Section 11

Case Studies

Case Studies

SOPHIE SAUVÉ

PROJECT LEAD: Dan Currier, Central Vermont Regional Planning Commission (CVRPC)
PARTNERS: Northfield, Friends of the Winooski River
DESIGNED BY: Watershed Consulting Associates, LLC

11.1 NORTHFIELD: CENTRAL STREET BIORETENTION

PROBLEM DEFINITION: Located adjacent to Depot Square in downtown Northfield, Central Street is on a steep grade, making it susceptible to fast erosive flow during storm events. Catch basins in this part of town are linked to the combined storm sewer system that discharges to the wastewater treatment plant. Large volumes of water during storm events can overwhelm the capacity of the treatment plant, causing discharge of untreated sewage to the Dog River. Reducing the volume of water that reaches the storm sewer can reduce the regularity of these overflow events and protect water quality.

PROJECT BACKGROUND: The VT Department of Environmental Conservation (VT DEC) manages a mapping program that identifies a town's existing stormwater infrastructure and sources of runoff, and then prioritizes project locations based on feasibility, cost, and pollutant reduction potential. This site was identified in 2011 during a mapping exercise in the Village as a priority location for intervention to protect the Dog River. The Central Street Bioretention is one of three stormwater practices installed in this area with funding the Vermont Department of Environmental Conservation's Ecosystem Restoration Program (ERP) –now the Clean Water Initiative.

TECHNICAL INFORMATION: Central Street Bioretention is a terraced series of filtration planters with a timber frame and check dams to reduce water velocity on the steeply sloped site. The terraced chambers allow water to filter into the amended soil and into ground water – reducing the volume of stormwater that enters the catch basins at the roadway. A standpipe in the lowermost chamber allows rare large events to safely discharge to the storm sewer without risk of flooding infrastructure.

BENEFITS: Outfalls disconnected stormwater runoff from Central Street and eliminated combined sewer overflow events by reducing loading to the system. The two basins (also one adjacent to Legion Hall Parking Lot) receive water from 14 acres, seven of which are impervious surfaces. The partnership with the municipality, who maintain the facility and worked with the CVRPC to build it quickly, was crucial to the success of this project.

LESSONS LEARNED: When seeking to design and install innovative infrastructure, hiring qualified contractors and receiving accurate quotes for work can be a challenge. Ensuring experienced project management and construction oversight can help reduce these challenges.

11.2 HINESBURG: SILVER STREET RAIN GARDEN

PROBLEM DEFINITION: The LaPlatte River has been identified as stressed due to stormwater runoff influencing flow and nutrient loading to the waterbody. In a 2010 stormwater mapping study, the intersection of Route 116 and Silver Street in Hinesburg was noted as a site generating a large runoff volume from extensive impervious cover and limited infiltration or retention in the drainage area. The LaPlatte River is less than 800 feet from the roadway junction – making management of stormwater critical for waterway health.

PROJECT BACKGROUND: The Hinesburg Community School parcel is adjacent to the well-travelled intersection of Route 116 and Silver Street, making this location ideal for treatment, visibility, and public access. Over the past decade several Vermont Agency of Transportation (VTrans) projects were constructed in this drainage area, including a new bridge over the LaPlatte and intersection realignment and sidewalk extension. None of these projects were required to address stormwater. With leadership from the Lewis Creek Association, the rain garden project was prioritized for implementation and funded by the VT Department of Environmental Conservation Ecosystem Restoration Program (ERP).

TECHNICAL INFORMATION: The Silver Street Rain Garden consists of two-tiered vegetated chambers with a forebay at the outfall of 3 large stormwater pipes to settle out particles and slow water velocity. The garden was designed to filter runoff before it reaches the LaPlatte River – providing reduced storm flow and improved water quality. Native plant species including iris, marsh marigold, aster, and turtle head were selected for suitability in rain garden soil conditions, visual interest, and pollinator benefits. Pollutant removal modelling of the project indicates a reduction of 87% of suspended solids and 34% total phosphorus from the drainage area.

BENEFITS: Stormwater captured in the rain garden is filtered and infiltrates into the soil rather than flowing directly into the LaPlatte untreated. The garden's proximity to the Hinesburg Community School allows educational benefits for the children, including regular visits to observe wildlife and vegetation growth. The diversity of native plants creates habitat for multiple wildlife from insects, amphibians and birds and provides visual interest at different times of year. What was once a monoculture of mowed lawn on a steep slope now a highlights the important ecological functions that can be incorporated into a village environment that includes multiple modes of transportation.

LESSONS LEARNED: As a retrofit project, it was challenging to work within the existing site constraints. Recognition by VTrans of stormwater impacts to the LaPlatte during the design and engineering phases of the multiple projects would have allowed time and cost savings for construction of the rain garden. The existing small colony of cattails was not expected to dominate the planted area. The aesthetic features of the diverse plantings are now overwhelmed by the cattails but the diversity of native plant species still provides ecological benefits. A strong maintenance plan with dedicated funding and staff is important to ensure long term project success. Cattails are establishing in the garden which was not part of the design. A strong maintenance plan with dedicated funding and staff is important to ensure long term project success.

PROJECT LEAD: Lewis Creek Association, Andrea Morgante, Board Member
PARTNERS: Town of Hinesburg, Mike Anthony, Road Foreman
DESIGNED BY: Milone & MacBroom In., Brian Cote Project Engineer


SOPHIE SAUVÉ

PROJECT LEAD: Paul Simon (formerly of White & Burke)
PARTNERS: Malone Properties, property owners
DESIGNED BY: White & Burke, SE Group, DeWolf Engineering

11.3 SOUTH BURLINGTON: TRADER JOE'S: PARKING LOT RAIN GARDEN

PROBLEM DEFINITION: In 2013, the Development Review Board and City Council of South Burlington were debating the adoption of a Form Based Code for their City-Center District. While regulations at the time were in flux during a period of Interim Zoning, the prospective tenant and owner sought to meet both current and future regulations, leading them to address stormwater on site.

PROJECT BACKGROUND: Garden Street, the Street leading to Trader Joe's / Pier 1 in South Burlington is expected to be extended and become one of the main entry points to the cities planned City-Center. Ahead of the city-wide standard that would set a threshold of half acre of disturbance/ development to trigger stormwater management requirements (lower than the state's one acre), the use of Low Impact Development (LID) techniques for typical rainfalls were sought. Stormwater was part of the permitting process, including the maintenance agreement and bioswale management, therefore, if not well cared for, it becomes a zoning violation.

TECHNICAL INFORMATION: Green Stormwater Infrastructure includes a bioswale within the parking median central to the development, in addition to landscaping around the building and in the parking islands. The bioswale includes sloped vegetation and numerous plantings capable of withstanding periodic saturated soil conditions working to trap pollutants and silt particles from the parking lot.

BENEFITS: The bioswale was designed as an attractive site feature and is maintained by the property owner. Educational signage is also included on-site to educate the importance of a bioswale and highlight the benefits of the project.

LESSONS LEARNED: Looking ahead at future regulations can help ease the permitting process.

11.4 ST. ALBANS: PERMEABLE PAVEMENT, SILVA CELLS, AND STORMWATER PLANTERS

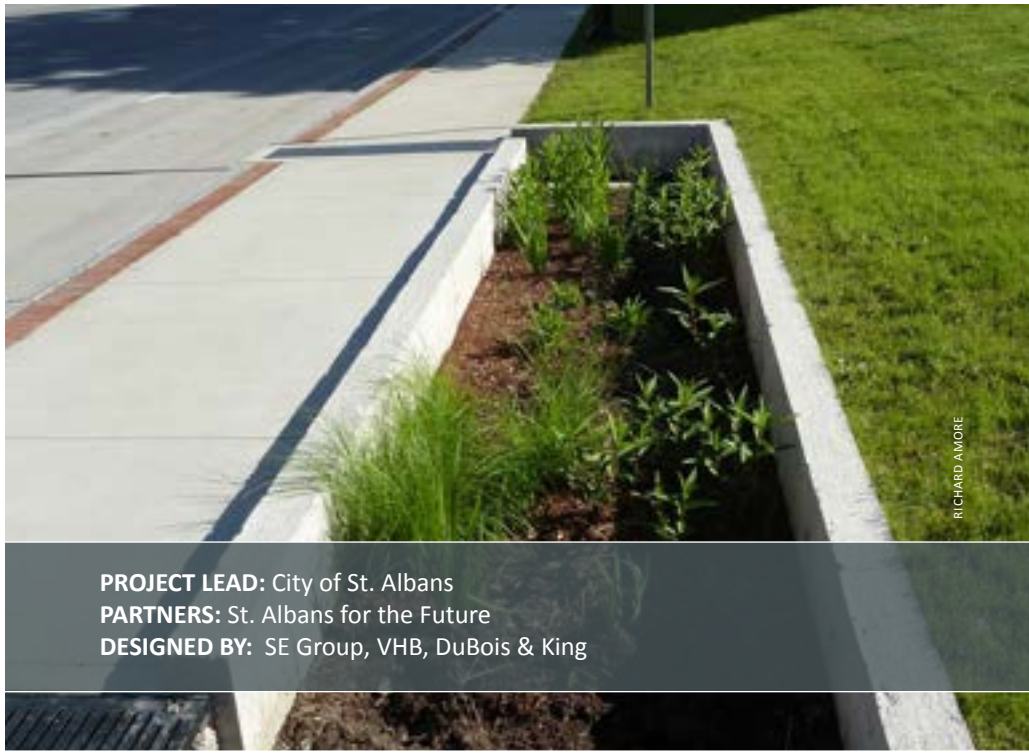
PROBLEM DEFINITION: Downtown St. Albans is an historic town center with a rich tradition as a center of commerce in the northern part of the state. Aging infrastructure, parking patterns that impede multi-modal transportation and narrow sidewalks were impacting the City's ability to attract new businesses, provide access to new and existing visitors, and serve as an attractive and safe place for community gatherings. To the west of the downtown square, St. Albans Bay is impacted by excess phosphorus runoff, causing algae blooms that impede use of the natural resource.

PROJECT BACKGROUND: As the first in a series of projects, the Main Street Streetscape project was not the only public infrastructure project that was finished to revitalize the Downtown, but it was the one that started the ripple effect. Green features were integrated at several points in the planning and design. Pervious concrete replaced asphalt paving along pedestrian walkways in Taylor Park. Installation of that feature took place over multiple project and funding rounds from 2009-2011. In 2013, the larger revitalization effort was underway and included stormwater planters installed along Main Street adjacent to the park and street trees with Silva Cell technology on the merchant side of the road. Concurrently, sidewalks were widened to accommodate pedestrians and outdoor seating and parking patterns were updated to allow safe crossing with bump outs and improved access for multiple transportation modes.

TECHNICAL INFORMATION: Pervious concrete in Taylor Park reduced impermeable surfaces in the downtown and provides a publicly accessible example of its installation. Stormwater planters along the roadway filter and infiltrate runoff prior to discharge into the City storm sewer. The result is a reduction in volume and an improvement of water quality reaching waterways. Silva Cells® provide structural support for the expanded sidewalk while giving tree roots access to substantial soil volume to increase healthy growth.

BENEFITS: The public investment in downtown St. Albans has resulted in new development including a new 84-room Hampton Inn Hotel and expansion of existing businesses to provide outdoor dining on the extended sidewalk area. Downtown storefront vacancies decreased by 75% and all upper story spaces along Main Street are either inhabited or planned for renovation. The prominence of the green features in the downtown core invites conversation and learning from locals and visitors on unfamiliar techniques for managing stormwater that incorporates an historic village character.

LESSONS LEARNED: The selected stormwater features require more maintenance than the City can regularly provide with its limited staff. Considering local capacity for ongoing maintenance is critical for functioning and beautiful Green Streets features. Many of the trees required replacing in the first couple of years. As with any landscaping effort, including a replacement insurance provision with the contractor ensures that vegetation failure within the first year of planting will be replaced at no cost to the City. Permeable concrete in its currently available mixture, has been found unsuitable for Vermont's harsh conditions of freeze-thaw cycles and common use of deicing salts. The walkways in the park are showing signs of premature wear as a result. Careful selection of materials for the specific conditions of a site can reduce the chance of failure. Alternatives to pervious concrete are readily available in the marketplace.



PROJECT LEAD: City of St. Albans
PARTNERS: St. Albans for the Future
DESIGNED BY: SE Group, VHB, DuBois & King

References

Bassuk, Nina. Bryan R. Denig, Ted Haffner, Jason Grabosky and Peter Trowbridge. 2015. CU-Structural Soil®: A Comprehensive Guide.

CISCO. Corporate Social Responsibility. ND. SMART Metrics for Nonprofits. *http://csr.cisco.com/pages/smart-metrics-for-nonprofits*. Accessed May 2017.

City of Philadelphia. City of Philadelphia Green Streets Design Manual. *http://www.phillywatersheds.org/img/GSDM/GSDM_FINAL_20140211.pdf*

City of Philadelphia. 2014. Green Stormwater Infrastructure Maintenance Manual. http://phillywatersheds.org/doc/GSI%20Maintenance%20Manual_v1.pdf

City of Portland Green Streets. *https://www.portlandoregon.gov/bes/article/414873*

County of San Diego Department of Public Works. 2016. Green Streets Maintenance Schedule. *http://www.sandiegocounty.gov/content/dam/sdc/dpw/WATERSHED_PROTECTION_PROGRAM/watershedpdf/County_BMPDM_App_K.5.pdf*

City of Toronto. 2013. Tree Planting Solutions in Hard Boulevard Surfaces Best Practices Manual.

Day, Susan Downing and Sarah B. Dickinson, Eds. 2008. Managing Stormwater for Urban Sustainability using Trees and Structural Soils. Virginia Polytechnic Institute and State University. Blackburg, VA.

Environmental Protection Agency (EPA). N.D. Using Trees and Vegetation to Reduce Heat Islands. *https://www.epa.gov/heat-islands/using-trees-and-vegetation-reduce-heat-islands*

Environmental Protection Agency (EPA)/ Davey Resource Group. 2013. Stormwater to Street Trees: *Engineering Urban Forests for Stormwater Management. http://www.davey.com/media/183712/stormwater_to_street_trees.pdf*

Feehan, Caitlin. 2013. A Survey of Green Infrastructure Maintenance Programs in the United States. *http://hixon.yale.edu/sites/default/files/files/fellows/paper/feehan_hixonpaper20131.pdf*

Li, H. Harvey, J.T., T.J. Holland, and M. Kayhanian. 2013. The use of reflective and permeable pavements as a potential practice for heat island mitigation and stormwater management. *http://iopscience.iop.org/article/10.1088/1748-9326/8/1/015023*

Lukes, Robb, and Christopher Kloss. 2008. Managing Wet Weather with Green Infrastructure. Municipal Handbook. Environmental Protection Agency. *https://www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_green_streets_0.pdf*

Minnesota Pollution Control Agency. "Potential Stormwater Hotspots" *https://stormwater.pca.state.mn.us/index.php?title=Potential_stormwater_hotspots*. Accessed April 4th, 2017.

Minnesota Pollution Control Agency. 2017. Design Criteria for Bioretention. https://stormwater.pca.state.mn.us/index.php/Design_criteria_for_bioretention#Snow_considerations

Monash University: Water for Liveability Centre. N.D. Green Cities and Microclimate. *http://www.waterforliveability.org.au/?page_id=4586*

National Association of City Transportation Officials. 2016. Global Streets Design Guide. Washington: Island Press.

National Association of City Transportation Officials. 2017. Urban Street Stormwater Guide. Washington: Island Press.

Nevue Ngan Associates & Sherwood Design Engineers. 2011. San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook. 1st Ed. *http://www.flowstobay.org/files/greenstreets/GreenStreets_booklayout_Guidebook.pdf*

References

Pellett, Norman E., Mark C. Starrett. N.D. Landscape Plants for Vermont. Burlington: University of Vermont.

Philadelphia Green Streets Design Manual. 2014. *http://www.phillywatersheds.org/img/GSDM/GSDM_FINAL_20140211.pdf*

Proppe, Sara Joy. 2017. The Isolation of Aging in an Auto-Oriented Place. *https://www.strongtowns.org/journal/2017/4/14/what-developments-mean-for-you-as-you-get-older?mc_cid=e1bfc990bd&mc_eid=e228ea8810*

Rhodes, Margaret. 2017. The Brilliant Simplicity of New York's New Times Square. *https://www.wired.com/2017/04/brilliant-simplicity-new-yorks-new-times-square/?mc_cid=e1bfc990bd&mc_eid=e228ea8810#slide-4*

Schmidlin, Thomas, W. 1986. Freeze-Thaw Days in the Northeastern United States. American Meteorology Society: Journal of Climate and Applied Meteorology.

Sisson, Patrick. 2017. Cycling success: 10 U.S. cities pushing biking forward. *http://www.curbed.com/2017/4/18/15333796/best-cities-bike-commute-us-cycling?mc_cid=e1bfc990bd&mc_eid=e228ea8810.*

The Green Infrastructure Ontario Coalition and Ecojustice. N.D. Health, Prosperity and Sustainability: The Case for Green Infrastructure in Ontario. *https://www.ecojustice.ca/wp-content/uploads/2014/08/Health-Prosperity-and-Sustainability_The-Case-for-Green-Infrastructure-in-Ontario.pdf*

Tree Trust and Bonestroo. 2007. City Trees: Sustainability Guidelines and Best Practices. *http://vtcommunityforestry.org/sites/default/files/pictures/city_trees.pdf*

USDA, Natural Resources Conservation Service – New Jersey. 2011. Soil Health Fact Sheet – Ocean County. *https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_017822.pdf*

USDA, Natural Resources Conservation Service. Web Soil Survey. *https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm*

Vermont Agency of Natural Resources. 2017. Vermont Stormwater Management Manual Rule. Environmental Protection Rule Chapter 36. *http://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/ManualUpdate/FinalRule/2016_12_20%3B%202017_VSMM_Rule_Final.pdf*

Vermont Department of Environmental Conservation. 2016. Vermont Guide to Stormwater for Homeowners and Small Businesses. *http://dec.vermont.gov/sites/dec/files/wsm/erp/docs/VT_Guide_to_Stormwater_for_Homeowners_DRAFT.pdf.*

Vermont Planning Information Center. N.D. Green Infrastructure Calculators and Sizing Tools. *http://www.vpic.info/GreenInfrastructureCalculatorsAndSizingTools.html*

Vermont Urban & Community Forestry Program. N.D. Right Tree, Right Place. *http://vtcommunityforestry.org/sites/default/files/pictures/species_selection_v2.pdf*

Vermont Urban & Community Forestry Program. N.D. Vermont Tree Selection Guide. *http://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Community_Forests_and_Trees/Library/VTTree%20Guide.pdf*

Walker, Alissa. "Landscape Architecture icons to know now: Cornelia Oberlander and Harrier Pattison". *http://www.curbed.com/2017/3/8/14856376/modernist-landscape-architects-women*

Water Environment Research Foundation. 2010. Green Streets Basics and Design. *https://www.werf.org/liveablecommunities/toolbox/gst_design.htm*.

Watershed Consulting Associates. 2017. Green Infrastructure for Stormwater Management: Guidance for Municipal Officials in New York's Lake Champlain Basin. *http://www.lcbp.org/wp-content/uploads/2017/05/NYGI_manual_Final_Submittal.pdf*