connecting the Drops exhibit to be held in Essex Junction during the summer of 2014. CtD 2.0 had a significant impact on successfully meeting and exceeding CCST's outreach goals in 2014. The amount spent by CCST ($1,728.77) on CtD2.0 was six percent of CCST's FY15 budget. This relatively small budget percentage had a large impact on overall community participation numbers, which exceeded workplan goals in 2014. Due to the success of CtD2.0, CCST decided to pursue a third year of the campaign, Connecting the Drops 3.0 (CtD 3.0). The Town of Williston was selected because it was a 2015 CCST target town and there was support from town representatives.

Full reports on the details of the CtD 3.0 and all of the Connecting the Drops campaigns are available and on file with the CCST chairs.

A total of seven rain barrels were displayed at Williston Community Park for the CtD 3.0 exhibit displayed from May 23-June 29, 2015. Five barrels were decorated by local artists and two barrels were decorated by student artists from the Champlain Valley Union High School Art Club. In addition to the display in Williston Community Park, there were two outreach events associated with CtD 3.0 and a build-your-own rain barrel workshop. Throughout the five weeks that the rain barrels were on display in Williston Community Park before the give-away, 85 people applied through the Let it Rain website/QR code on the display signage to win a rain barrel (Table 4); an additional 30 people signed up during the Independence Day celebration (Table 5) for a total of 115 sign-ups.

Table 4. Rain Barrel Sign-Ups by Town (QR Code)

Town	# of People
Burlington	4
Essex	2
Essex Junction	9
South Burlington	2
Williston	55
Colchester	2
Other	11
TOTAL	**85**

Table 5. Rain Barrel Sign-Ups by Town (During Event)

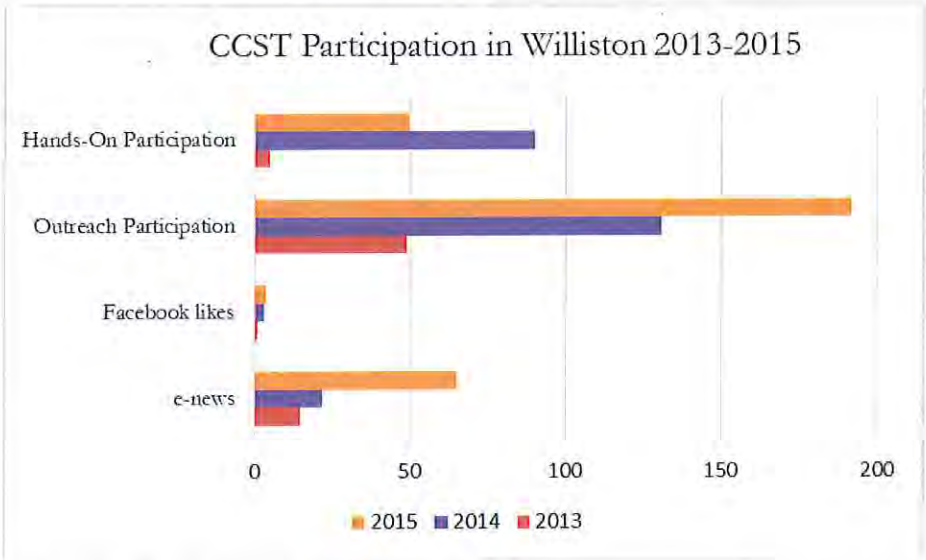
Town	# of people
Williston	26
Essex	2
Essex Junction	1
Burlington	1
Total	**30**

The total cost to plan, manage and implement CtD 3.0 was $3,800.84. In addition to personnel hours for project management and travel funds, the primary costs are compensation for the five professional artists ($1,000) and paid advertising ($722.10). CCST staff used 48.5 personnel hours and $94.55 of mileage to plan and execute CtD3.0.

Connecting the Drops 3.0 had a significant impact on CCST's successful year in 2015. The amount spent by CCST ($3,800.84) is 14 percent of CCST's FY15 budget. This relatively small budget percentage had a large impact on the overall participation numbers in 2015. All workplan targets for outreach and event participation in Williston were exceeded through the CtD 3.0 events. Additionally, the draw of signing up to win a rain barrel at the Williston Independence Day Celebration resulted in the largest impact in terms of outreach that CCST has made in Williston to date. Not only did Williston residents sign up to win a barrel, but many of them took outreach materials, talked with CCST staff and/or decorated CCST's chalkboard rain

barrel. A comparison of participation numbers in Williston between 2013, 2014 and 2015 for equivalent events and interactions is provided below (Figure 1). The elevated outreach numbers may be attributed to the increased CCST presence and advertising efforts that occurred through CtD3.0.

Figure 1. Williston Participation Numbers 2013-2015



Adopt-a Rain Garden Program Summary

The Stream Team's Adopt-a-Rain Garden program is an opportunity for individuals to assist in keeping Chittenden County's public rain gardens clean and attractive by performing basic maintenance activities like picking up litter, pulling weeds, and installing new mulch. The "adopted" gardens are of varying age and origin. A few were installed by the Winooski Natural Resources Conservation District/Chittenden County Stream Team, some have been in existence for a long time and needed extra care, while others are new. Information about CCST adopt-a-rain garden program is available on the Stream Team website.
In 2015, CCST chairs approved funding to create signage for the rain gardens. The signs were printed and installed in several gardens.

Following is a description of the status of each of the CCST public rain gardens; Table 6 condenses the information:

Brownell Library Rain Garden
Location: 6 Lincoln St. Essex Junction
Status: This garden has existed for many years and has several mature shrubs. Unfortunately, several of the mature shrubs are the invasive burning bush (Euonymus alatus.) Although the garden does not currently have an adopter, it has had an active adopter over the last several years. Additional plants and mulch were added to the garden in 2013 and 2014. It has been weeded and well-maintained in 2013, 2014 and 2015. Brownell Library staff are interested in getting rid of the burning bush. CCST would like to work with the Village of Essex Junction to remove the invasive plants and seek replacement shrubs.

Chittenden County Stream Team
Summary of Activities January-December 2015

Callahan Park Rain Garden
Location: Locust St., Burlington
Status: This garden has been functioning well for some time, despite its surrounding conditions. In 2013 the garden began to experience significant slumping. Work was done to repair the slumping, which caused the loss of many plants. However, the garden appears to be building back up and doing better. This garden has an active volunteer, Brad Ketterling, who is committed to weeding and monitoring the garden. This garden received donated plants in 2015. Brad is interested in adding more pollinator species in the future.

Chamberlain School
Location: 262 White Street, South Burlington
Status: This garden was installed in partnership with WNRCD and the Let it Rain Program in 2013. This is one of several rain gardens on the grounds of Chamberlain Elementary. Chris Provost has adopted this garden and actively maintains it. He often uses his students to help maintain the gardens and uses the gardens as an educational aide. Additional plants and mulch were provided to these gardens in 2014 and 2015.

Coast Guard Station
Location: Depot Street, Burlington
Status: This garden was very overgrown for some time. It is a small garden in a large parking lot at the edge of Lake Champlain. In 2014, CCST worked with the ECHO summer kids program to engage elementary school children in rain gardens. In several work sessions over the summer, the students pulled weeds, removed trash, planted dozens of new plants and applied mulch. The garden is doing very well and now has an active adopter, Wiley Reading.

Correctional Facility
Location: 7 Farrell St., South Burlington
Status: This garden is visible from the road and appears to be functioning. Originally, employees of the prison adopted this garden and would occasionally maintain the garden with inmates. There has been a lot of staff turn-over in the past few years without a clear adopter. In 2013, CCST delivered upwards of 50 plants to the center to be planted by the inmates. We were told that there was a weed-pulling day in 2014.

Farrell Park
Location: Swift Street, South Burlington
Status: This garden is unique in terms of its design. It is called an "advanced wetland stormwater filter." It was installed in 2012. Stormwater enters the garden through inlet, flows through the gravel wetland filter media, is cleaned and exits through other end. The garden requires very little maintenance because it has a flushing system that prevents sediment from building up. This garden had an active adopter for its entire life, until 2015 when the adopter moved away. The garden was not ever in need of additional plants or maintenance. It would not be appropriate to add mulch to this garden. CCST would like to find another adopter to bring any issues to our attention.

Landry Park
Location: North St., Winooski
Status: This garden was constructed in 2006. It was originally constructed as two separate gardens along the narrow strip of grass between a fence at Landry Park and the road. Over the years, the garden has fallen into

disrepair. A few years ago, nearby road construction altered the slope of the road carrying larger volumes of water into the garden. The increased flows have killed most of the vegetation and caused gullies to form. Over the years, CCST has attempted to add more vegetation and mulch in hopes of slowing the flow, but these attempts have not been successful. The City of Winooski is willing to work with CCST to repair the garden. Currently UVM students in an Ecosystem Design course are developing recommendations to repair the garden. There is no current adopter; the adoption program was put on hold for this garden as we try to address its problems.

Williston Town Hall Annex
Location: 7900 Williston Rd, Williston
Status: This small garden, near the entrance walkway to the Annex building and the parking lot, has had an active adopter since 2014, Rita Desseau. Each year she weeds the garden and has installed plants and mulch as needed. In 2013, after an absence of care for a year, UVM students helped clear the garden of trash and weeds.

Williston Library
Location: 21 Library Lane, Williston
Status: This garden has had an active adopter for many years. Andrew Wolf cares for the garden and keeps CCST posted on its status. The garden is functioning properly, is weeded and not in need of any extra care.

New Garden:

South Burlington Fire Department
575 Dorset St.
Status: South Burlington recently installed a bioretention area/rain garden to improve stormwater management at the Fire Department. http://www.sburlstormwater.com/stormwater-projects/city-offices-stormwater-improvement-project/. We have been actively looking for a volunteer to maintain this garden over time.

Table 6. CCST 2015 Rain Garden Status Update

Town	Garden Name	Adopter	Last Miantenance	Needs
Burlington	Coast Guard Station	Yes	plants/mulch 2014, 2015 weeding	None
Burlington	Callahan Park	Yes	plants/weeding 2015	None
South Burlington	Farrell Park	No	monitored through 2014	Nothing for garden, but do need a new adopter
South Burlington	Correctional Center	Yes	2014 plants/weeding	Touch base with new staff
South Burlington	Chamberlain School	Yes	2015 plants/mulch	none
South Burlington	Fire Station	No	new garden	needs adopter
Essex Junction	Brownell Library	No	2014/2015 new plants, weeding	Needs new adopter, needs removal of invasives
Williston	Town Hall Annex	Yes	2015 weeding/2014 mulch and plants	None
Williston	Willsiton Library	Yes	2015 plants/weeding	None
Winooski	Landry Park	No	2014 plants, weedng (2015 maintenance on hold)	Serious attention/redesign

Appendix H

Memo:

To: Jim Jutras, WWTF/PW Director
From: Terry Hass, Assistant Zoning Administrator
Date: January 19, 2016
Re: Stormwater Runoff as of December 2015

CONSTRUCTION SITE STORMWATER RUNOFF
AS OF DECEMBER 2015

Project Name	Address	Lot Size	Lot Coverage
Autumn Pond	38 Thasha Lane nka Autumn Pond Way	23.11 Acres	6.40 Acres

*Under construction, the following is a list of buildings permitted:

Bldg. #1 Apartments	38 Thasha Lane	30 units	C/O issued 06/24/15
Bldg. #2 Apartments	38 Thasha Lane	30 units	C/O issued 09/28/15
Bldg. #3 Apartments	38 Thasha Lane	30 units	C/O issued 09/28/15
Bldg. #5 Apartments	369 Autumn Pond Way	30 units	
Clubhouse and Pool	375 Autumn Pond Way		

Champlain Valley Self Storage Final C/O issued on 12/11/15	78 Lincoln Street	3.51 Acres	2.27 Acres
Village Haven Final C/O issued on 01/26/15	Roscoe Court	4.91 Acres	1.96 Acres
Village Walk	Kiln Road and Maple Street	22.4 Acres	4.69 Acres
Whitcomb Heights II	Cushing, Dunbar and Lavoie Drive	99.59 Acres	8.84 Acres
Riverside in the Village	Franklin Street Fuller Place	28.1 Acres	*9.83 Acres

As of December 31, 2015 the Village of Essex Junction issued Certificates of Occupancy for 273 units of Apartments.

*Under construction, the following is a list of buildings permitted:

Bldg. #1 Apartments	48 Park Street	24 units	C/O issued 09/13/13
Bldg. #2 Apartments	3 Franklin Street	36 units	C/O issued 12/11/12
Bldg. #3 Apartments**	10 Franklin Street	6 units	C/O issued 05/28/02
Bldg. #4 Apartments	13 Franklin Street	6 units	C/O issued 06/12/12
Bldg. #5 Apartments	15 Franklin Street	6 units	C/O issued 10/20/11
Bldg. #6 Apartments**	12 Franklin Street	6 units	C/O issued 12/19/02

Bldg. #7 Apartments**	10 Fuller Place	6 units	C/O issued 08/29/02
Bldg. #8 Apartments**	8 Fuller Place	6 units	C/O issued 08/29/02
Bldg. #9 Apartments	14 Franklin Street	6 units	C/O issued 10/20/11
Bldg. #10 Apartments**	6 Fuller Place	3 units	C/O issued 10/19/06
Bldg. #11 Apartments**	2 Fuller Place	6 units	C/O issued 09/07/05
Bldg. #12 Apartments**	4 Fuller Place	6 units	C/O issued 09/11/07
Bldg. #14 Apartments**	5 Fuller Place	6 units	C/O issued 08/27/09
Bldg. #15 Apartments**	9 Fuller Place	24 units	C/O issued 10/07/09
Bldg. #16 Apartments	1 Fuller Place	36 units	C/O issued 10/23/15
Bldg. #17 Apartments	3 Fuller Place	30 units	C/O issued 09/05/14
Bldg. #19 Apartments	21 Franklin Street	6 units	C/O issued 04/09/09
Bldg. #20 Apartments	23 Franklin Street	6 units	C/O issued 04/09/09
Bldg. #21 Apartments	25 Franklin Street	6 units	C/O issued 12/03/08
Bldg. #22 Apartments	27 Franklin Street	6 units	C/O issued 12/03/08
Bldg. #23 Apartments	29 Franklin Street	6 units	C/O issued 12/03/08
Bldg. #24 Apartments	31 Franklin Street	6 units	C/O issued 07/23/08
Bldg. #25 Apartments	33 Franklin Street	6 units	C/O issued 07/23/08
Bldg. #26 Apartments	35 Franklin Street	6 units	C/O issued 07/23/08
Bldg. #27 Apartments	37 Franklin Street	6 units	C/O issued 07/23/08
Bldg. #28 Apartments	39 Franklin Street	6 units	C/O issued 07/23/08
Apartments	44 Park Street	48 units	
Parking Garage (Not to be built)			

**Student Housing buildings were converted to apartments

Appendix I

Town of Essex and Village of Essex Junction Chloride Report

Summer

2015

Preliminary chloride testing of Indian Brook, Sunderland Brook, Alder Brook, and Browns River.

Kira Hancock and Kaitlin Tallman

Introduction and Background

In the fall of 2014, Vermont Agency of Natural Resources released the first ever chloride standards for waterways in the state. These standards are based off of those in the EPA Clean Water Act. In 1988, the EPA performed a study which found that freshwater aquatic organisms "should not be affected unexpectedly if the four-day average concentration of dissolved chloride...does not exceed 230 mg/L more than once every three years...and if the one-hour average concentration does not exceed 860 mg/L more than once every three years on the average."

The Town of Essex, VT along with the Village of Essex Junction, VT contains 11 different watersheds. Five of these are not monitored by the Town or Village because a majority of the waterway is in a different town. The remaining 6 watersheds belong to Abbey Brook, Browns River, Alder Brook, Indian Brook, Sunderland Brook, and the Winooski River.

Chloride is natural in the environment but is also released through road deicing, agricultural runoff, wastewater treatment and water softeners. Chloride trends are influenced by weather. In the winter warmer temperatures are expected to increase chloride levels due to the accumulated deicing materials running off. In the summer, during periods of increased precipitation, levels of chloride will be decreased as they are diluted. During periods of low precipitation increased chloride levels are expected due to the residual chloride in the soil and groundwater not diluted by summer rains.

Materials

Spot testing was performed using the HI 98129 by Hannah Instruments. This meter can measure pH, electric current, total dissolved solids, and temperature. It was chosen because its electric current reading range from 0 to 3999 µS/cm is the range of chloride expected in a stream or river. The temperature function was used as well but the electric current reading is automatically corrected for 25°C.

Procedure

First test locations had to be chosen for each of the bodies of water. Water quality has been performed in Indian Brook in the past so those locations were used again for chloride testing. They were also used as a model for choosing test locations for other watersheds. The first test point on Indian Brook is at the headwaters so the headwaters of each watershed were chosen as the first test point if they were within a reasonable distance. Next locations with roads close by were chosen for their ease of access. The last feature taken into account was the location of impervious surface within the watershed. The test locations of Indian Brook, Alder Brook, and Sunderland Brook are displayed in the in the last three pages of this document.

The chloride meter was placed in the running stream and held until the reading was steady. The second test date samples were taken from the stream and the sample was tested for chloride. This was found to be a hassle so all other tests were done directly in the stream.

An excel sheet was kept to organize the data. The date, air temperature, current weather, and precipitation in the past five days were recorded for each sampling date. At each location the time of the sample, water temperature, and electric current were recorded.

Air temperature data and precipitation over the past five days were taken from Accuweather.com for the Essex Junction area.

To convert the electric current (µS/cm) to concentration of chloride (mg/L) an equation developed by New Hampshire was used. New Hampshire developed this equation by testing multiple locations under different flow conditions and concentrations of chloride.

$$Chloride\ (mg/L)\ =\ 0.307 * Specific\ Conductance\ (uS/cm) - 22.00$$

Results

Chloride readings were taken ten different days over the period of summer 2015. The data in Table 1 is an overview of all the chloride level data collected. The cells highlighted in yellow are the cells that exceeded the chronic impairment level. No test resulted in a level of chloride above the level of acute impairment.

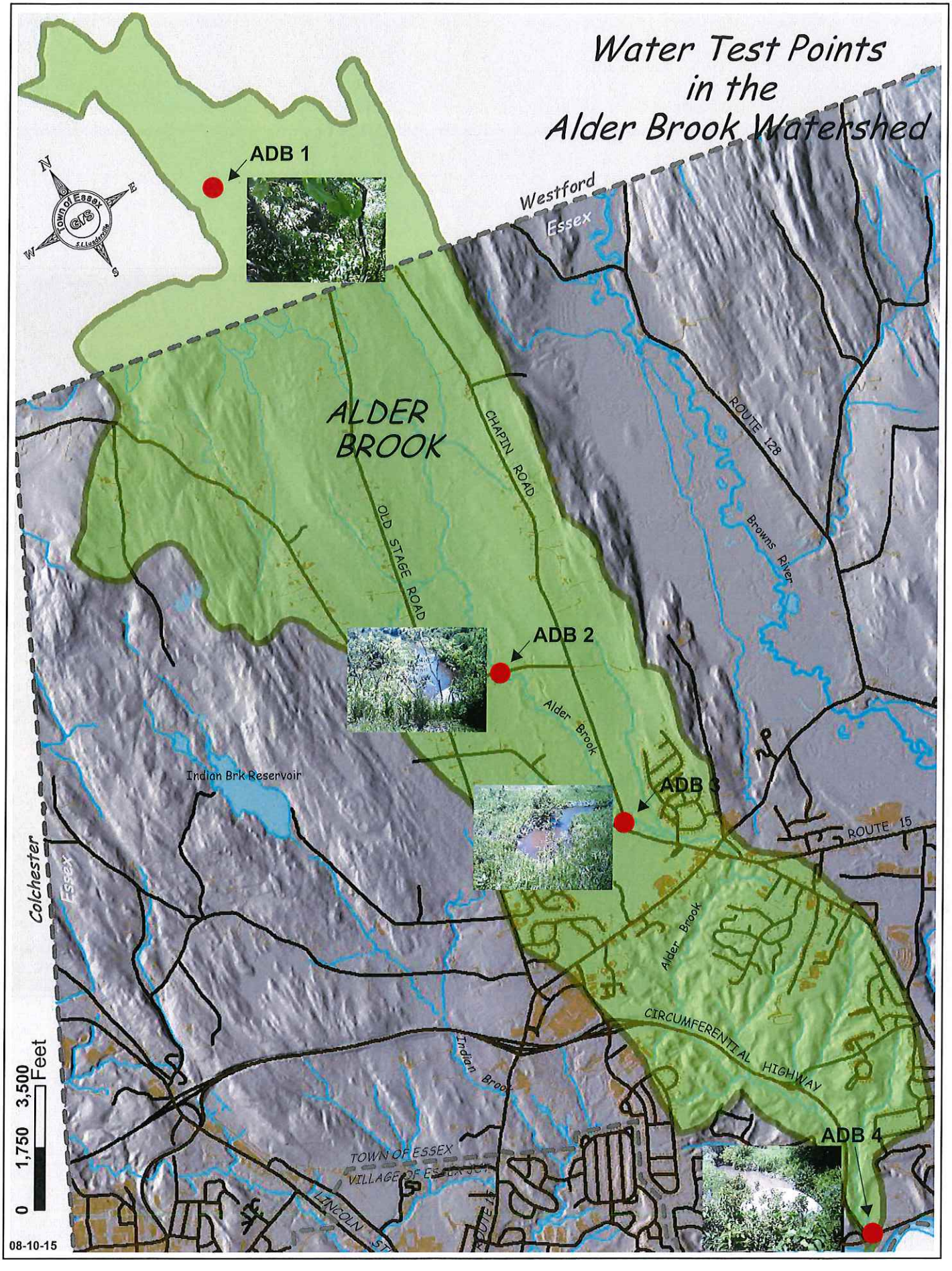
Chloride Levels by Test Date and Location

*All Chloride measurments in mg/L			Date									
			17-Jun	18-Jun	23-Jun	6-Jul	13-Jul	21-Jul	27-Jul	30-Jul	4-Aug	10-Aug
	Precip 5 days prior to test date:		2.1"	0.76"	1.51"	2.46"	0.12"	0.49"	0.36"	0.30"	0.10"	0.04"
Body of Water	LandMark	GPS Location										
Indian Brook	Indian Brook Res	IB 1	15	30	Not Tested	16	17	17	Not Tested	17	20	23
	Lost Nation	IB 2	16	19		19	21	27		28	22	30
	Lang Farm Nursery	IB 3	30	39		38	50	69		97	116	198
	Densmore	IB 4	81	105		87	109	132		162	178	232
	High School	IB 5	103	182		109	138	228		226	266	424
	Pinecrest	IB 6	84	111		99	145	153		181	190	228
Alder Brook	Rollin Irish Rd	ADB 1	Not Tested	Not Tested	2	46	56	57	Not Tested	60	68	77
	Colonial Page Rd	ADB 2			-1	35	47	49		52	54	67
	Chapin Rd	ADB 3			16	109	52	52		59	20	70
	River Rd	ADB 4			8	85	128	109		130	Not Tested	166
Sunderland Brook	Expo Pond	SB 0	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	84	Not Tested	77	86	Not Tested
	Bridge	SB 1					205	188		185	180	
	Brooks Ave	SB 2					280	222		205	213	
	Pearl Street Park	SB 3					274	202		197	205	
	Rite Aid	SB 4					231	Not Tested		Not Tested	Not Tested	
Browns River	Pettingill Rd	BR 1	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	31	Not Tested	36	Not Tested
	128 Cornfields	BR2							32		36	
	Naylor Rd	BR 3							30		29	

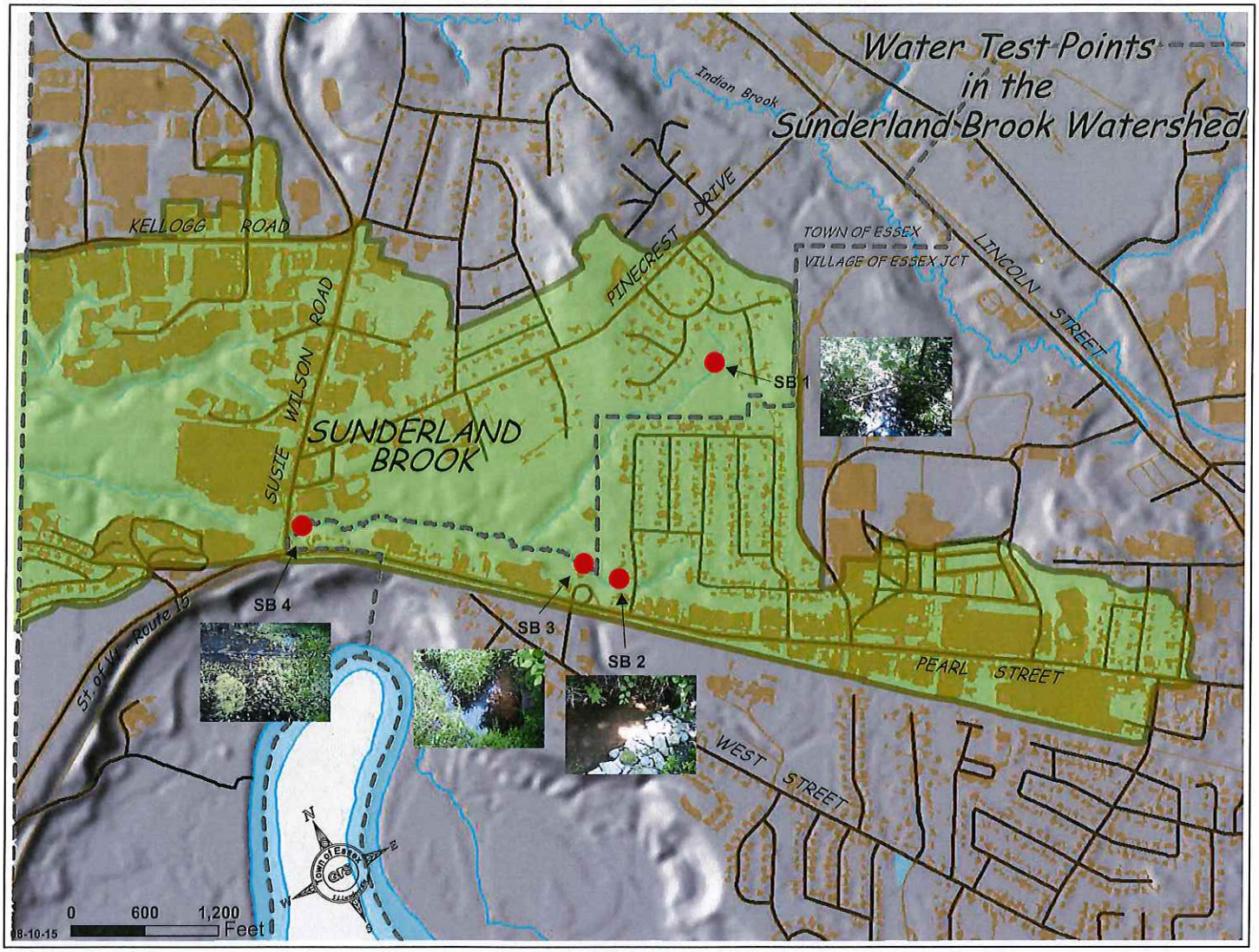
The Essex High School test location delivered interesting results. Directly up stream of the test location an outfall from the Essex Skating Facility parking lot meets Sunderland Brook. The outfall was tested on August 10th 2015 and the specific conductance was 2336 µS/cm which is a chloride level of 695 mg/L. Where the outfall meets the stream a specific conductance of 2360 µS/cm was measured for a chloride concentration of 703 mg/L. On some occasions it was difficult to measure specific conductance at this location because the reading would not stop jumping around.

Discussion and Conclusion

The data collected was only quick and dirty spot testing to identify which streams may need closer monitoring than others. The state standards are in terms of 4 day and hour averages. Sunderland Brook shows numbers over the chronic level on a specific day. If the days before and after had lower levels of chloride then it would be okay to see these numbers on a specific day. Indian Brook at the Essex High School testing location shows high levels on multiple test days which is more concerning. The Essex High School Location of Indian Brook was chosen as the first location to put a long term chloride tester due to these high levels and its ease of access. It will be important to measure all streams for long periods of time to get chloride levels under many different flow conditions.



Water Test Points
in the
Alder Brook Watershed
ADB 1
ADB 2
ADB 3
ADB 4
Westford
Essex
ALDER
BROOK
CHAPIN ROAD
OLD STAGE ROAD
ROUTE 128
Browns River
Alder Brook
Indian Brk Reservoir
ROUTE 15
Colchester
Essex
CIRCUMFERENTIAL HIGHWAY
Indian Brook
TOWN OF ESSEX
VILLAGE OF ESSEX JCT
LINCOLN ST
0 1,750 3,500 Feet
08-10-15


Water Test Points
in the
Sunderland Brook Watershed
Indian Brook
KELLOGG ROAD
PINECREST DRIVE
TOWN OF ESSEX
VILLAGE OF ESSEX JCT
LINCOLN STREET
SUSIE WILSON ROAD
SUNDERLAND BROOK
SB 1
SB 2
SB 3
SB 4
St. of Vt. Route 15
PEARL STREET
WEST STREET
N
W
E
S
Town of Essex
GIS
0
600
1,200
Feet
8-10-15

Appendix J

CHITTENDEN MS4 MUNICIPAL STORMWATER PROGRAM ACCOMPLISHMENTS	2003-2008 YEARLY AVERAGE	2009	2010	2011	2012	2013	2009-2013 YEARLY AVERAGE	2014
CATCH BASIN CLEANING SEDIMENT REMOVED	**435.5 TONS**	1619.6 TONS	2530 TONS	708 TONS	856 TONS	603 TONS	**1263.3 TONS**	**1708.4 TONS**
STREET SWEEPING SEDIMENT REMOVED	**532.2 TONS**	3301.5 TONS	948 TONS	1775 TONS	2820 TONS	1403.5 TONS	**1797.6 TONS**	**1078.3 TONS**
GREEN-UP & STREAM CLEAN-UP TRASH & DEBRIS REMOVED	**51.36 TONS**	36.7 TONS	28.2 TONS	46.2 TONS	101.28 TONS	18.5 TONS	**46.17 TONS**	**24.3 TONS**
HAZARDOUS WASTES PROPERLY DISPOSED (IN COUNTY)	**160 TONS**	NA	117.8 TONS	185.5 TONS	NA	NA	**151.6 TONS**	**8195 TONS**
STORMWATER OUTFALLS INSPECTED	**293**	1701	672	794	880	571	**924**	**753**
CATCHBASIN INSPECTIONS	**2665**	8711	5550	5910	5597	3844	**5922**	**4001**
STORM DRAINS LABELED FOR NO DUMPING	**1088**	1976	1011	1019	996	222	**1045**	**783**
ILLEGAL OR ILLICIT DISCHARGES DETECTED	**10**	11	11	12	7	8	**10**	**12**
ILLEGAL OR ILLICIT DISCHARGES ELIMINATED	7	6	3	9	7	8	**7**	**12**
CONSTRUCTION EROSION SITE INSPECTIONS	**1108**	1811	3076	2778	3110	1754	**2506**	**2977**
SITE PLANS REVIEWED FOR STORMWATER MANAGEMENT	**752**	767	629	821	809	604	**726**	**669**
DOLLARS SPENT ON STORMWATER PROGRAM	**$400,000 / MS4**	$2,865,500 6 MS4s	$3,045,842 5 MS4s	$1,292,036 4 MS4s	$5,011,573 7 MS4s	$3,371,882 7 MS4s	**$501,174 / MS4**	**$4,312,426 6 MS4s**
MUNICIPAL EMPLOYEE TRAINING	**97 HOURS**	641 HOURS	900 HOURS	667 HOURS	2605.25 HOURS	144.5 HOURS	**992 HOURS**	**290 HOURS**
PET WASTE BAGS DISTRIBUTED	**144,068**	33,144	228,120	194,148	203,973	119,880	**134,275**	**101,520**

Appendix K

2015 MS4 INDICATORS	MS4 Village of Essex Junction
CATCH BASIN CLEANING	145 basins cleaned, 3 VorTech units, 1 private CB system 6 cubic yards or 1.55 tons total material removed
STREET SWEEPING	71 lane miles swept 620 cubic yards or 167.4 tons of material removed
GREEN-UP & STREAM CLEAN-UPS	0.56 tons of trash 4 tires
HAZ WASTES DISPOSED OR REUSED LBS (CSWD JULY-JULY)	1200 lbs
#STORMWATER OUTFALLS SURVEYED	187
#CATCHBASIN INSPECTIONS	850
#STORM DRAINS MARKED	600 of 850 CB inspected in 2015. No new markers installed in 2015.
#ILLICIT DISCHARGES DETECTED	7 investigations of illegal dumping's into infrastructure
#ILLICIT DISCHARGES ELIMINATED	7 resolutions of illegal dumping
#CONSTRUCTION EROSION SITE INSPECTIONS	50
#SITE PLAN REVIEWS FOR SW MANAGEMENT	5
DOLLARS SPENT ON STORMWATER PROGRAM	Approx. $72, 000 Hard to estimate for 2015 due to Town of Essex/Village of EJ SW budget combined in July 2015
MUNICIPAL EMPLOYEE TRAINING (HRS)	2 hours
#PET WASTE BAGS DISTRIBUTED	4200
CHANNEL PROTECTION VOL. CREATED (CUBIC FEET OR ACRE-FT)	No new in 2015