VERMONT

State of Vermont

Green Stormwater Infrastructure

Agency Work Plans

Agency of Administration – Department of Buildings and General Services

Agency of Commerce and Community Development

Agency of Natural Resources

Agency of Transportation

Submitted July 1, 2013

Per Executive Order 06-12

Pervious Pavement - St. Albans

Constructed Gravel Wetland - St. Albans

Bioretention - Montpelier

Silva Cell™ - Burlington

Roadside Curb Removal – Route 9

State of Vermont

June 28, 2013

Stormwater runoff is a significant contributor to water quality impairments, especially in developing and urban areas. It is a ubiquitous problem that originates from roads, buildings, parking lots, and other impervious surfaces. It can have dire implications for water quality and quantity, habitat and biological resources, public health, and the aesthetic appearance of waterways. Controlling stormwater runoff in a sustainable and efficient way is crucial to long-term public and environmental health.

Green stormwater infrastructure (GSI) is a tool that addresses stormwater issues through natural processes and concepts. It differs from more traditional gray infrastructure in that it strives to take a holistic approach to stormwater management. This is achieved by preventing runoff through decentralized, multifunctional practices, which provide numerous economic, environmental, and societal benefits.

Over the years, state agencies have implemented GSI in a variety of projects and programs and supported external partners in their efforts to do the same. Unfortunately, most of this work was done in piecemeal fashion until the launch of the Green Infrastructure Initiative in 2009. Since that time, we have made important strides in our understanding of GSI and our coordination of GSI efforts. Through Executive Order 06-12 and the formation of the Interagency Green Infrastructure Council, we hope to do even more.

The following plans outline some of the challenges and opportunities we face moving forward. Although these plans highlight particular challenges and strategies identified by separate Agencies, they have been packaged together in an effort to showcase our efforts to address stormwater runoff in a collaborative manner.

We look forward to working together to make these plans a reality.

Jeb Spaulding, Secretary
Agency of Administration

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EXECUTIVE SUMMARY

Stormwater runoff from roads, buildings, parking lots and other impervious surfaces degrades the water quality of the state's surface waters.

Green stormwater infrastructure (GSI) is an efficient, effective, and sustainable method of reducing and capturing stormwater runoff. GSI is comprised of natural and engineered landscape elements that provide or mimic natural hydrologic function. Using GSI, stormwater is slowed down, spread out, and absorbed as close to the source as possible. This decentralized approach is in contrast to the more traditional method of stormwater management, which uses "grey stormwater infrastructure" (ditches, pipes, and catch-basins) to capture, channel, and convey stormwater runoff to another location.

In March 2012, Governor Shumlin signed an Executive Order forming an Inter-agency Green Infrastructure Council. The Council, composed of representatives from the Agency of Administration, Agency of Commerce and Community Development, Agency of Natural Resources, and the Agency of Transportation, is charged with integrating GSI into Agency programs though coordination, planning, and inter-agency information sharing. One of the Council's first assignments was to compile each Agency's current GSI-related initiatives, challenges for change and short-term opportunities and strategies. The results of this effort are included in the attached Agencies' reports.

FINDINGS

There are dual roles for the state. First, making sure state lands and facilities showcase GSI and other sustainable stormwater management techniques. This means incorporating GSI into facility planning, design, engineering, redevelopment, and operations. Second, working in tandem with municipalities and the private sector to understand and implement GSI. This requires greater integration of GSI into existing and future programs and processes

The individual agencies have been undertaking an array of activities related to GSI, but there is much more to do. Working at an inter-agency level will produce results.

CHALLENGES

Lack of knowledge among state, private, and municipal design, engineering, planning and public works professionals as to what constitutes GSI, how it compares to traditional stormwater management, and how it intersects with regulatory requirements.

Limited Vermont focused GSI design standards.

Competing priorities and resources. For example, a desire for road widening to accommodate bicycle and pedestrian traffic in towns and villages also hoping to reduce total impervious area.

Inconsistent or non-existent data about GSI benefits, costs, and performance.

MOVING FORWARD

While individual agencies will muster the resources to implement the "short term opportunities and strategies" as described in the reports, collectively the Council will focus on the following:

1. Developing a protocol or methodology for identifying GSI opportunities at state facilities. Also developing a list of priority facilities that would benefit the most from GSI and offering broad opportunities to demonstrate the practices.

2. Partaking in revisions to the Vermont Stormwater Management Manual. The stormwater regulations will be revised in 2014 to allow for reasonable GSI approaches for addressing stormwater. This will help in mainstreaming GSI and lay the groundwork for VT GSI Design Standards. The GSI Council is an important sounding board for ANR as it goes forward with this rulemaking.

3. Making connections between GSI and resiliency. The agencies have growing inter-agency programs to address flood resilience, climate change, and disaster recovery. Managers and staff are being trained and the level of knowledge overall on river management, floodplain dynamics and the relationship with the built environment is greatly improving and in some instances is being shared with municipalities. Water quality and GSI specifically should be combined with these efforts.

4. Strengthening information paths and relationships with municipalities. The Agencies have existing relationships (programs, planning, and grant opportunities) with municipalities. These relationships are an excellent way to share information and incentivize action at the municipal level. Examples include ACCD's planning grants, ANR's Ecosystem Restoration Program grants, and grants through VTrans' Vermont Better Back Roads program. Work needs to be done by the Agencies individually and collectively to leverage these and other opportunities, and show successful outcomes.

5. Increasing internal capacity to plan for, design, implement and manage GSI on state property.

INTRODUCTION

Stormwater runoff is any form of precipitation (rain or melting snow and ice) that runs off the land instead of infiltrating into the ground. This typically occurs when precipitation comes in contact with an impervious surface such as a driveway, rooftop, or patch of compacted soil. The runoff water picks up pollutants such as chemicals, sediment, debris, and pathogens. These pollutants are carried, untreated, into ditches and storm drains, and eventually into nearby water bodies where they negatively affect water quality, aquatic habitat and biota, and public health. Depending on the nature and area of impermeability, the runoff may also channelize and increase in both volume and velocity causing localized erosion, streambank destabilization, and increased sedimentation.

According to research completed by the University of Connecticut's Nonpoint Education for Municipal Officials (NEMO) Program, many of the above-mentioned effects occur at as low as 10% impervious cover. Although Vermont is a mostly rural state, it does contain a number of urbanized areas (e.g. Barre City, Greater Burlington Area, Montpelier, Randolph, Rutland City, and St. Albans). GIS analysis has shown that these areas range from 5.5% - 31.1% impervious and higher[1]. Given that the 12 Vermont waters impaired for stormwater are located in close proximity to these areas, a strong link between impervious cover and water quality is certainly evident.

How to manage this link is a fundamental challenge for local, regional, and state entities. Stormwater runoff is typically managed with "gray infrastructure." Gray infrastructure is centralized in nature and uses conveyance systems to move water to off-site locations. These systems often consist of pipes, catch basins, paved swales, curbs, and other manmade structures. The receiving area may be an end-of-pipe treatment practice such as a detention pond or, more commonly, a river, lake, or pond. This approach prevents many on-site issues but can have a drastic impact on downstream waters by increasing flood frequency and magnitude, altering stream geomorphology, and diminishing groundwater recharge. Additional problems occur in areas where traditional wastewater and stormwater systems are combined. Excess stormwater flows can quickly overwhelm these systems leading to untreated runoff, sewage, and debris overflowing into receiving water bodies. Due to these realities, many are looking to alternative stormwater management techniques.

[1] Mapping Impervious Surfaces with High Resolution QuickBird Satellite Data; completed by UVM in collaboration with VTANR and the City of South Burlington in 2005

One alternative solution that has gained considerable national attention over the past few years is the utilization of "green stormwater infrastructure" (GSI).[2] GSI has many definitions but for the purposes of this document is defined as "a suite of systems and practices that restore and maintain natural hydrologic processes in order to reduce water volume and the negative water quality impacts of the built environment while providing multiple societal benefits." [3]

GSI is comprised of both semi-natural and engineered landscape elements. In contrast to gray stormwater infrastructure, GSI is distributed and decentralized. Various GSI components are placed throughout a site or landscape, providing a variety of functions including infiltration, evapotranspiration, and storage. GSI is used to eliminate and reduce runoff and pollutant loads as close to the source as possible. Rain gardens, permeable pavements, tree box filters, vegetated buffers, infiltration trenches, and bioswales are all considered examples of GSI.

At the most basic level, GSI utilizes natural processes to protect, restore, and enhance ecological and hydrologic function. As such, it has significant importance to the triple bottom line of sustainability by providing a number of environmental (clean water, improved air quality, flood resiliency), economic (job creation, increased home values, reduced energy costs), and societal (public health, open space, aesthetics) benefits.

In light of this, many local, state, and federal entities throughout the country have taken steps to increase the use and adoption of GSI. At the local level, municipalities are building public and private partnerships, incorporating GSI into capital improvement projects, and enacting regulatory provisions encouraging or requiring the use of GSI. At the state level, governments are providing GSI incentives, developing work plans, establishing GSI networks, and revising stormwater management standards. And at the federal level, agencies such as the Environmental Protection Agency (EPA) are strongly encouraging the use of GSI to meet permit requirements.

In recognizing the value of GSI as an effective means of sustainably managing stormwater in Vermont, Governor Shumlin signed an Executive Order in March of 2012, which established an Interagency Green Infrastructure Council. The Council includes the Secretaries of the Agency of Commerce and Community Development (ACCD), Agency of Natural Resources (ANR), Agency of Transportation

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[2] Green Infrastructure (GI) is defined as "a wide range of natural and fabricated landscape elements that enhance ecosystem health, increase resiliency, and benefit human populations." Green Stormwater Infrastructure (GSI) is a subcomponent of GI that specifically relates to the management and control of stormwater runoff and the protection of hydrologic function.

[3] The Vermont Green Infrastructure Initiative Strategic Plan: 2011-2013

(VTrans), and the Commissioner of the Department of Buildings and General Services (BGS) or their designees. The main responsibilities of the council include, but are not limited to:

A. Identifying opportunities for the integration of green stormwater infrastructure systems and practices into existing state programs.

B. Initiating a process for the development of a technical guidance for implementation of green stormwater infrastructure systems and practices.

C. Establishing a plan and timeframe for the implementation of green stormwater infrastructure systems and practices associated with state properties and state constructed sites.

D. Identifying state liaisons to support green stormwater infrastructure implementation within their agencies.

E. Identifying and undertaking green stormwater infrastructure research and monitoring studies.

F. Identifying on-going and sustainable funding sources to support regional planning, coordination, and implementation efforts.

In conjunction with the above, members of the Council are also responsible for the development of GSI Implementation work plans. The purpose of the work plans is to highlight current initiatives, identify barriers to the use of green infrastructure practices, and set a direction for the promotion and adoption of green infrastructure in the years ahead.

The following is a compilation of the ACCD, ANR, BGS, and VTrans work plans. These plans were developed over the course of several months. Interagency meetings were coordinated by ANR staff and held on a monthly basis. The work plan framework was developed collaboratively and the content was refined by various staff within each Agency and Department. Individual plans received approval by the Secretaries and Commissioners of each respective Agency and Department. Follow-up reports will be submitted to the Governor on an annual basis on July 1 each year until the order expires in 2017. These reports will highlight success made, challenges encountered, and additional opportunities and strategies.

Note that these plans are a first step towards greater integration of GSI concepts into State processes and programs. A great deal of education, outreach, and discussion is needed before more specific and tactical work plans can be developed and widespread implementation is achieved. The State, through the affected Agencies and Departments, looks forward to revising these plans and reporting accomplishments as progress is made.

AGENCY OF ADMINISTRATION - DEPARTMENT OF BUILDINGS AND GENERAL SERVICES (BGS) GREEN STORMWATER INFRASTRUCTURE IMPLEMENTATION WORK PLAN

The residents and businesses of the State of Vermont publicly fund BGS construction and renovation projects. The expectation is to expend these resources wisely. This funding process usually involves budgetary estimates from the BGS Regions. Projects occasionally fall short on funding due to constraints, leading to conflicts involving competing interests. The projects' competing interests are resolved through the following:

1) Develop a safe facility: organizationally, structurally, and consistent with all project permits
2) Satisfy program goals: maximize developed spaces
3) Develop a high quality, maintainable, and durable facility
4) Minimize value engineering of the heating, ventilation, and air conditioning system
5) Maximize the utilization of energy efficient designs and the incorporation of energy efficient equipment, materials, and methods
6) Maximize integration of sustainability in design and construction
7) Maximize the incorporation of alternative renewable energy technologies

These objectives address the use of energy and its impact on the environment. However, it is a challenge to achieve the same level of efficiency and environmental responsiveness for all of the projects given each project's variation in budget and scope of work. Technological changes are occurring continuously, and BGS strives to take advantage of these changes when it is prudent, justified, and without unnecessary or unusual risk.

CURRENT GSI INITIATIVES WITHIN BGS

BGS Design Guidelines

The intention of the guidelines is the application to all designs and construction projects at BGS. This guideline is a living document. This guideline serves as a supplement to, not a replacement of, any code, design, and industry standards. Other agencies provide language for the guidelines to incorporate during the annual revisions.

Green Infrastructure Roundtable

Participation in roundtable assists the State in moving specific GSI initiatives and strategies forward. This group developed the GSI Strategic Plan and provided support as the Plan moves towards implementation.

Construction Project Strategies

1) Incorporate tree protection zones on a construction site is to prevent damage to branches, stems, and root systems of existing individual trees to remain and to ensure the trees' survival. Provisions include steps to minimize soil and root disturbance and to construct protection measures for trees close to construction areas.
2) Incorporate practices such as rain gardens as part of designs with a completed project in a parking lot re-design in a downtown city location along a river.
3) Landscape planting selection shall include only native or adapted plants to reduce site maintenance needs. Use the WaterSense Water-Efficient Landscape Design Tips from the United States Environmental Protection Agency.
4) Consider the use of gray water and rainwater capture systems for use as landscape irrigation.
5) Consider the use of permeable pavements such as concrete, asphalt, or pavers for parking areas and walkways to increase on-site infiltration.
6) Consider the use of vegetated roofs in new construction designs using native or adapted plants only.
7) Locate walkways and parking areas at least three (3) feet away from the drip line beneath the roof eaves to reduce the risk of icy spots that will require treatment in the winter season. Design entryways to buildings so that the roofs provide protection from roof rainwater and snow runoff.

CURRENT CHALLENGES TO WIDESPREAD UTILIZATION OF GSI IN BGS

1. Awareness and Knowledge of GSI is Low

One major challenge is a general lack of understanding and knowledge regarding GSI among BGS staff. To date, much of the work accomplished in relation to GSI has been limited to isolated projects where strategies became part of the designs from outside requests or previous exposure to GSI practices. As a result, a large portion of the BGS staff has limited knowledge about incorporating the GSI strategies in projects and general maintenance. There is also some confusion over the use of stormwater terms that have slightly different components.

2. Information about GSI is inaccessible or limited

BGS does not have an accurate inventory of the current buildings and their impact on the nearby waterways due to the impervious surfaces owned by BGS. The volume of locations, the limited staff knowledge, and the limited staff availability presents a challenge to complete an accurate inventory needed to develop an implementation plan.

BGS' SHORT-TERM OPPORTUNITIES AND STRATEGIES

Over the next year, BGS will work with other agencies to develop short-term opportunities and strategies to overcome the challenges and better define the implementation of the GSI Strategic Plan.

Task	Task Description	Executive Order Items Addressed	Challenges Addressed
1	Review existing design standards and consider addition of low impact development and green stormwater infrastructure techniques.	A	C1, C2
2	Assist in the development of a stormwater auditing process for state lands and buildings.	B,C	C1, C2
3	Work with the Agency of Transportation on a plan for education and outreach about Low Impact Development (LID) and GSI at Information Centers.	F	C1, C2
5	Assist the Agency of Natural Resources (ANR) on the development of a GSI certification program for contractors.	E	C1, C2
6	Work with ANR to educate BGS engineers and staff about LID and GSI.	D,F	C1, C2

AGENCY OF COMMERCE AND COMMUNITY DEVELOPMENT (ACCD) GREEN STORMWATER INFRASTRUCTURE IMPLEMENTATION WORK PLAN

Many communities across Vermont experienced flood-related damage in the wake of storms such as the Spring Floods of 2011, Tropical Storm Irene in 2011 and, more recent flooding in May 2013. Damage from these events resulted in billions of dollars of damage and took lives. Many affected communities responded to recent flood disasters with expensive, engineered solutions, elevating buildings, constructing levees, floodwalls, and armoring banks and installing larger culverts or stormwater pipes. Despite these measures, flood losses continue to grow. Climate change projections suggest the frequency and intensity of severe storms is on the rise, increasing the urgency with which communities must address flood resiliency.

Many of Vermont historic downtowns and village centers are located along rivers and in floodplains. Typically, these sites relate to a town or region's economy and contribute to the attractive character of these historic commercial centers. However, the result is an urgent need to address stormwater and mitigate flooding through Green Stormwater Infrastructure and other flood mitigation strategies. Green Stormwater Infrastructure (GSI) relies on natural and semi-natural systems to infiltrate, treat, and store water in dispersed locations throughout the landscape, and can make our communities more resilient. Green infrastructure helps retain and/or reuse stormwater and is often less costly and more environmentally friendly than traditional stormwater treatment.

ACCD embraces the use of GSI as one effective tool to make communities more resilient, mitigate flooding and manage stormwater. ACCD is proud of flood resilience efforts put forth to date and recognizes that GSI is an important additional tool to mitigate flooding and make our downtowns and villages more resilient. The following work plan addresses many of the challenges of using GSI and examines at a variety of ways to address them over the course of the coming year.

ACCD'S LONG-TERM VISION FOR GSI

GSI becomes an integral component of resilient communities, protecting people, buildings and facilities from future flooding events, and ensuring that our villages and downtowns remain economically, socially and environmentally viable places to live.

CURRENT GSI INITIATIVES WITHIN ACCD

Integrating Green Infrastructure into guidance on flood resilience and disaster recovery

The Department of Housing and Community Development (DHCD) encourages and promotes the use of GSI in its flood resiliency programs and projects (i.e. the EPA – SGIA project in the Mad River Valley to inform the development of statewide guidance for municipalities).

Vermont Planning Information Center (VPIC) Publication on Green Infrastructure

In 2012, DHCD worked with The Department of Forests and Parks and the Vermont League of Cities and Towns to produce a topic paper for municipal officials on Green Infrastructure. The Land Use Implementation Manual introduces GSI, provides an overview of implementation strategies, and recommends funding mechanisms.

Interagency GI Council

ACCD staff attends the Interagency GI Council – a group of interagency staff representing state agencies established by ANR. The GI Council assists ANR in moving specific GSI initiatives and strategies forward, including the development of the GSI Strategic Plan. The Council will continue to provide support as the Plan moves towards implementation.

Downtown Transportation Grants

ACCD funds Downtown Transportation Grants to help municipalities pay for transportation-related capital improvements within or serving a designated downtown district. Recent Downtown Transportation Grants funded green infrastructure projects in St. Albans, Burlington and Poultney.

Work Group on Wastewater Treatment for Villages

A Work Group organized by DHCA with DEC staff, is working to address wastewater treatment needs of villages that lack a sewage treatment system. In most cases, decentralized wastewater treatment with in-ground disposal is the only option, so planning for wastewater needs to be coordinated with green infrastructure solutions. This is especially important for villages where soils are impervious and sites for infiltrating stormwater or wastewater are limited.

Resilient Vermont

ACCD is working with the Institute for Sustainable Communities (ISC) on its Resilient Vermont Initiative. Resilient Vermont's aim is to weave together the many initiatives currently underway and equip the state to prepare for, respond to and bounce back from future natural disasters.

CURRENT CHALLENGES TO WIDESPREAD UTILIZATION OF GSI IN ACCD

In the past five years, ACCD has made progress in the promotion and adoption of GSI practices. However, in order to fully integrate GSI into agency processes and programs, a number of existing challenges must be addressed.

1. Lack of Awareness, Information and understanding of GSI

A major challenge is the general lack of understanding, appreciation and knowledge regarding GSI among agency staff and local and regional partners. To date, much of ACCD's GSI-related work focused

on the larger issues of flood resilience and disaster recovery. There is also a perception that GSI is a natural resource issue, in ANR's mission, not ACCD's. We need better awareness that GSI is an essential component of compact, vital, downtowns, villages and neighborhoods. Insufficient information about GSI and its benefits exacerbates this problem. We need additional research and data to prove GSI is a viable, effective and worthwhile endeavor. Local and Regional partners must have information and resources to promote and encourage the development of GSI.

2. Lack of Understanding of GSI in a rural context

In rural settings, forests, fields, and other open spaces can capture and slow the flow of stormwater, particularly when combined with smaller scale GSI techniques. Farm and forest managers often engage in practices to convey stormwater away from those lands for economic or aesthetic reasons. They could design these lands to accommodate occasional inundation with rain gardens, depressions, ponds, swales, and plants that can tolerate occasional inundation, and by improving the porosity and water-retaining capability of the soils. Using these techniques helps reduce damage from flooding and recharges aquifers. Increasing knowledge of how GSI applies in rural settings to mitigate flooding and build resilient communities is vital.

3. The need to explore watershed-wide stormwater management

Flood damage mitigation measures, such as constructing levees or armoring banks, implemented in one jurisdiction within a watershed can have unintended consequences for other communities in that watershed. Recognizing this fact, some communities are taking a regional and watershed-wide approach to stormwater management. Communities can develop stormwater master plans for their watersheds and use river science and watershed modeling to understand what actions will absorb and slow down stormwater across the watershed to reduce flooding risk. These stormwater master plans should incorporate GSI strategies.

4. The need to adopt stormwater management regulations that include green infrastructure techniques

In Vermont, the state regulates stormwater for developments exceeding one acre of impervious surface. However, stormwater runoff from smaller developments also contributes to flooding problems. To meet regulations, developers often use "Hard" engineering solutions. Projects should consider "softer" green infrastructure (GSI) approaches as an alternative or supplement to structural solutions in both small and larger scale developments.

5. Consider GSI early in the planning process

The ACCD and local municipalities need to better integrate GSI and stormwater concerns early in the planning process for capital improvements, public and private facilities, and residential and commercial

development. ACCD with ANR's lead needs to improve capacity building to increase local knowledge and awareness of stormwater management issues and GSI.

6. Lack of incentives and awareness of agricultural and other landowners to implement stormwater mitigation measures

Agricultural land in floodplains can provide flood storage capacity and absorb stormwater runoff during heavy rain events, reducing flood-related damage and associated losses. Local communities should collaborate with organizations and the agricultural community to reduce flood risk through the purchase of conservation easements on farmland or by providing other incentives to agricultural landowners to implement stormwater mitigation measures and GSI strategies.

7. Limited development and lack of awareness of GSI projects in Vermont

There are currently limited GSI built projects across the state. We must work to promote more projects that highlight the benefits of GSI and test their effectiveness in Vermont. Without real world built GSI projects that are time tested, developers and municipal officials are hesitant to incorporate GSI into new construction and redevelopment projects. The perceived risk associated with a new or untested design is simply too great to take in many cases.

8. Lacking incentives and lack of funding to incorporate GSI into projects

One way to increase implementation of GSI is through incentive-based programs and additional funding. Unfortunately, very few GSI incentive and funding programs exist in Vermont. Much of the state funding used to implement GSI projects comes from either ANR's Ecosystem Restoration Program (ERP) Grants or Watershed Grants. ACCD provides priority consideration for Municipal Planning Grants projects that deal with flood resiliency and the Downtown Transportation Grant Program provides limited funding for GSI projects in Designated Downtowns. Grants, rebates, recognition programs, discounts, and development incentives (expedited permitting, decreased fees, zoning upgrades, and reduced stormwater requirements) have not yet been used on a large scale to promote GSI. Use of these tools will result in greater adoption of GSI throughout the state.

9. Uncertainty about how to incorporate GSI concepts into existing programs

The GSI Strategic Plan identifies strategies at the state level to promote GSI but does not detail specific actions. In order to move this initiative forward, we must work out additional details. For example, Vermont's Town Greens are a perfect place to display GSI in action. Yet before that can happen, we must outline the process to assess village green infrastructure determine how to prioritize projects and identify funding sources

10. Need for stronger leadership and implementation of GSI

Finally, we need stronger leadership. It is unreasonable to expect people to deviate from traditional development and stormwater management practices without significant support, encouragement, and inspiration. ANR has made significant progress we must continue to demonstrate the use of GSI on state lands, develop and disseminate a consistent message, and promote the use of GSI in both urban and rural settings. Because GSI is a fairly new concept, this type of leadership is needed at all levels, from field staff directly involved in implementation to upper level managers looking at the benefits of GSI on a statewide scale.

ACCD'S SHORT-TERM OPPORTUNITIES AND STRATEGIES

ACCD intends to improve its ability to promote and support GSI utilization. In conjunction with implementation of the GSI Strategic Plan, ACCD will undertake the following tasks:

Task	Task Description	Executive Order Items Addressed	Challenges Addressed
1.	Review existing agency processes and programs and develop a plan for incorporating GSI concepts. Pay particular attention to the following: • Flood Resilience and Hazard Mitigation Planning • Land Use Planning and Regulation • Growth Center Designation • Downtown/Village Center Designation and Revitalization • Downtown/Village Center Master Planning and Design	A	C8, C9
2.	Consider incorporation of GSI concepts as appropriate when developing and implementing new programs and projects.	A	C1, C8, C9
3.	Provide and/or Promote training opportunities to ACCD staff and local and regional partners to increase knowledge of GSI.	A, D	C1, C2
4.	Investigate the modification and development of funding sources to support the utilization of GSI. Consider adding priority consideration for GSI into Municipal Planning Grant and Downtown Transportation Grant selection criteria.	A, F	C6, C7
5.	Seek opportunities for greater inter-agency and intra-agency collaboration and cooperation.	A, D	C2
6.	Assist external partners in efforts to provide GSI assistance, outreach, and training to municipal entities, private landowners, and design professionals. Determine specific funding needs.	F	C1, C4, C9, C10
7.	Revisit the GSI Implementation Work Plan and review progress. Add additional challenges and opportunities as necessary. Continue to assume leadership role on the Interagency GSI Council.	A,B,C,D,E,F	C10

AGENCY OF NATURAL RESOURCES (ANR) GREEN STORMWATER INFRASTRUCTURE IMPLEMENTATION WORK PLAN

Stormwater runoff, caused by precipitation running off impervious surfaces and developed lands, is a leading cause of surface water pollution in Vermont. Impervious surfaces generate hundreds of thousands of gallons of untreated runoff per year[4] resulting in various negative affects to streambank stability, aquatic habitat, and infrastructure. Managing the quality and quantity of this runoff in a sustainable way is of utmost importance for the health of our communities and the protection of natural resources.

The traditional approach to managing stormwater runoff is with "gray infrastructure," a network of pipes, storm drains, and concrete tanks where collected runoff is conveyed and then discharged to receiving waters. Time has shown that this approach is very effective at moving water but does little to mitigate volume and pollutant loads. In fact, this traditional method can cause, and has caused, additional issues downstream from outlets and end-of-pipe structures.

An alternative approach is to use green stormwater infrastructure (GSI), which relies on natural and semi-natural systems to infiltrate, evaporate, and store water in dispersed locations throughout the landscape. This decentralized approach deals with stormwater as close to the source as possible. Groundwater recharge, flow control, and filtration are all inherent features of GSI. As a result, GSI has many benefits including reduced and delayed stormwater runoff volumes, enhanced groundwater recharge, stormwater pollutant reductions, reduced sewer overflows, urban heat island mitigation, improved air quality, additional wildlife habitat and recreational space, improved human health, and increased land values.

In light of these facts, ANR has chosen to embrace the use of GSI as an effective means of avoiding, mitigating, and managing stormwater. ANR is proud of the efforts put forth to date in regards to GSI and recognizes that there are many challenges ahead. The following work plan will bring many of those challenges to light and look at a variety of ways to address them over the course of the coming year.

ANR'S LONG-TERM VISION FOR GSI

GSI becomes an integral component of efficient stormwater management and is promoted, supported, and utilized at a local, regional, and statewide scale.

[4] An impervious area of 100 square feet will generate 62.3 gallons of stormwater runoff for every inch of precipitation.

CURRENT GSI INITIATIVES WITHIN ANR

Green Stormwater Infrastructure Website

The Vermont Department of Environmental Conservation (DEC) hosts a website for individuals seeking information on GSI and Low-Impact Development (LID).[5] Launched in 2010, the site features information on individual best management practices, links to various publications related to the subject, and an additional resources page that highlights groups doing similar work.

Vermont Low Impact Development Guide for Residential and Small Sites

In 2010, a non-technical guide for individuals seeking to incorporate GSI on small and residential sites was developed and distributed. The guide contains a wide array of examples, and is designed to educate homeowners and municipal officials about different types of GSI. The guide also contains additional resources for those seeking more information, as well as a glossary of terms for those who are unfamiliar with stormwater basics. The guide is available for download on the GI website and distributed to individuals at a variety of events and workshops by ANR staff and partners.

GI Roundtable

In 2010, ANR established the GI Roundtable – a group of interested parties representing both the public and private sectors. The Roundtable assists ANR in moving specific GSI initiatives and strategies forward. The group was instrumental in the development of the GSI Strategic Plan (see below) and will provide support as the Plan moves towards implementation. The Roundtable also advocated for the Executive Order that led to the development of this work plan.

Vermont GSI Strategic Plan: 2011-2013 (Appendix A)

With the assistance of the GI Roundtable, ANR was successful in developing and adopting a GSI Strategic Plan. The overall goal of the plan is to ensure that GSI is being used to minimize changes to natural hydrology during and after development. To accomplish this, the plan targets four key audiences: stormwater professionals, municipal governments, property owners, and State agencies. The plan identifies specific objectives and tactics for working with each target audience. The plan will be reviewed on a biennial basis and revised as necessary based on progress.

[5] Low Impact Development (LID) is an innovative land planning and engineering design approach that seeks to maintain a sites pre-development ecological and hydrologic function through the protection, enhancement, or mimicry of natural processes. LID, GI, and GSI are many times used interchangeably although there are definite differences between the three.

Ecosystem Restoration Program (ERP), Watershed Grant, Section 319, and 604(b) Funding

Numerous GSI proposals have ranked highly and been funded through state (ERP and Watershed Grants) and federal (Section 319 and 604(b)) programs. ANR expects to see additional projects proposed as GSI increases in popularity. ANR will continue to fund these and similar types of projects so long as they continue to be high priority and meet eligibility requirements for funding. Specific projects or geographically explicit target areas that are identified within Tactical Basin Plans will receive higher rankings for funding support under these grant programs.

GI Coordinator Position

Since 2009, ANR has supported a GI Coordinator position within DEC through various funding mechanisms. This position plays a critical role in coordination of GI and GSI efforts both internally and externally. The GI Coordinator is housed in the Ecosystem Restoration Program of the Watershed Management Division.

Vermont Stormwater Management Manual (VSMM) Revisions

In March 2013, the Stormwater Program of DEC sought proposals for a contractor to review the existing VSMM and develop a draft update. The Stormwater Program intends to update the VSMM to integrate advances in stormwater management, including the incorporation of LID and GSI techniques. Similar revisions have been done in other states such as New York and Rhode Island. These revisions, once approved, should allow more flexibility for LID and GSI in the permitting process.

Stormwater Master Planning

In the spring of 2013, DEC developed a set of guidelines that highlight key steps in the stormwater master planning process. Stormwater master planning is used to identify data gaps, define stormwater problem areas, summarize current conditions, and propose recommended actions for developed lands where better stormwater management is needed or desired. There are a variety of ways to complete a master plan and the guidelines highlight at least eight different scenarios. Two of those scenarios include elements of low impact development and green infrastructure.

Urban and Community Forestry Program (U&CF)

In 2012, U&CF was awarded a USDA Forest Service grant to support and address three key elements in the GSI Strategic Plan: state leadership in GSI, outreach and support to municipalities, and a possible state and municipal credit system to incentive GSI practices including trees. Work is in progress with partners to meet grant deliverables. The program has an established partnership with DEC to support the GI initiative.

CURRENT CHALLENGES TO WIDESPREAD UTILIZATION OF GSI IN ANR

Over the course of the past five years, ANR has made progress in the promotion and adoption of GSI practices. However, in order to fully integrate GSI into Agency processes and programs, a number of existing challenges must be addressed.

1. Awareness and knowledge of GSI is low

One major challenge is a general lack of understanding and knowledge regarding GSI among the majority of agency staff. GSI is a fairly new concept and while staff that deal with stormwater on a day-to-day basis have a strong working knowledge of GSI, those who do not deal with stormwater are less likely to be informed. Given the multifunctionality of GSI, it is important that other staff throughout ANR gain a greater understanding of GSI and how it may help fulfill a number of policy aims and Agency goals.

2. Information about GSI is inaccessible or limited[6]

The general lack of knowledge is exacerbated by insufficient information about GSI and its benefits. Currently, the GI page of the DEC website and the Vermont Low Impact Development Guide for Residential and Small Sites are the main sources of information related to GSI that have been developed by ANR. Although these resources provide background information about GI and GSI, they do not go into great depth about the cost, benefits, and challenges of using GSI. This is partially because data demonstrating benefits, costs, and performance are limited, somewhat variable, and not always applicable to Vermont's unique soils and climate. Additional research and data is needed to convince a broader audience that GSI is a viable, effective and worthwhile endeavor.

3. Vermont specific GSI design standards and specifications do not exist

A lack of design standards and specifications for GSI is another hurdle. While many GSI standards have been developed[7], very few have been adopted in Vermont. This results in a general hesitancy on behalf of developers (and ANR engineers) to incorporate GSI into new construction and redevelopment

[6] It should be noted that a good deal of information does exist in relation to broader landscape level GI elements such as riparian buffers, wetlands, open space, etc.

[7] Design standards and specifications have been developed in various places throughout the country including Minnesota, Michigan, New York, and Rhode Island.

projects. The perceived risk associated with a new or untested design is simply too great to take in many cases.

4. ANR's ability to regulate the vast majority of stormwater runoff issues is limited

The main mechanism through which ANR regulates stormwater is the permit process. This process is meant to support both Act 250 regulation and Vermont Water Quality Treatment Standards. This process has been very successful at mitigating stormwater runoff but unfortunately is somewhat limited. The permitting process only came about a few decades ago and Vermont was already significantly developed at that time. This means that a majority of the existing sites were not required to meet the standards, which still holds true. The State's jurisdiction only comes into play when projects create or redevelop greater than one acre of impervious surface, and for projects that expand existing impervious surface by more than 5,000 square feet where the total resulting impervious surface is greater than one acre. Anything below this threshold is considered sub-jurisdictional and covered by local zoning ordinances or regulations. Very few towns have ordinances or bylaws that manage stormwater. As a result, only about 6% of existing developed land is regulated under state/federal stormwater permits. The inclusion of Municipal Separate Storm Sewer Systems (MS4) permitted lands brings this number up to about 12%. The vast majority of existing developed land is not regulated, does not manage or treat stormwater, and can cause adverse water quality impacts to surface waters.

5. The Vermont Stormwater Management Manual favors traditional stormwater management approaches

The Vermont Stormwater Management Manual, last revised in 2002, contains the regulatory requirements for the management of stormwater as well as technical guidance to assist in the design of stormwater treatment practices. The manual is predicated on five treatment standards: water quality volume, recharge volume, channel protection volume, overbank flood protection, and extreme storm protection. The manual does include GSI approaches, including infiltration, bioretention, and GSI site design credits, however these are optional, and certain new GSI approaches, including pervious pavement, are not included. This fact, in addition to a difficulty in meeting the channel protection and extreme storm protection criteria, means developers and designers would need to go to additional lengths to get practices approved and permitted.

6. Funding does not meet demand

Another challenge is a lack of funding. Despite a growing interest and need for increased GSI in Vermont, limited funding is available. Much of the state funding recently used to implement GSI

projects comes from either Ecosystem Restoration Program (ERP) Grants or Watershed Grants. These grants are highly competitive and have limited monies available. ERP funding is also restricted to capital eligible projects that preclude or severely limit planning oriented activities. State Revolving Funds (SRF) are another option as they have mandatory percentages of funding dedicated for green reserve projects, but these loans are often used for energy efficiency and not GSI.

7. Lacking incentives

One way to increase adoption of new technologies is through incentive-based programs. Unfortunately, very few GSI incentive programs exist in Vermont. Grants, rebates, recognition programs, discounts, and development incentives (expedited permitting, decreased fees, zoning upgrades, and reduced stormwater requirements) have not yet been used on a large scale for the purposes of promoting GSI. Increased use of these tools could assist in greater adoption of GSI throughout the state. This may be a particularly important means of addressing existing impervious.

8. Uncertainty about how to incorporate GSI concepts into existing programs

A lack of a comprehensive plan is also an issue. The GSI Strategic Plan identifies in broad strokes what should be done at the state level to promote GSI but does not go into detail as to the specific actions that need to be taken. In order to move the initiative forward, additional details will need to be worked out. As an example, Vermont State Parks are a perfect place to display GSI in action. Yet before that can happen, the following questions must be asked. What process is used to assess park infrastructure? How are projects prioritized? Where does the funding come from?

9. Inconsistent definitions and terms

There is some inconsistency in the use of the terms Low Impact Development, Green Infrastructure, and Green Stormwater Infrastructure throughout the state. While these are generally used interchangeably, they do represent slightly different concepts and should be more clearly defined to avoid confusion. Additional clarity could also be shed on the difference between structural and nonstructural components of GSI.

10. Competing priorities

In certain situations, competing priorities may make utilization of LID and GSI difficult. This can occur on sites with limited space for both wastewater and stormwater management, or on sites with exclusive management priorities or restrictions. It may also occur because of regulatory requirements, such as with a 1272 Order and a stormwater flow control/restoration requirement.

11. Need for additional leadership

Finally, additional leadership is needed. It is unreasonable to expect people to deviate from traditional development and stormwater management practices without significant support, encouragement, and inspiration. ANR has made significant progress in this regard over the past few years but additional work can be done, specifically in terms of demonstrating GSI on state lands, developing and disseminating a consistent message, and promoting the use of GSI. Because GSI is a fairly new concept, this type of leadership is needed at all levels, from field staff directly involved in practice implementation to upper level managers looking at the benefits of GSI at a statewide scale.

ANR'S SHORT-TERM OPPORTUNITIES AND STRATEGIES

Over the next year, ANR intends to improve its ability to promote and support GSI utilization. In conjunction with implementation of the GSI Strategic Plan, ANR will undertake the following tasks:

Task	Task Description	Executive Order Items Addressed	Challenges Addressed
1	Review current regulatory barriers to GSI and consider revisions where appropriate. Pay particular attention to the Vermont Stormwater Management Manual.	A	C3, C4, C5
2	Consider the role that GSI plays in the development of reasonable assurances and implementation of TMDL's. Research the use of GSI in other states to meet regulatory requirements (tree credits, stream restoration, and others).	A	C3, C4
3	Review existing state processes and programs and develop a plan for incorporating GSI concepts. Pay particular attention to the following: • Surface Water Management Strategy • Tactical Basin Planning • Stormwater Master Planning • Corridor Planning • LakeWise Certification Program • Combined Sewer Overflow Policy • NPS Management Program	A	C8, C9
4	Consider incorporation of GSI concepts as appropriate when developing and implementing new programs.	A	C1, C8, C9
5	Provide training opportunities to ANR staff and external partners to increase knowledge of GSI.	A, D	C1, C2

6	Investigate the modification and development of funding sources to support the utilization of GSI. Consider green add-on funds for marginal costs (i.e. the cost difference to install a green roof instead of a conventional one).	A, F	C6, C7
7	Identify gaps in technical information and guidance and develop a plan for creating additional resources. Gather additional BMP cost, benefit, and performance information and make it readily available.	B	C1, C2
8	Support additional research and monitoring opportunities related to GSI. Tie in with existing efforts such as the Monitoring Strategy Implementation Team and the Vermont Water Quality Monitoring Council. Work closely with Vermont institutions to develop and gather Vermont specific data.	E	C1
9	Seek opportunities for greater inter-agency and intra-agency collaboration and cooperation.	A, D	C2
10	Develop a process for auditing GSI on ANR owned and managed lands (e.g. State parks, wildlife management areas, and fishing access areas) and explore opportunities to enhance or utilize additional GSI. Discuss GSI concepts with ANR Lands Team.	A, C	C8, C11
11	Review GSI components and develop a list of appropriate uses based on land type and land use. Consider lakes, ponds, wetlands, floodplains, and drinking water source protection areas. Take into account impact on land type or use, cost, and risk of failure.	B	C3, C8, C10
12	Increase coordination between FED, Stormwater, and MAPP in regards to CSO projects. Bring appropriate parties together during the preliminary engineering phase for CWSRF projects.	A	C6, C8, C10
13	Reconvene GI Roundtable. Priority tasks include: • Create governance structure • Review and track progress on Strategic Plan • Agree on definitions and use of terms	A	C1, C2, C9, C11
14	Assist external partners in efforts to provide GSI assistance, outreach, and training to municipal entities, private landowners, and design professionals. Determine specific funding needs.	F	C1, C4, C9, C11
15	Revisit GSI Implementation Work Plan and review progress. Add additional challenges and opportunities as necessary. Continue to assume leadership role on Interagency GSI Council.	A,B,C,D,E,F	C11

AGENCY OF TRANSPORTATION (VTRANS) GREEN STORMWATER INFRASTRUCTURE IMPLEMENTATION WORK PLAN

Governor Shumlin, in March of 2012, signed an Executive Order, which established an Interagency Green Stormwater Infrastructure (GSI) Council. The Council includes the Secretaries (or delegates) of the Agency of Natural Resources, Agency of Transportation, Agency of Commerce and Community Development, and the Commissioner of the Department of Buildings and General Services or their designees. The main responsibilities of the council include, but are not limited to:

A. Identify opportunities for integrating GSI systems and practices into existing state programs.
B. Develop technical guidance for implementation of GSI systems and practices.
C. Establish a plan and timeframe for implementing GSI systems and practices associated with state properties and state constructed sites.
D. Identify state liaisons to support GSI implementation within their agencies.
E. Identify and undertaking GSI research and monitoring studies.
F. Identify on-going and sustainable funding sources to support regional planning, coordination, and implementation efforts.

In conjunction with the above, members of the Council are also responsible for the development of Green Stormwater Infrastructure (GSI) Implementation Work Plans. The purpose of the work plans is to highlight current initiatives, identify barriers and challenges to the implementation of GSI practices, and set a direction for the promotion and adoption of GSI in the years ahead. Note that these plans are a first step towards greater integration of GSI concepts into State processes and programs. A great deal of education, outreach, and discussion is needed before more specific and tactical work plans can be developed.

1) Stormwater Runoff & Traditional Treatment Methods
    a. Stormwater runoff, caused by precipitation running off impervious surfaces, is a leading cause of surface water pollution in Vermont. Impervious surfaces generate hundreds of thousands of gallons of untreated runoff per year resulting in various negative effects to streambank stability, aquatic habitat, and infrastructure. Managing the quality and quantity of this runoff in a sustainable way is of utmost importance for the health of our communities and the protection of our natural resources.
    b. The traditional approach to managing stormwater runoff is with “gray infrastructure,” a network of pipes, storm drains, and concrete tanks where collected runoff is then discharged to receiving waters. Time has shown that this approach is very effective at conveying water but does little to mitigate volume and pollutant loads. In fact, this

traditional method can cause, and has caused, additional issues downstream from end-of-pipe (outlet) structures.

2) Green Stormwater Infrastructure and its Benefits
    a. An alternative approach is to use GSI, which relies on natural and semi-natural systems to infiltrate, treat, and store water in dispersed locations throughout the landscape. This decentralized approach deals with stormwater as close to the source as possible. Groundwater recharge, flow control, and filtration are all inherent features of GSI as it strives to manage stormwater and pollutants by restoring and maintaining the natural hydrology in a watershed and emphasizes infiltration. This approach reduces runoff and pollutant loading.
    b. As a result, GSI has many benefits including reduced and delayed stormwater runoff volumes, enhanced groundwater recharge, stormwater pollutant reductions, flood mitigation, reduced sewer overflows, improved air quality, additional wildlife habitat and recreational space, improved human health, increased land values, and long term cost savings from reduced stormwater infrastructure operation and maintenance costs.
3) Green Stormwater Infrastructure and VTrans
    a. VTrans has chosen to embrace the use of GSI as an effective means of mitigating and managing stormwater. VTrans is proud of its efforts put forth to date incorporating GSI into Agency projects and processes and recognizes that there are many challenges and opportunities ahead. The development of this GSI Work Plan has brought many of those challenges to light and sets a course for looking at a variety of ways to address them over the course of the coming years.
    b. The outcome of this effort will have impacts on how VTrans goes about its business in project planning, scoping, design, construction, and operation & maintenance. The development of a VTrans GSI Implementation Work Plan has also allow VTrans to document work efforts, research, policies, practices, and strategies already in place that meet the intent of the GSI Executive Order.
    c. Integrating GSI into Agency projects, transportation infrastructure and associated facilities statewide that VTrans owns and controls will be a multi-year effort. As a matter of perspective, VTrans owns or controls 2,702 miles of roadway; 62 District Maintenance Facilities; 9 State Airports; 24 Active Park & Rides (plus 4 inactive); 3 Gravel Pits; 14 Rail Yards (leased to 3rd party); and 2 Public Transit Facilities (leased to 3rd party).

VTRANS LONG-TERM VISION FOR GSI

VTrans has successfully integrated GSI systems and practices into some of its existing programs (refer to “Past and Current VTrans GSI Initiatives” section). The long-term vision for VTrans is to develop a

program that uses an adaptive management approach towards the integration and implementation of GSI systems and practices into its existing programs to the maximum extent practicable, given financial and resource constraints, barriers and challenges to GSI implementation, and to the extent that it does not interfere with VTrans' Mission:

"To provide for the safe movement of people and goods in a reliable, cost effective and environmentally responsible manner."

VTrans will need to address how and to what extent GSI will be implemented across Agency functions. Although GSI is an important practice to have in the tool box, developing strategic policy recommendations and specific actions addressing the issues, barriers, questions, and opportunities put forth in this GSI Work Plan needs to be a balanced and fitting approach for the transportation sector. This effort will focus on identifying initiatives that promote transportation co-benefit opportunities such as flood resilience, regulatory relief, mitigation, and cost savings, and recognize strategies worthy of research and more analyses. Timing for considering integrating and implementing GSI systems and practices into VTrans operating systems, across all state property and into all projects, will vary depending upon the specific initiative. Progress will be reported annually.

CURRENT GSI INITIATIVES WITHIN VTRANS

There are three (3) major Divisions within VTrans that are involved and influence how projects are planned, designed, constructed, and maintained. It is within these Divisions of the Agency that GSI is being practiced to varying degrees. Current Initiatives discussed in this GSI Work Plan are supported by federal or state funds tied to projects or operation and maintenance budgets. The level of funding from year to year is not reliable and thus neither will be the level of GSI implementation from one budget year to the next.

Past and current GSI initiatives by Program are listed below which will be updated annually to reflect current state of GSI practice at VTrans.

<u>Policy, Planning and Intermodal Division (PPAID)</u>

The Policy and Planning Section of PPAID is responsible for developing Agency policy, preparing the State Long Range Transportation Business Plan and the State Transportation Improvement Program; strategic, modal and corridor management plans; and for regional planning relationships and activities. PPAID also includes Aviation, Public Transit and Rail Sections.

1) Aviation (9 State Airports), Public Transit (2 facilities) and Rail (14 facilities)
    a. Compliance under the NPDES Multi-Sector General Permit (MSGP) for Industrial Stormwater with site specific Stormwater Pollution Prevention Plan (SWPPP) for each state airport, rail and public transit facility considers the need for stormwater treatment

practices including GSI. Some of these facilities are also subject to State Stormwater Discharge Permits, which may have constructed GSI under that permit program.

2) Rest Areas (15 sites) leased to third party (BGS)
    a. Rest Areas and Welcome Centers will be addressed by Buildings and General Services (BGS).
3) Highway Stormwater Treatment Practice Research
    a. Linear Highway Stormwater Treatment Best Management Practice Research has been recently completed in 2012 looking at which types of GSI are better suited for the linear nature of the Transportation system. This information will be used to launch the development of a VTrans Highway Stormwater Design Manual and/or to augment/enhance the update of the Agency of Natural Resources Stormwater Design Manual.

<u>Program Development Division (PDD)</u>

This Division includes project design sections under Highway Safety & Design (Pavement Management, Roadway, and Structures), a Local Transportation Facilities Section, a Right-of Way Section (including Highway Access Management), an Environmental/Hydraulics Section, a Construction Section, and a Materials & Research Section.

1) Project Scoping, Design Development and Construction
    a. Designers and plan reviewers are actively looking for opportunities to move towards GSI (i.e. pavement management projects and guardrail replacement projects….we are looking at removing timber curbing under guardrails to allow sheet flow over vegetated roadway side slopes and are actively looking for opportunities to eliminate closed drainage systems and promote surface sheet flow into vegetated areas along our projects).
    b. Other examples of GSI constructed on VTrans projects include:
        i. Using grass swales and disconnection along roads; disconnection of roof tops at airports; and infiltration swales within Interstate medians.
        ii. Using rain gardens & rain barrels at Williston I-89 Welcome Centers.
        iii. Park & Rides incorporating GSI (i.e. bioretention/infiltration at Ferrisburgh Park & Ride, gravel wetland at St. Albans Park & Ride, Waterbury Park & Ride infiltration trench, and porous pavement at Randolph Park & Ride).
        iv. VTrans Construction Environmental Engineers monitor water quality permit compliance during construction activity and ensure appropriate erosion control practices are followed and vegetation is restored in a timely manner.
2) Right-of-Way & Highway Utilities & Permits

a. Highway access management; “drain-on” control; and illegal connection/illicit discharge detection, elimination, and prohibition.
b. Standard permit conditions for controlling type and volume of water entering right-of-way.
c. Require outside right-of-way (ROW) treatment by an applicant seeking to discharge stormwater into our ROW such that there will be no increase over pre-construction flows to ROW.
d. We are looking at holding onto our surplus land holdings where those parcels provide natural treatment of stormwater from transportation infrastructure.

3) Program Development Environmental & Hydraulics Review
    a. Scoping & Resource Identification – working with project designers to preserve natural systems (wetlands and river/lake buffers which provide stormwater treatment).
    b. Hydraulics Manual promotes adequate culvert and bridge sizing and stream equilibrium.
    c. VTrans Better Back Roads Program funds municipal water quality enhancements.
    d. VTrans Culvert and Ditching Procedure in place to offer guidance to contractors and District Maintenance Crews on proper temporary and permanent stormwater treatment controls.
4) Materials & Research
    a. Ongoing internal research, literature reviews, and stormwater treatment practice testing.
    b. Ongoing cooperative research with UVM Transportation Research Center on stormwater treatment practices (i.e. Porous Pavement Park and Ride in Randolph).

<u>Operations Division (OPS)</u>

The Agency of Transportation (VTrans) has a significant public investment in its transportation infrastructure. And it’s the Operations Division (OPS) that must maintain that infrastructure for the benefit of the traveling public. The OPS Environmental Program is charged with administering compliance for the Agency under NPDES Clean Water Act and State Stormwater Permits in addition to promoting environmental stewardship in all our activities.

1) District Maintenance Facilities (62 sites) and Gravel Pits (3 sites)
    a. Site-specific Stormwater Pollution Prevention Plans (SWPPPs) have been developed for five Maintenance Facilities and three Gravel Pit sites with plans to develop SWPPPs for the remaining 57 District Maintenance Facilities over a period of time. These SWPPPs look for and incorporate stormwater treatment practices and source control at these sites, some already including GSI. Some of these facilities are also subject to State Stormwater Discharge Permits, which may have constructed GSI under this permit program.

2) District Highway Operation and Maintenance Best Management Practices
    a. Maintenance Activities have and will continue to be assessed to look for opportunities to incorporate GSI to the maximum extent practicable into daily operation and maintenance activities. Most of the maintenance activities that are compatible with GSI practices and philosophy are covered under Best Management Practice Guidance Documents, some of which are already in place and include:
        i. Vegetation Management (Mowing, Tree, Brush, Invasive Species Management and Riparian Protection)
        ii. Bridge Washing & Vehicle Washing
        iii. Snow and Ice Control
3) Town Grant Programs
    a. Codes and Standards have been developed under Act 110 that promotes municipal road maintenance standards benefitting water quality, some of which are GSI.

<u>Inter-Agency Communication, Policy, and Other Programmatic Strategies involving GSI</u>
There are various other initiatives underway that embrace GSI and have been used meet the intent of the GSI Executive Order. These include:

1) Inter-Agency Communication Protocol, Post Construction Stormwater Protocol, and Local Transportation Facilities Stormwater Protocol allow for meaningful opportunities to influence project design with a specific emphasis on stormwater treatment.
2) Environmental Ethic Policy.
3) Partnerships focused on water quality enhancements.
4) VTrans representation on GSI Council and GI Roundtable.

CURRENT CHALLENGES TO WIDESPREAD UTILIZATION OF GSI IN VTRANS

Barriers and challenges are an expected part of any new initiative and change is particularly difficult in a large State Agency such as VTrans. We have identified some of the barriers and challenges under a number of categories listed below. The Agency hopes to gain better insight into how and if barriers can be overcome and challenges turned into opportunities. A better understanding of how GSI is relevant to VTrans from a functional perspective including planning, design, and maintenance could help move GSI further along In the Agency.

1) Physical Barriers
    a. Site infeasibility and right-of-way space limitations.
    b. Soil suitability for infiltration.
    c. Proximity to high ground water, steep slopes, floodplains, wetlands and waterways; contaminated soils; underground utilities; Meteorological conditions.

2) Technical Barriers
    a. Design and safety standards for highways (FHWA) and for Airports (FAA).
    b. Inconsistent messages on the greater meaning of GSI and limited technical guidance.
    c. Unknown life cycle costs and lack of understanding about what GSI will cost to design, construct, operate, maintain and replace in comparison to conventional stormwater treatment approaches.
    d. Unknown risks and lack of long-term performance data.
    e. Local, State, and Federal code and regulation limitations.
3) Institutional Barriers
    a. Risk and liability issues.
    b. Stormwater has been and sometimes still is an afterthought in project design.
    c. Lack of ability of VTrans to timely alter is procedures, standards, and specifications.
    d. Lack of education and training at all levels.
    e. Competing Agency missions – environmental priorities challenge other Agency priorities (i.e. safety).
    f. Competing interests for funding – environmental mitigation competing with other Agency priorities.
    g. Leased land (Rail and Public Transit) and municipally managed projects.
    h. VTrans Policy regarding Road to Affordability Priorities.
4) Financial and Resource Barriers
    a. Competing interests for limited funding and mounting demands calling for more resources.
    b. Perceived and real costs and lack of investment in research.
    c. Lack of financial support to operate and maintain stormwater infrastructure.

VTRANS' SHORT-TERM OPPORTUNITIES AND STRATEGIES

VTrans' short-term strategy is to continue and enhance what it has done to date to incorporate GSI practices and systems into Agency Programs. We have identified a VTrans GSI Liaison to coordinate and track all internal GSI efforts and to sit on the joint State Agency GSI Council as the Agency's sole representative. This Liaison will develop an internal GSI Team representing each relevant program in VTrans that, over the coming years, will:

1) Develop strategic policy recommendations and specific actions addressing the issues, barriers, questions, and opportunities put forth in this GSI Work Plan.
2) Implement GSI Work Plan and prepare annual reports addressing accomplishments and challenges in that year and opportunities and strategies moving forward in the coming year.
3) Work with ANR to identify training opportunities for VTrans staff.

4) Support research and monitoring of new and innovative technologies.
5) Support GSI initiatives at the local level (town road crews).
6) Support development of technical guidance and standards.
7) Review Better Back Roads Program for applicability of GSI components.

It is important is to remember that the purpose of the GSI Work Plan is to highlight current initiatives, identify barriers, challenges, and opportunities to the implementation of GSI, and set a direction for the promotion and adoption of GSI in the years ahead. Note that this plan is the first step towards greater integration of GSI concepts into State Transportation processes, programs, and projects.

COMMONLY USED ACRONYMS AND ABBREVIATIONS

ACCD	Vermont Agency of Commerce and Community Development
ANR	Vermont Agency of Natural Resources
BGS	Vermont Department of Buildings and General Services
BMP	Best Management Practice
Council	Interagency Green Infrastructure Council
CSO	Combined Sewer Overflow
DEC	Vermont Department of Environmental Conservation
EPA	Environmental Protection Agency
ERP	Ecosystem Restoration Program
FED	Facilities and Engineering Division
FPR	Vermont Department of Forests, Parks and Recreation
GI	Green Infrastructure
GSI	Green Stormwater Infrastructure
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System
SRF	State Revolving Funds
SWMM	Vermont Stormwater Management Manual
TMDL	Total Maximum Daily Load
VTrans	Vermont Agency of Transportation
WSMD	Watershed Management Division

GLOSSARY

Act 250
Vermont legislation passed in 1970 and officially known as the Land Use and Development Law. The objective of the Act is to protect the environment, balance development with local, regional, and state issues, and to provide a forum for neighbors, municipalities and other interest groups to provide public comment.

Best Management Practice
A practice or combination of practices that are the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point or nonpoint source pollutants at levels compatible with environmental quality goals.

Bioretention
On-lot retention of stormwater using vegetated depressions engineered to collect, store, and infiltrate runoff.

Centralized System
A managed system consisting of pipes, catch basins, and conveyances to collect and treat water from a specific area.

Channel Protection Volume
According to SWMM, design criteria which requires either 12 or 24-hour detention of the one-year post developed, 24-hour storm event for the control of stream channel protection.

Decentralized System
Treatment system for collection, treatment, and dispersal/reuse of stormwater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities, at or near the point of stormwater generation.

Development
The construction of impervious surface(s) on a tract or tracts of land.

End-of-pipe
A point where collected and concentrated surface and storm water runoff is discharged from a pipe system or culvert.

Erosion
The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Detachment and movement of soil or rock fragments by water, wind, ice or gravity.

Extreme Flood Protection
According to SWMM, the storage volume required to control those infrequent but large storm events. Post-development peaks discharge rates shall not exceed the pre-development peak discharge rate for the 100-year, 24-hour storm event.

Filtration
A process of separating particulate matter from a fluid, such as air or a liquid, by passing the fluid carrier through a medium that will not pass the particulates.

Gray Infrastructure
That which is manmade and part of the built environment in a community including but not limited to roads and other transportation systems, stormwater drainage, sewer and drinking water systems, schools and utilities.

Green Infrastructure
A wide range of multi-functional, natural and semi-natural landscape elements located within, around, and between developed areas at all spatial scales.

Green Stormwater Infrastructure
Systems and practices that restore and maintain natural hydrologic processes in order to reduce the volume and water quality impacts of the built environment while providing multiple societal benefits.

Groundwater Recharge
A hydrologic process where water moves downward from surface water to groundwater.

Hydrology
The science dealing with the waters of the earth, their distribution on the surface and underground, and the cycle involving evaporation, precipitation, flow to the seas, etc.

Impervious Surface
Those manmade surfaces, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways, and walkways, from which precipitation runs off rather than infiltrates.

Infiltration
Movement of water through the soil surface into the ground.

Low Impact Development
An innovative land planning and engineering design approach which seeks to maintain a sites pre-development ecological and hydrologic function through the protection, enhancement, or mimicry of natural processes.

Municipal Separate Storm Sewer System
A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer; and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

Nonpoint Source Pollution
Water pollution caused by rainfall or snowmelt moving both over and through the ground and carrying with it a variety of pollutants associated with human land uses. A nonpoint source is any source of water pollution that does not meet the legal definition of point source in section 502(14) of the Federal Clean Water Act.

Overbank Flood Protection
According to SWMM, the post-development peak discharge rate shall not exceed the pre-development peak discharge rate for the 10-year, 24-hour storm event.

Recharge Volume
According to SWMM, the average annual recharge rate for a prevailing hydrologic soil group. Recharge volume (Rev) is determined as a function of annual predevelopment recharge for a given soil group, average annual rainfall volume, and amount of impervious cover at a site.

Sediment
Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sewer Overflows
Discharge of a mixture of storm water and domestic waste when the flow capacity of a sewer system is exceeded during rainstorms.

Stormwater Master Planning
The development of a comprehensive plan to identify and characterize the key components that must be implemented to protect an area or watershed against stormwater related challenges.

Stormwater Runoff
Precipitation and snowmelt that does not infiltrate into the soil, including material dissolved or suspended in it, but does not include discharges from undisturbed natural terrain or wastes from combined sewer overflows.

Surface Water Management Strategy
Describes the management of pollutants and stressors that affect the uses and values of Vermont's surface waters. The Strategy presents the Watershed Management Division's goals, objectives and approaches for the protection and management of Vermont's surface waters, and will help to guide the Department's future decision-making to ensure efficient, predictable, consistent and coordinated management actions. As per the Strategy, surface waters are defined as all rivers and streams, lakes, ponds and reservoirs, and wetlands.

Tactical Basin Planning
Maximizes geographic specificity and coordinating multi-program implementation to a common set of stressors. Tactical basin plans will be the vehicle by which the WSMD will implement the actions laid out in the Surface Water Management Strategy, by providing coordination of the many water quality protection and improvement programs in Vermont. Tactical basin implementation plans will fulfill all of the geographically specific planning requirements in the Water Quality Standards.

Total Maximum Daily Load
The calculations and plan for meeting water quality standards approved by the U.S. Environmental Protection Agency (EPA) and prepared pursuant to 33 U.S.C. 1313(d) and federal regulations adopted under that law.

Urbanization
Changing land use, population density, and degree of imperviousness from rural characteristics to urban (city-like) characteristics.

Vermont Stormwater Management Manual
The Agency of Natural Resources' stormwater management manual.

Vermont Water Quality Standards
Vermont legislation that aims to protect and enhance the quality and usefulness of surface waters and assure public health.

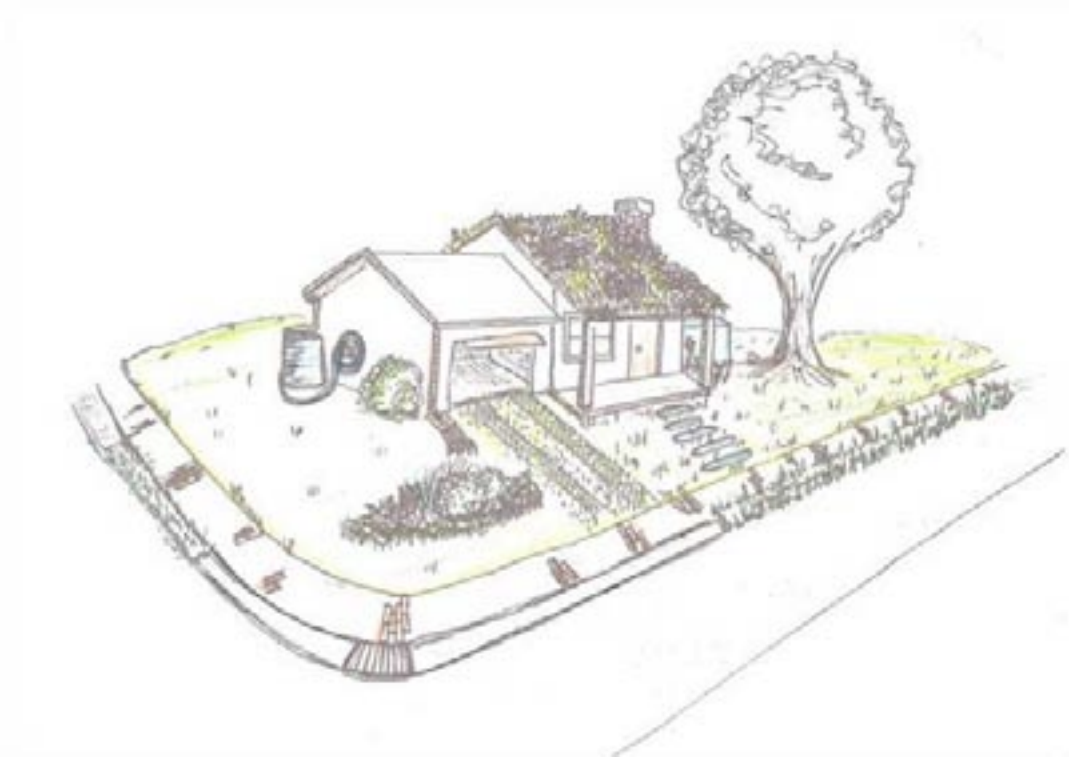
Watershed
The topographic boundary within which water drains into a particular river, stream, wetland, or body of water.

Water Quality Volume
According to SWMM, the storage needed to capture and treat 90% of the average annual stormwater runoff volume.

303(D) List
The list of impaired waters (stream/river segments, lakes) that the Clean Water Act requires all states to submit for EPA approval every two years.

APPENDIX A – VERMONT GSI STRATEGIC PLAN: 2011-2013

The Vermont Green Infrastructure Program Strategic Plan: 2011-2013



Introduction

Stormwater runoff is a significant contributor to water quality impairments, especially in developing and urban areas. Stormwater runoff affects water quality and quantity, habitat and biological resources, public health, and the aesthetic appearance of waterways. During the spring of 2011, communities throughout Vermont experienced firsthand the damaging effects of stormwater runoff. Flooding throughout the Lake Champlain Basin and beyond damaged infrastructure, destroyed roads, closed businesses, and necessitated millions of dollars in repairs. Stormwater runoff originates from a number of sources including residential areas, commercial and industrial sites, roads, highways and bridges.

When a land area is changed from a natural ecosystem to a constructed development, the introduction of rooftops, streets and parking lots significantly alters the hydrology of the system. When water can no longer infiltrate, recharge groundwater, or be utilized by plants, it is converted directly into surface runoff. Assessments of streams and rivers across the state have demonstrated how the force of stormwater runoff erodes stream banks, washes out roads, and introduces large amounts of sediment and pollutants to receiving waters. While only 5% of Vermont is considered developed land, that development is estimated to contribute about 46% of the phosphorus into Lake Champlain, due mostly to impervious surfaces and associated stormwater runoff.

Green Infrastructure is an emerging concept to address the stormwater issues associated with land development. Green infrastructure strives to manage stormwater and pollutants by restoring and maintaining the natural hydrology in a watershed. The advantages of using green infrastructure practices in place of traditional stormwater management controls are many and varied. The conventional way of collecting and conveying stormwater in developed areas consists of inlets and underground pipes commonly referred to as storm sewers. This “gray infrastructure” is man-made and immovable. The green infrastructure approach to stormwater management eliminates or reduces runoff and pollutant loading as close to the source as possible by linking together small-scale practices. Green infrastructure practices may include rain gardens, porous pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting.

In addition to water quality and surface water benefits, green infrastructure hosts a variety of other environmental, economic and social benefits, especially in urban and suburban areas. These benefits include wetland and riparian habitat protection, improved air quality, increased land values, increased carbon sequestration, improved community value and aesthetics, and long term cost savings from reduced water infrastructure maintenance.

The spring 2011 floods were brought on by extreme weather events which are predicted to increase in frequency. The State of Vermont has been proactive in recognizing the need for a new approach to stormwater management in addition to its' current water quality initiatives. Moving Vermont towards development and retrofit practices that incorporate green infrastructure will help lead the State to a more sustainable future. In response to that need, the State is developing a Green Infrastructure Program. To make green infrastructure practices common practice throughout the State, the program has pulled together a group of experts from across Vermont to establish a framework for action by developing a programmatic strategic plan.

The Vermont Green Infrastructure Program's 2011 Strategic Plan has one overarching goal: to restore and maintain the pre-development hydrology of the State's watersheds through the use of green structure practices. To achieve this goal, four key audiences are targeted: stormwater professionals (i.e. design engineers, landscape architects), municipal governments, existing property owners, and State agencies. For each target audience, the Strategic Plan identifies the current challenges to widespread adoption of green infrastructure practices and describes a set of objectives and tactics to address those challenges.

In considering the needs of design professionals, it became clear that the primary barrier was the lack of clarity in how green infrastructure practices could be successfully employed to meet site needs and regulatory requirement and, in particular, compliance with the Vermont Stormwater Management Manual. Work on this issue has already begun with two training opportunities offered during the summer of 2011.

In the case of municipalities, non-MS4 communities are often not aware of the impacts of stormwater runoff, or the options available to address them. As a result, many have existing ordinances that may actually exacerbate runoff problems. Efforts to reach this audience will include support for review of existing zoning and land-use policies, assistance with development review to include the use of green infrastructure practices, and non-regulatory incentives for green infrastructure adoption.

In most cases, individual property owners are unaware that a problem even exists, let alone how their properties are contributing. To address this target audience, we will work to identify gaps in messaging and education, work with partners to resolve those gaps and provide access to technical information and incentives to employ green infrastructure practices.

None of these objectives can be met without the cooperation and active participation of State Agencies. A dedicated Green Infrastructure Program should be established in order to address the issues facing each target audience, and ensure the implementation of this Strategic Plan. Additionally, the State has a unique opportunity in their own development projects to demonstrate green infrastructure practices on new and existing properties. This Strategic Plan provides clear mechanisms for both of these Agency related issues to be resolved.

The Vermont Green Infrastructure Program is an Agency of Natural Resources initiative with support from the Department of Environmental Conservation, the Ecosystem Restoration Program and the Department of Forests, Parks and Recreation. The plan was guided under the direction of the Green Infrastructure Roundtable, a group of experts in stormwater management from both the public and private sectors. The Roundtable was established in 2010 and much of their time has been invested in the development of the Strategic Plan. Roundtable members include:

Milly Archer, Vermont League of Cities & Towns
Karen Bates, Vermont Watershed Planning Section
Jenna Calvi, Vermont Stormwater Program
Craig Digiammarino, Agency of Transportation
Tom DiPietro, City of South Burlington
Danielle Fitzko, Vermont Dept. of Forests, Parks & Recreation
Stephanie Hurley, University of Vermont – Rubenstein School of Environment & Natural Resources
Justin Kenney, Winooski Natural Resources Conservation District
Laura Killian, University of Vermont, NEMO Program / SeaGrant
Megan Moir, City of Burlington
Julie Moore, Stone Environmental
Linda Setchell, Friends of the Winooski River
Ann Smith, Friends of the Winooski River
Adam Zahniser, Herbert, Rowland & Grubic, Inc.

Program History & Achievements 2009-2011

In 2009 the Water Quality Division's Basin Planning Program established a Green Infrastructure Coordinator position to help encourage and expand the use of green infrastructure practices throughout Vermont. During that time, the Program was funded through the American Reinvestment & Recovery Act. Funds from this source were exhausted at the end of 2010 and the position was transferred to the Stormwater Section. Recognizing the value and need of the Program, funding for an additional year was provided by the Ecosystem Restoration Program and the Department of Forests, Parks and Recreation.

In the two years since its inception, the Green Infrastructure Program has made a number of notable accomplishments, as described below.

Vermont Low-Impact Development Guide for Residential & Small Sites

During the first six months of the Green Infrastructure Program, a technical guide for individuals seeking to install green infrastructure practices on small and residential sites was developed and distributed. The guide contains a wide variety of practices, and is designed to educate individual homeowners on the different GI practices that they might employ on their property. The guide also contains additional resources for those seeking more information, as well as a glossary of terms for those who are unfamiliar with stormwater basics.

Vermont Green Infrastructure Website

A comprehensive website for individuals seeking information on green infrastructure practices and Low-Impact Development techniques was launched in 2010. The site features information on individual best management practices, links to various publications related to the subject, and an additional resources page to groups doing similar work.

In the future, the site will house virtual demonstrations of green infrastructure installations around the State, and serve as a resource for property owners seeking technical assistance in their own projects. Additionally, the site will also provide a database of engineers and construction professionals who have implemented green infrastructure projects to provide a connection to professional expertise.

Workshops & Professional Development

On June 15, 2011, a workshop focused on the use of green infrastructure practices in compliance with the Vermont Stormwater Management Manual was offered. Participants received an overview of green infrastructure practices, and how those practices can be used for jurisdictional projects. The one-day event had more than forty people in attendance, with a lengthy waiting list. Because of the huge amount of interest in this training opportunity, a second workshop is being planned for the Fall of 2011.

A second workshop is being planned for August of 2011, and will be focused on the site design aspects of green infrastructure practices. The training will be administered by a regional expert at SUNY Albany, and will provide more technical guidance on the installation of green infrastructure practices on larger sites.

The Vermont Agency of Natural Resources Green Infrastructure Strategic Plan 2011-2013

VERMONT

Green Infrastructure:

Systems and practices that restore and maintain natural hydrologic processes in order to reduce the volume and water quality impacts of the built environment while providing multiple societal benefits.

Overarching Goal:

Restore and maintain the pre-development hydrology of the State's watersheds through the use of green infrastructure practices.

Objectives

Design professionals (Engineers, Landscape Architects, Architects, Design/Build Contractors) statewide are trained in, promoting and utilizing GI practices.

Municipalities recognize the impacts from stormwater runoff and work to mitigate the effects.

Property owners voluntarily advocate for and implement GI practices on their property(s).

State Agencies secure and commit funding to develop policies and programs to support GI.

Objective 1. Design professionals statewide are trained in, promoting, and utilizing GI practices.	
Tactic A. Increase training opportunities for professionals.	
1A1	Offer yearly training in utilizing GI practices via the stormwater manual. Seek professional credits i.e. Engineers, LA's, CPESC.
1A2	Offerly quarterly web-trainings on GI practices.
1A3	Offer yearly in-depth training on the technical aspects of GI practices.
1A4	Investigate GI training/certification program for design professionals that include incentives i.e. expedited permitting.
1A5	Establish training partnerships with design professional associations.
1A6	Offer training with CEUs to wastewater design professionals in GI practices.
1A7	Identify and promote higher educational programs that support GI work.

Objective 1. Design professionals statewide are trained in, promoting, and utilizing GI practices.	
Tactic B. Improve communication between design professionals working with stormwater.	
1B1	Investigate and promote existing networks of design professionals - i.e. NPS Information Listserv.
1B2	Develop a Vermont specific networking tool for design professionals.
1B3	Develop a database of design professionals utilizing GI practices.
1B4	Investigate adding GI project designation in existing stormwater permit database.

Objective 1. Design professionals statewide are trained in, promoting, and utilizing GI practices.	
Tactic C. Provide tools & resources for design professionals to incorporate GI on projects.	
1C1	Work with the media to promote a GI messages, practices and projects.
1C2	Compile and share data demonstrating benefits associated with GI practices with an emphasis on cost savings.
1C3	Develop and disseminate supporting documentation & tools on how to use GI practices to meet the current stormwater regulations i.e. calculation worksheets, workshop proceedings.

Objective 2. Municipalities understand the impacts of stormwater runoff and work to mitigate the effects.	
Tactic A. Municipalities regulate land use with an understanding of the impacts on water quality and natural hydrologic systems.	
2A1	Identify and assess the barriers to GI in current municipal regulations.
2A2	Develop set of tools and training opportunities for local planning review boards to assess the hydrologic impacts of development activities.
2A3	Develop and disseminate library of financial and technical resources to support local GI planning efforts.
2A4	Work with ANR's Ecosystem Restoration Program (ERP) to include preference in grant applications for municipalities who are addressing the impacts of stormwater locally.
2A5	Identify mechanism to support demonstration projects on municipal properties.

Objective 2. Municipalities understand the impacts of stormwater runoff and work to mitigate the effects.	
Tactic B. Municipalities provide regulatory support for stormwater management.	
2B1	Strategize which towns need GI regulations most and partner with Non-point Education for Municipal Officials Program (NEMO) and Vermont League of Cities and Towns (VLCT) to reach out to them with existing VLCT by-law materials.
2B2	Provide access to model GI regulations.
2B3	Offer yearly technical training to municipal planning commissions / development review boards on how to evaluate new development projects for GI components.

Objective 2. Municipalities understand the impacts of stormwater runoff and work to mitigate the effects.	
Tactic C. Municipalities provide non-regulatory incentives to reduce stormwater runoff.	
2C1	Develop financial resources guide for local GI implementation.
2C2	Investigate offering expedited stormwater permitting to towns with GI bylaws.
2C3	Develop outreach material on incentives options.

Objective 3. Property owners voluntarily advocate for and implement GI practices.	
Tactic A. Developed property owners are aware of, understand, and feel empowered to address the environmental issues associated with stormwater runoff and the options available to address them.	
3A1	Inventory and assess existing messaging / outreach campaigns for stormwater in Vermont.
3A2	Identify gaps & assess the effectiveness of existing stormwater messaging / outreach campaigns.
3A3	Work with Green Infrastructure Roundtable to develop a targeted, statewide messaging / outreach campaign to fill gaps in existing messaging.
3A4	Work with partners to spread key GI messages to target audiences.

Objective 3. Property owners voluntarily advocate for and implement GI practices.	
Tactic B. Developed property owners have access to accurate technical and education information for implementing GI practices.	
3B1	Develop an interactive website on GI practices with details on installation.
3B2	Provide access to technical training on GI practices.
3B3	Offer mechanism to match GI experienced professionals to interested property owners.
3B4	Review existing technical & educational resources to identify gaps.
3B5	Develop technical and educational resources to fill in identified gaps.

Objective 3. Property owners voluntarily advocate for and implement GI practices.	
Tactic C. Offer incentives for developed property owners to implement GI practices.	
3C1	Seek grant funding and partnerships to offer financial aid to private landowners to install GI practices on their properties.
3C2	Investigate recognition/certification program for GI (i.e. Blue Certification).
3C3	Capture & share success stories.

Objective 4. State agencies secure and commit funding to develop policies and programs to support GI.	
Tactic A. The Vermont Stormwater Program encourages the use of GI practices.	
4A1	Identify GI gaps in the current stormwater manual and promote updates/amendments.
4A2	Support regional stormwater coordination and project implementation.
4A3	Identify opportunities for a dedicated funding stream to support regional coordination and implementation efforts.
4A4	Encourage the VT Stormwater Program to require the use of GI practices before conventional treatment practices in permitting.

Objective 4. State agencies secure and commit funding to develop policies and programs to support GI.	
Tactic B. The State supports a recognizable GI Program.	
4B1	Vermont supports GI Program with staffing.
4B2	Provide a clear identity, mission and purpose for the GI Program.
4B3	Establish an advisory board to the GI Program.
4B4	Identify existing programs / initiatives that the GI Program can be integrated into.
4B5	Develop relationships / partnerships to sustain the GI Program.

Objective 4. State agencies secure and commit funding to develop policies and programs to support GI.	
Tactic C. State agencies serve as a role model for GI implementation.	
4C1	Identify state agency liaisons to champion efforts internally.
4C2	Draft an Executive Order or legislative language requiring all State development projects use GI practices.
4C3	Support development of technical guidance for implementation of GI practices on state projects.