

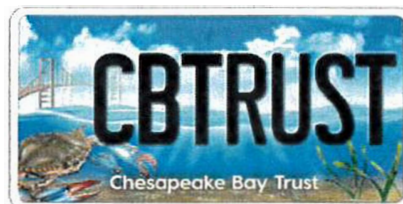
Stakeholder Interview Report

School Recognition Programs and BMPs on School Grounds

David Kline, Nanette Marcum-Dietrich, Steve Kerlin, Tara Muenz

Stroud Water Research Center
970 Spencer Rd
Avondale PA 19311

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Abstract

This report presents findings on the implementation of BMPs on school grounds, the integration of BMPs in student and community learning, and the influence of sustainability recognition programs. Through a series of interviews of Sustainable/Green School Recognition programs (GSRP) and schools/school districts from the District of Columbia (DC) and each state in the Chesapeake Bay Watershed, we found the implementation of BMPs varies quite significantly, affected by age of the school (building codes), location (individual initiatives) and size of school district (larger districts often have more resources such as funding, facility and sustainability personnel). Throughout the interview findings it is clear that many opportunities exist for schools and school districts to be an important partner in efforts to expand BMP implementation and adoption that would enhance environmental literacy and Chesapeake Bay restoration goals.

Keywords: Best Management Practices, School grounds

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Executive Summary

To support Chesapeake Bay restoration goals, we conducted interviews to explore and support Best Management Practice (BMP) installation and restoration at schools. For the purpose of this study, the “Best Management Practices” (or BMPs) are defined as conservation practices that could be implemented to protect water quality and promote soil conservation. A BMP can be structural “things” that you install on-the-ground, or policy/procedural changes that seek to limit impacts on water quality. Examples may include runoff diversions, silt fence, planting stream buffers, reducing chemical use, enforcing a no-idling policy, or planting ground cover vegetation over bare soil areas. The focus of the interviews was to specifically learn more about the implementation of BMPs on school grounds, the integration of BMPs in student and community learning, and the influence of sustainability recognition programs. We conducted two sets of interviews, with Sustainable/Green School Recognition programs (GSRP) and also with schools/districts from the District of Columbia (DC) and each state in the Chesapeake Bay Watershed. The interviews of Sustainable/Green School recognition programs (GSRP) and school districts in the Chesapeake Bay Watershed were conducted using a semi-structured interview protocol in order to gain insights into the roles and dynamics of schools, school districts, and recognition programs in implementing best management practices (BMPs) on school grounds. Interviews were conducted primarily using Zoom meeting software and three interviews were conducted in person. All interviews were transcribed and analyzed using an a priori coding process, in which the high-level categories are established prior to the analysis and subcategories emerge during the analysis process. These categories are used in the report to discuss overall findings.

All states in the Chesapeake Bay Watershed actively participate in the federal GSRP. Most states (NY, WV, PA, and DE) have a state recognition program that is modelled after the federal program and serves as a pathway to the national program. DC is currently developing a new state program that aligns to the federal GRSP and that helps schools to prepare to apply to the federal GRSP. MD and VA have additional recognition programs that are separate from the national program and do not feed into the GRSP. MD’s Maryland Association for Environmental and Outdoor Education (MAEOE) Green Schools Program and VA’s Virginia Naturally School Recognition Program predate the federal GRSP. All states reported that the number of applicants for GRSP has declined in recent years. Feedback on the GRSP programs received from school districts suggests that they are deterred from applying due to the perceived complexity and length of the application and the absence of a monetary award to incentivize achieving recognition.

States and DC provide varied levels of assistance to school districts during the GRPS application process. In each state and DC there is only one person tasked with overseeing the GRPS. In each state and DC, the sole person assigned to oversee the program has limited time devoted to the recognition program. All states require applicants to show progress in each of the 3 pillars (Reduced Environmental Impact and Costs, Improved Health and Wellness, Effective Environmental and Sustainability Education) of GRSP and to show a curriculum connection. While student and community involvement was encouraged by all states, it was not required by any state. When asked if the installation of BMP’s was required for recognition, all states responded with “not required” but stated that BMP installation is recommended. Most noted that it would be very difficult for schools to earn recognition without providing evidence for the installation of some BMPs, including practices for

mitigating the impact of stormwater on their local watersheds. None of the GRSP entities track the installation of BMPs on school grounds or maintain any data related to restoration. The only data related to BMP installations is information included on recognition applications. Lack of time and funding to create and maintain a tracking system were the main reasons given.

Over 70 schools and school districts were approached to participate and 38 representatives from 24 schools and school districts in the Chesapeake Bay Watershed were interviewed. We found that organizational structures of school districts in the different states vary greatly, and directly affect the impact of BMP installations on school grounds in meeting restoration goals and enhancing student learning opportunities. School districts that are designated by county lines (VA, MD, DC) tend to be larger with more departments and personnel available to facilitate the installation of BMPs on school properties and integrate projects into curriculum and learning. These school districts often have access to county government programs that assist with the installation and maintenance of BMPs on school grounds. These districts also serve large student populations and seem to have more money and resources available. West Virginia is the exception as school districts are based on county lines although average enrollment is lower and schools seem to operate more autonomously. States with multiple school districts per county (PA, NY, DE) operate with less administrative infrastructure, smaller operating budgets, and fewer resources. In these districts sustainability projects and goals tend to be driven by school board initiatives or invested superintendents and teachers.

Most school districts did not report having a formal sustainability plan or goal. Districts with formal plans often included initiatives to earn LEED certification for new construction and renovations. The installation of BMPs to mitigate stormwater issues and protect local watersheds was not identified as a distinct element of their plans, rather a component of the LEED certification application. The use of BMPs (and Outdoor Learning Spaces) is generally encouraged, but not required. For most states, BMPs are not directly tied to academic standards, although there are standards that could incorporate the use of BMPs in student instruction if a teacher is so inclined. School Districts in MD and VA often cited the Chesapeake Bay Watershed Agreement as an impetus for their programs and projects. School districts in MD, VA, and DE have embedded outdoor education experiences into the curriculum for all students in the district and many of these include stormwater management as a topic within the curriculum at a specific grade level. Most school districts do not engage in opportunities to educate their local communities about the BMPs installed on their properties and how they benefit the watershed.

Two modalities for the installations of BMPs on school grounds emerged from the interviews: construction based and project based. For most school districts, the installation of BMPs on school grounds is predicated on meeting local or state building codes during construction or renovation projects and are typically not integrated into the curriculum or student learning. BMPs as a component of school site plans are typically drafted and designed by engineering and architectural firms, installed by contractors, and maintained by the district. School districts with expanded administrative resources often have in-house engineering and construction divisions with personnel to provide oversight. Districts with limited personnel and resources rely on consulting firms and often institute the minimum requirements for BMP installations. Project based BMP installations originate from facilities managers looking to solve issues or save money on maintenance, partnerships with outside agencies (county initiatives or watershed groups), or individuals in the district with a curricular goal that would benefit from a teaching resource. The latter two generally included a curriculum connection and could involve Meaningful Watershed Educational Experiences (MWEE) for students. Most school districts did not cite Green Ribbon School or sustainability recognition programs as a motivating factor for installing BMPs

on school grounds. Of the schools and districts that have earned recognitions, most included BMPs and stormwater management projects in their applications.

The installation of the BMP is often aided by grant funding but these grants do not include funding opportunities for long-term maintenance of BMPs. The maintenance of BMPs installed as a result of construction projects or site plan revisions is usually the responsibility of the facilities and grounds management teams. School maintenance staff reported BMP maintenance as a lower priority within grounds and facilities management as other tasks often take precedence (such as preparing athletic fields, mowing, building repairs, and cleaning). BMPs that originate from partnerships or classroom initiatives are often maintained by teachers, students, and staff. Common maintenance challenges for both were time, funding, and expertise. Lack of proper training often led to mowing or removal of desired vegetation. When specific teachers or administrators initiate projects and then retire or relocate, the remaining personnel lack the knowledge to maintain the projects properly. Maintenance is identified as a hurdle to the long-term success of these small-scale projects. Throughout the interview findings it is clear that many opportunities exist for schools and school districts to be an important partner in efforts to expand BMP implementation and adoption that would enhance environmental literacy and Chesapeake Bay restoration goals.

Conducted Interviews Methods and Analysis

The focus of the interviews was to learn more about the implementation of BMPs on school grounds, the integration of BMPs in student and community learning, and the influence of sustainability recognition programs. In order to conduct interviews the project team first created interview protocols, questions, consent forms, and filed for approval for research with human subjects with Millersville University's Institutional Review Board. Upon approval for this research, we began interviews that were to last anywhere from 30 minutes to 1 hour. A coding framework was created that aligns with the interview questions, which ranged from 40 to 49 questions. Interviewees were identified through internet searches, state partner contact lists, and interviewee suggestions. The interviews of Sustainable/Green School recognition programs (GSRP) and school districts in the Chesapeake Bay Watershed were conducted using a semi-structured interview protocol in order to gain insights into the roles and dynamics of schools, school districts, and recognition programs in implementing best management practices (BMPs) on school grounds. Interviews were conducted primarily using Zoom meeting software and three interviews were conducted in person. All interviews were transcribed and analyzed using an a priori coding process, in which the high-level categories are established prior to the analysis and subcategories emerge during the analysis process.

Table 1. Interviews Summary

	GSRP*	School Districts	Total
Hours of Interviews (Hr:Min)	11:58	21:16	33:14
Number of Interviewees	14	38	52
Number of Interviews	12	24	36

NOTE: *Green School Recognition Programs

We interviewed a representative from the state board of education who is responsible for facilitating the National Green Ribbon Schools Program for each state in the Chesapeake Bay region and DC as well as representatives from other recognized green school programs. For the green ribbon recognition programs, a total of 12 interviews were conducted with 14 total participants (Table 1). In the Chesapeake Bay Region all states and the District of Columbia (DC) actively promote and participate in the National Green Ribbon Schools Program (NGRSP). Participating states and DC have considerable autonomy on how they select their nominees. To better understand how the National Green Ribbon Schools Program operates in the Chesapeake Bay Region, we conducted interviews with Department of Education staff who oversee NGRSP in each state and DC using a semi-structured interview protocol (See Appendix A). Twelve interviews were conducted with Green Ribbon School Recognition Programs and partner organizations (Table 2). We interviewed 14 individuals totaling 11 hours and 58 minutes of interview time with each interview lasting between 40 and 90 minutes. Interviews were conducted using Zoom meeting software which generated a video and audio recording of each interview, as well as an automatic transcription. Interview transcripts were reviewed for accuracy and analyzed using qualitative methodology using a pre-set coding schema. Similarities and differences in the administration of the NGRSP programs in each state and DC are reported.

Table 2. Green Ribbon/Sustainable School Recognition Program Interviews

State	TYPE (GSRP)	GSR Program	Interview Time (Hr:Min)	Number of participants Interviewed
DC	GSRP	DC Green Ribbon Schools	1:04	1
DE	GSRP	DE Green Ribbon Schools	0:44	1
DE	Facilitator GSRP	DE Pathways to Green Schools - Green Building United	1:13	1
International	GSRP	Eco-Schools USA	1:10	1
MD	GRSP	MAEOE Green School	0:57	1
MD	GSRP	MD Green Ribbon Schools	1:15	1
NY	GSRP	NY State Green Ribbon Schools	1:07	1
PA	GSRP	PA Pathways to Green Schools	0:52	1
US	GSRP	ES ED Green Ribbon Schools	1:12	1
VA	GSRP	VA Green Ribbon Schools	0:25	1
VA	GSRP	VA Naturally	0:41	1
WV	GSRP	WV Sustainable Schools	1:18	3
Total			11:58	14

Schools and school districts from all seven state entities (six states and the District of Columbia) within the Chesapeake Bay Watershed were contacted to participate in this study (Table 3). The initial study design called for identifying schools/districts with BMPs installed and without BMPs installed on school properties. From the initial contacts and interviews with schools/districts, we found that most schools have BMPs installed on their properties due to required compliance with updated municipal or state regulations that include BMPs and stormwater management. The lack of BMP installation differentiation necessitated a change in the study design and required an update to the coding framework. The modified study design looked for schools with and without sustainability initiatives and success in earning sustainability recognitions. All state green ribbon school program coordinators were asked to provide suggestions of schools and school districts with success in earning recognitions that we might contact. Email requests for voluntary participation were sent to some school districts (or private and charter schools) that had earned the US Department of Education Green Ribbon School recognition. Other schools/districts were chosen randomly to receive the requests for participation in this study. The goal of enlisting participation from every state proved to be a challenging task and many schools and districts refused to participate or did not respond to interview requests. Delaware has limited school districts where 25% (or more) of the land area within the school district jurisdiction boundary is also within the Chesapeake Bay Watershed, so all eight school districts that met this criteria were contacted and only three agreed to participate. New York State has no schools within the Chesapeake Bay Watershed that have earned the US Department of Education Green Ribbon School recognitions and school districts (19) were randomly selected until three agreed to participate. Over 70 schools and school districts were approached to participate and 38 representatives from 24 schools and school districts in the Chesapeake Bay Watershed were interviewed.

Table 3. School District Interview Summary

State	School/District Type	Interview Time (Hr:Min)	Number of participants Includes Follow-ups
DC	School District	1:33	1
DC	Public Charter School	0:52	1
DC	Public Charter School	0:36	1
DE	School District	1:10	1
DE	School District	0:49	2
DE	School District	0:25	2
MD	School District	1:08	1
MD	School District	1:12	3
MD	School District	1:38	3
NY	School District	0:48	2
NY	School District	0:49	1
NY	School District	0:36	1
PA	School District	0:22	1
PA	School District	0:54	2
PA	School District	1:13	2
PA	Independent School	0:54	1
VA	School District	0:45	1
VA	School District	1:03	4
VA	School District	0:46	2
VA	School District	0:37	1
WV	School District	0:51	1
WV	School District	0:34	1
WV	School District	0:26	2
WV	School District	1:15	1
		Total Hours of Interviews	Number of Interviewees
		21:16	38

Interviews were conducted with school/district personnel (one or more individuals) representing public, charter and private schools who were knowledgeable about BMP installations on school grounds, sustainability initiatives and recognitions, and/or the integration of BMPs into student and community learning opportunities (Table 3). If questions were not addressed in the initial interview,

attempts were made to follow up with appropriate personnel to obtain the missing information, and some data was collected from school/district websites. All states within the Chesapeake Bay Watershed and the District of Columbia (DC) were represented in the interview pool of schools and school districts. Interviews were conducted with 3-4 schools/districts per state and DC

Table 4. *School District Interviews by Each State and DC*

State	Interviews
DC	3
DE	3
MD	3
NY	3
PA	4
VA	4
WV	4

The interview data collected from sustainable school recognition programs and schools/districts enhanced our understanding of the challenges and supports needed to increase the capacity for schools/districts to support the Chesapeake Bay Program goals. The results of this analysis are reported in the following pages of this document.

US Department of Education Green Ribbon Schools Program Interviews Report

A. Summary of Award Programs by State and DC:

Launched in the summer of 2011, the National Green Ribbon Schools Program (NGRSP) is a federal outreach & engagement tool structured as a recognition award. The program honors schools, districts, & postsecondary institutions that 1) reduce environmental impact and costs; 2) improve the health and wellness of schools, students, and staff; 3) provide effective environmental and sustainability education. Sustainable/Green School Recognition programs (GSRP) from the District of Columbia (DC) and each state in the Chesapeake Bay Watershed, along with three supporting recognition programs (VA, MD, & DE) and two national programs were interviewed to understand how these programs support or do not support, the installation of BMPs on school grounds and the tracking of restoration/BMP data. All states in the Chesapeake Bay Watershed actively participate in the federal Green Schools recognition program. Most states (NY, WV, DE, and PA) have a state recognition program that is modeled after the federal program and serves as a pathway to the national program. DC is currently developing a state program and MD and VA have a state program that predates the federal Green Schools program.

All states reported that the number of applicants for the recognition program has declined in recent years. The feedback that the recognition programs received from school districts suggest that they are deterred from applying due to the perceived complexity and length of the application and the absence of a monetary award for achieving recognition. States provide varying levels of assistance to school districts during the application process. In each state, there is one person overseeing the award program and that person has limited time to devote to the national recognition programs. Most state recognition programs rely on a committee to review the applications which can include state employees, engaged stakeholders, and experts in different aspects of the three pillars (Reduced Environmental Impact and Costs, Improved Health and Wellness, Effective Environmental and Sustainability Education). All states and DC require applicants to show progress in each of the three pillars and to show a curriculum connection. While student and community involvement was encouraged by all states, it was not required by any state.

When asked if the installation of BMP's was required for recognition, all states responded with "not required" but stated that BMP installation is recommended. Most noted that it would be very difficult for schools to earn recognition without providing evidence for the installation of some BMPs, including practices for mitigating the impact of stormwater on their local watersheds. None of the GRSP entities track the installation of BMPs on school grounds or maintain any data related to restoration. The only data related to BMP installations is information included on recognition applications. Lack of time and funding to create and maintain a tracking system were the main reasons given. A few of the recognition programs mentioned that tracking of BMP installations does occur by other departments or programs in their locations.

B. National Green Ribbon Schools Program

As stated previously, participating states and DC have considerable autonomy concerning how they select their nominees. Therefore, interviews were conducted to better understand how each state and DC manages their National Green Ribbon Schools Program starting with the subject of the nomination process. Each state and DC may nominate up to five schools or school districts and a single postsecondary institution annually. Interview data suggests that the National Green Ribbon Schools Program in the Chesapeake Bay Region is not at capacity and each state and DC are struggling to attract applicants. All states and DC reported that the number of applicants for the recognition program has declined in recent years (Table 5).

Table 5. *Green Ribbon Schools Program Nominee Summary*

State	Total Recognized	Discussion
DC	2 public, 2 charter, 1 private, 1 IHEi	No schools have been recognized since 2012. No schools have applied since 2016.
DE	6 public, 2 districts, 3 private	Receives more applications from private schools than from public schools. Sees room for growth as many schools are doing good work but have not applied. About 2% of schools are recognized.
MD	16 public, 4 districts, 1 private	Currently 1 -2 schools apply each year. More schools applied in the early years.
NY	11 public, 1 private	Currently 2 to 6 schools apply each year. The number of applications has waned in recent years.
PA	13 public, 3 districts, 3 private, 3 IHE	Currently 2 to 4 schools apply each year. 47 schools applied from 2011 to 2012.
VA	10 public, 5 districts, 2 private, 1 IHE	The number of applications has declined in recent years.
WV	9 public, 1 district	More schools applied in the early years. Currently only 1 applicant each year. There were two years where no school applied.

To attract applicants to the state and the NGRSP, each state and DC actively engages in promotion of their program (Table 6). The most common forms of program promotion are email blasts, announcements on their websites, and social media posts. West Virginia is the only state to offer a monetary incentive to schools that apply and earn 70% of the points available on the rubric.

Table 6. Program Promotion

State	Description
DC	No data.
DE	Promotion includes flyers, social media, website, emails, etc. Promotion of those who receive recognition - Dept. of Ed writes a feature article on recipients that is shared with the media. Also, Green Building United provides support and hosts an award ceremony.
MD	Promotion includes emails to science supervisors, personal invitations.
NY	Promotion includes presentations to superintendents and facility managers, website, social media.
PA	Promotion includes emails to listservs, websites, green and healthy schools. DCNR, DEP, PA Dept. of Conservation all promote the program.
VA	Promotion includes emails to schools & teachers, social media.
WV	Promotion includes announcements in superintendent weekly email blast. The program is listed on the state website under teacher opportunities. State staff engage in outreach to schools and in the past year started a \$5k incentive for schools that are recognized.

The interview data illuminated a number of common barriers to attracting NGRSP applicants in the Chesapeake Bay Region. All areas of the Chesapeake Bay Region reported that the NGRSP receives limited support in terms of state staffing and personnel time. The data shows that in each state and in DC, there is only one staff person assigned to the Green Ribbon state and national programs and a mere 5% of the staff member's time is devoted to overseeing these programs. All reported that this lack of personnel time devoted to the programs limited their ability to promote and support the programs.

To understand the barriers to school participation, we asked the state and DC Green Ribbon Schools administrators to describe any feedback they received from local schools about the application process (Table 7). Feedback received by the states and DC included comments from local school districts that suggest that prospective applicants are deterred from applying due to the perceived complexity and length of the application and the absence of a monetary award for achieving recognition.

Table 7. Feedback From Schools on the Application Process

State	Feedback
DC	The application is too long and complicated for schools.
DE	No financial incentive is a barrier; Application is too long and is intimidating.
MD	The application is too difficult and complicated.
NY	Some schools are intimidated by the application and do not apply; lack of a monetary award is a deterrent to schools.
PA	Lack of promotion of the program in recent years has led some schools to believe that the program was defunct.
VA	Too many current initiatives for schools; the application is too long and too data intensive.
WV	The WV sustainable schools application is 10 pages long. Districts reported that it required too much work and that there was no incentive for the schools to apply. This year, the state gave a \$5,000 grant to schools who apply and who earn 70% of the points available to them on the rubric. This year, only 1 school applied and received the grant.

While the allocation of resources is similar across states in terms of state staffing and personnel time, the level of assistance offered to prospective applicants during the application process varies by state (Table 8). The type of support offered includes: providing applicants with directions to the Green Ribbon Schools website, access to an application guide, samples of former successful applications, connections to agencies and/or nonprofits that can assist, and offers to review the application and to provide feedback prior to submission.

Table 8. State Assistance With the Application

State	Details on State Assistance
DC	DC staff does not provide assistance with the application but they will connect applicants with agencies that can answer specific questions or provide needed data.
DE	DE staff refers applicants to the Green Ribbon Schools website and connects applicants to state agencies and nonprofits that can assist. Delaware Pathways to Greener Schools Program collaborates with Green Building United.
MD	MD staff directs schools to the federal program website. MD is currently modifying state app deadlines so they can give applicants feedback prior to the federal deadline.
NY	NY staff provides an application guide with links to resources. They also answer questions via phone and schools who are not successful receive feedback and coaching to reapply.
PA	PA staff is available to answer questions.
VA	VA staff provides a lot of assistance. They will help schools revise their application to meet expectations and they provide schools with samples of successful applications.
WV	The program website asks applicants to contact the state if they plan to apply. WV has experts in each pillar and shares contact info for each expert with the applicant.

Universally, state departments of education reported limited resources in terms of staffing to support schools applying for recognition. Identifying this resource limitation, Delaware found success by partnering with Green Building United (GBU). This local non-profit works with the state department of education to provide one-on-one support and expert resources for schools who are applying to the Delaware Pathways to Green Schools Program.

Green Building United (GBU) is seeking applicants for its Delaware Pathways to Green Schools Program. The Pathways Program provides grants, one-on-one support, and expert resources to K-12 schools in Delaware that are committed to becoming healthier, more sustainable, and more energy efficient. Qualifying schools receive a free building energy assessment and are eligible to apply to our annual mini grant program to support projects related to energy and/or climate change. Participating schools work toward achieving certification and national recognition through Eco-Schools USA and the U.S. Department of Education's Green Ribbon Schools award. All applicants are required to complete the attached questionnaire and participate in an in-person interview with GBU staff before being notified of their selection status. Public, charter, and independent schools will be selected to participate based on their capacity and ability to commit to the program; demonstrated success with sustainability initiatives; and potential for improvement. (Delaware Pathways to Green Schools 2019-20 Application for New Program Participants.)

There is commonality in the process of reviewing submitted applicants across states and DC (Table 9). Applications are reviewed internally by committees of state employees and/or stakeholders with expertise.

Table 9. Review Process

State	Details on Review Process
DC	There were only a few applicants so they submitted all who applied.
DE	Subcommittee of different stakeholders.
MD	Committee with expertise is assigned to each pillar; applications scored using a rubric.
NY	Committee of state employees.
PA	Committee of state employees.
VA	Committee of people with different expertise
WV	The process is reviewed by an expert in each pillar. The review process has become less formal in recent years as the number of applicants declined.

All states and DC require applicants to show progress in each of the three pillars and to show a curriculum connection. While student and community involvement was encouraged by all states, it was not required by any state. When asked if the installation of BMP's was required for recognition, all states responded with "not required" but stated that BMP installation is recommended (Table 10). Most noted that it would be very difficult for schools to earn recognition without providing evidence for the installation of some BMPs, including practices for mitigating the impact of stormwater on their local watersheds.

Table 10. Role of BMP in the Application

State	Is BMP Installation Required?	List of Common BMPs
DC	NOT REQUIRED but encouraged	The Office of the State Superintendent of Education has a Garden program - pollinator gardens and outdoor classrooms. The Department of Energy and Environment funds and installs outdoor classrooms with a focus on reducing stormwater runoff - rain gardens, native plantings, rain barrels, porous pavement. School renovation programs often include runoff management (i.e. green roofs, rainwater detention basins, etc.)
DE	NOT REQUIRED	Gardening and outdoor learning spaces are most common. Private schools do more with runoff management because they typically have more land. Ex. riparian buffers.
MD	NOT REQUIRED, but MD does ask about water quality and stormwater management	Riparian buffers and outdoor classrooms are most common.
NY	NOT REQUIRED, but NY does ask about water quality and stormwater management	Outdoor classrooms and rain gardens are most common. NY specifically mentions the following as examples in the application guide: porous pavement, bioswale, green roofs.
PA	Yes, it is REQUIRED. All recent awardees have included BMPs	Outdoor classrooms, detention basin, porous pavement, rain gardens, pollinator gardens, and native plantings are most common.
VA	NOT REQUIRED, schools often include BMPs in their narrative	Pollinator garden, riparian buffers, rainwater detention, outdoor classrooms are most common.
WV	NOT REQUIRED but encouraged; BMP is mentioned on the rubric and points are awarded for BMPs.	WV requires schools to have integrative pest management.

State Level Recognition Programs - All states in the Chesapeake Bay region have a state recognition program (Table 11). Most states have a recognition program that is modelled after the National Green Ribbon Schools Program (NGRSP). Pennsylvania, West Virginia, New York and Delaware align closely with the NGRSP and applicants to the state program are reviewed and successful applicants are submitted to the NGRSP for consideration. The District of Columbia is currently developing a local recognition program that will serve as a stepping stone to the NGRSP. Maryland and Virginia have state environmental sustainability programs that predate the NGRSP and differ significantly from the national program. Maryland's Green Schools program is a certification program that requires recertification. In contrast, the Virginia Naturally School Program is an "encouragement" program, not a competition or certification program, that recognizes exemplary efforts taken by schools to increase students' environmental awareness and stewardship.

In Maryland and Virginia, the NGRSP is overshadowed by other green school programs that predate NGRSP and are promoted and supported at the state level. For example, the Maryland Association for Environmental and Outdoor Education's (MAEOE) Maryland Green School (MDGS) award program is a certification program that began in 1999 and focuses primarily on pillar 3. MDGS has greater participation than NGRSP as 31% of Maryland schools participate in the MDGS program. The MDGS program is supported by state legislation and state funding in order to strengthen the program with a goal of reaching 50% Green Schools in the State by 2025. (Senate Bill 662 and House

Bill 1366 passed on May 25, 2019.) While separate and independent from NGSP, MAEOE's promotional materials state that the MDGS "can be used as a platform to apply for the national Green Ribbon School certification."

Virginia is another state that has a school recognition program that predates NGSP and that is promoted by the state's board of education.

Virginia Naturally Schools is the official environmental education school recognition program of the Commonwealth, administered by the Department of Game and Inland Fisheries with support from the Department of Education, Department of Environmental Quality and other resource agencies. The Virginia Board of Education has recognized the Virginia Naturally School program as the official environmental education school recognition program for the state. This program recognizes the wonderful efforts of many Virginia schools to increase the environmental awareness and stewardship of our youngest citizens. <https://www.dgif.virginia.gov/education/school-recognition/>

Table 11. State Recognition Program Summary

State	History
DC	The recognition program is in development. It is a tiered program that will act as a stepping stone to the National Green Ribbon Schools Program. It is adapted from Eco Schools and MAEOE (Maryland Association for Environmental and Outdoor Education).
DE	Promotes the federal program. The state program coordinates with the Delaware Pathways to Greener Schools Program which typically focuses on energy conservation not on BMP. All BMP is done through the National Wildlife Federation and Eco-Schools Program.
MD	The Recognition Program was established in 1999 and pre-dates the national program. It supports the Chesapeake Bay Program agreement goals for Environmental Literacy and the 2012 Environment Literacy Requirement. Maryland's Green School Program is run by MAEOE and is a certification program that requires recertification and it is still ongoing. The three objectives for this certification program are: 1) Integrating EE into the curriculum, 2) Student Action, and 3) Community Partnerships.
NY	Modelled after the National Green Ribbon Program. The state application is more elaborate than the National Green Ribbon Program application. The state recognizes all schools that are being nominated to the federal program. Currently, all schools that are nominated from New York have received the state award.
PA	Modelled after the National Green Ribbon Program. Uses the same application for both the National Green Ribbon Program and the State Recognition Program. Pennsylvania schools usually apply to both programs at the same time. National awardees are also given the PA state GRS recognition. Some schools/districts that do not earn the National level recognition can still earn the PA State level recognition. *Historically, only 2 schools have received state recognition without also receiving national recognition.
VA	Virginia schools predate Green Ribbon Schools. The program was developed by the state to coordinate with the state's EE goals. The state program is not a competition or certification. Rather it is described as a program that "encourages" EE. The state program is not aligned with the National Green Ribbon Program.
WV	Modelled after the National Green Ribbon Program. Both programs use a similar application. For the state program schools can be recognized for the state recognition for excellence on only 1 pillar. If schools score 70% or higher on the state application, they are nominated for the National Green Ribbon Schools Program.

School District Interviews Report

The school district interview report is divided into sections based on the five major topic areas of the interview questions (school district sustainability success, BMPs on School Grounds, BMP Maintenance, BMP education integration, and Outdoor learning spaces (OLS) education integration). Each section begins with an introduction to the topic area, the interview questions in this topic area, followed by tables and figures of responses and findings. Each section ends with a summary of findings.

A. School District Sustainability Participation

This section presents the findings related to the existence and the details of school district sustainability plans, goals, and initiatives. The interview questions explore the motivating factors for implementing sustainability initiatives, modes of encouragement for participation from school districts, an accounting of school and district sustainability recognitions, and an overview of school district demographics.

A. Summary of your school district's sustainability plan/goals?

1. What are the motivating factors in implementing sustainability plans and projects in your school district (e.g. money savings, certification, connection to curriculum, Sustainability/Green Ribbon recognition)?
2. How is the district encouraging your schools to be involved in sustainability plans and projects?
3. Have any schools in your district earned any commendations from green school/sustainability recognition programs (i.e. US or State Green Ribbon, State Sustainability, VA Naturally, Eco-Schools USA, etc.)?
4. How many schools are in your school district? How many students do you serve?

Sustainability Plan Implementation Infrastructure Classification. Schools/districts differed in their available resources to enact sustainability plans. As a result of the analysis of interview data, schools/districts were classified into four categories based on the level of structure, staffing, funding, and collaboration that was noted in their operations and implementations of sustainability initiatives within their school/district. Table 12 describes the attributes of the individual categories of the sustainability plan implementation infrastructure.

Table 12. Sustainability Plan Implementation Infrastructure Classification

Sustainability Plan Implementation Infrastructure	
Fully integrated	District has structure and personnel in place to bridge divisions and implement sustainability plans that includes facilities, community, and curriculum.
Moderately integrated	District is somewhat structured with personnel to lead initiatives with collaborative efforts between divisions.
Somewhat integrated	District has motivated staff that work together.
Not integrated	District has no structure to consider sustainability plans or projects and takes on opportunities as they arise (construction, community groups).

Table 13. Sustainability Plan/Goal and Recognition Participation Summary

State	Other Recognitions Attained = Yes	US Department of Education Green Ribbon Schools = Yes	US Department of Education Green Ribbon District = Yes	BMPs part of Recognition Application = Yes	BMPs Integrated into Curriculum = Yes	Published or Defined Sustainability Plan Existence = Yes	Sustainability Plan Implementation Infrastructure
DC	0	1	0	1	1	1	Fully integrated
DE	1	1	1	1	1	1	Fully integrated
MD	1	1	1	1	1	1	Fully integrated
MD	1	1	1	1	1	1	Fully integrated
MD	1	1	0	1	1	1	Fully integrated
PA	0	1	0	1	1	1	Fully integrated
VA	1	1	1	1	1	1	Fully integrated
DC	1	1	0	1	1	0	Moderately integrated
PA	0	0	0	0	1	1	Moderately integrated
VA	1	0	0	1	1	0	Moderately integrated
WV	0	1	0	1	1	1	Moderately integrated
DE	0	0	0	1	1	0	Somewhat integrated
DE	0	0	0	0	1	0	Somewhat integrated
PA	0	0	0	0	1	0	Somewhat integrated
VA	1	0	0	0	1	0	Somewhat integrated
VA	1	0	0	0	1	0	Somewhat integrated
WV	0	0	0	0	1	0	Somewhat integrated
WV	0	0	0	0	1	0	Somewhat integrated
DC	0	0	0	0	0	0	Not integrated
NY	0	0	0	0	1	0	Not integrated
NY	1	0	0	0	0	0	Not integrated
NY	0	0	0	0	0	0	Not integrated
PA	1	0	0	0	0	0	Not integrated
WV	0	0	0	0	1	0	Not integrated
Total	11	9	4	11	20	9	

Note: Other Recognitions Attained includes: VA Naturally, MAEOE Green Schools, and Eco-Schools USA (if Green Flag, Bronze, or Silver awards have been earned). ENERGY STAR recognitions (EPA/DOE) are indicated in blue.

There are many factors that may contribute to school district sustainability participation (implied by recognitions earned by each school/district interviewed) including: sustainable school recognitions earned, BMP inclusion in recognition applications, integration of BMPs in curriculum, sustainability plan

existence, and sustainability plan implementation infrastructure. A pattern exists (Table 13) between school/districts that have published or defined sustainability plans and those with greater sustainability implementation infrastructure in place (administrative organization and staffing). Schools/districts that have defined plans and more infrastructure demonstrate a greater level of success with implementing plans and projects, participating in recognition programs, and earning green school or sustainability recognitions. Table 13 shows that all schools/districts (7 of 7, 100%) that are deemed to have “fully integrated” implementation infrastructures have schools that earned US Department of Education Green School recognitions, and 4 of 7 (57%) have earned US Department of Education Green District recognition. Three of four (75%) of schools/districts with “moderately integrated” implementation infrastructures have earned US Department of Education Green Ribbon or “other” sustainable school recognitions. Only 4 of 13 schools/districts (31%) with “somewhat integrated” or “not integrated” implementation infrastructure earned “other” (two of these were EPA ENERGY STAR awards) and none of these 13 (0%) earned US Department of Education Green Ribbon Schools recognitions. School districts interviewed from Maryland demonstrated the greatest concordance between “Fully Integrated” implementation infrastructure and success with earning sustainability recognitions. Schools/districts in New York State had the least success earning sustainability recognitions and no schools/districts with “Fully Integrated” implementation infrastructure or established sustainability plans or goals.

Table 14. Sustainability Plan or Goal Existence Classification

Sustainability Plan/Goal Classification	
Published or Defined Plan/Goal	School/District reported a written sustainability plan or goal exists that is either published or circulated within the School/District departments.
Unwritten Plan/Goal with Progress or Motivation	School/District reported having a sustainability plan or goal that is unwritten and demonstrated progress or motivation through successful implementation initiatives.
No Plan/Goal - Initiatives Driven by Few Staff	School/District reported that no sustainability plan or goal exists, yet successful implementation initiatives were demonstrated.
No Plan/Goal - Minimal Initiative	School/District reported that no sustainability plan or goal exists, and limited implementation initiatives were demonstrated.

Interviewed Schools and School Districts were asked to provide a summary of their sustainability plans or goals. A classification for the existence of sustainability plans or goals was created based on the analysis of their responses and the progress or motivation towards implementing sustainability initiatives demonstrated (Table 14). Schools/districts with “No Plan/Goal - Initiatives Driven by Few Staff” were also noted to have a culture that allows and supports initiatives by individuals.

Table 15. Existence of School District Sustainability Plan or Goal by State

Sustainability Plan or Goal Existence	DC	DE	MD	NY	PA	VA	WV	Number of Schools/ Districts
Published or Defined Plan/Goal	1	1	3	-	2	1	1	9
Unwritten Plan/Goal with Progress or Motivation	1	-	-	-	1	1	1	4
No Plan/Goal - Initiative Driven by Few Staff	-	2	-	2	-	2	2	8
No Plan/Goal - Minimal Initiative	1	-	-	1	1	-	-	3
Totals	3	3	3	3	4	4	4	24

Table 15 provides a summary of the responses from schools/districts regarding the existence of sustainability plans or goals as well as the distributions by state and DC. Schools/districts sustainability initiatives were classified by the existence of a published or defined plan or goal, the mention of an unwritten plan or goal, or no plan or goal reported. Schools/districts that reported not having a goal or plan were subdivided by the level of progress demonstrated by staff or initiatives toward implementing sustainability projects or programs in their schools. Progress or motivation was recognized by the implementation of staffing to support sustainability initiatives and the achievements attained. As seen in the table above, 13 of 24 schools/districts (54%) reported having a sustainability plan or goal (either published or defined, or unwritten plan/goal). Eight of 24 schools/districts (33%) demonstrated progress with implementing sustainability projects driven by motivated individuals (educators or administrators). Of the school districts interviewed, Maryland reported the highest incidence (3 of 3, 100%) of published or defined sustainability plans or goals. Most schools/districts (21 of 24, 88%) showed some level of progress towards integrating sustainability in their schools, and only three of 24 schools/districts (13%) demonstrated minimal sustainability initiatives.

In the enactment of the Chesapeake Bay Watershed Agreement, one interviewee reported that all schools in their state are required to have sustainability plans. This interviewee also understood the plan's relationship to the Chesapeake Bay Watershed Agreement. Other interviewees had limited knowledge of their schools' sustainability plans and/or goals and its relationship to the Chesapeake Bay Watershed Agreement. The quotes below demonstrate this disparity.

INTERVIEWER: "Do you have a sustainability plan? And do you want to just give a summary of that?"

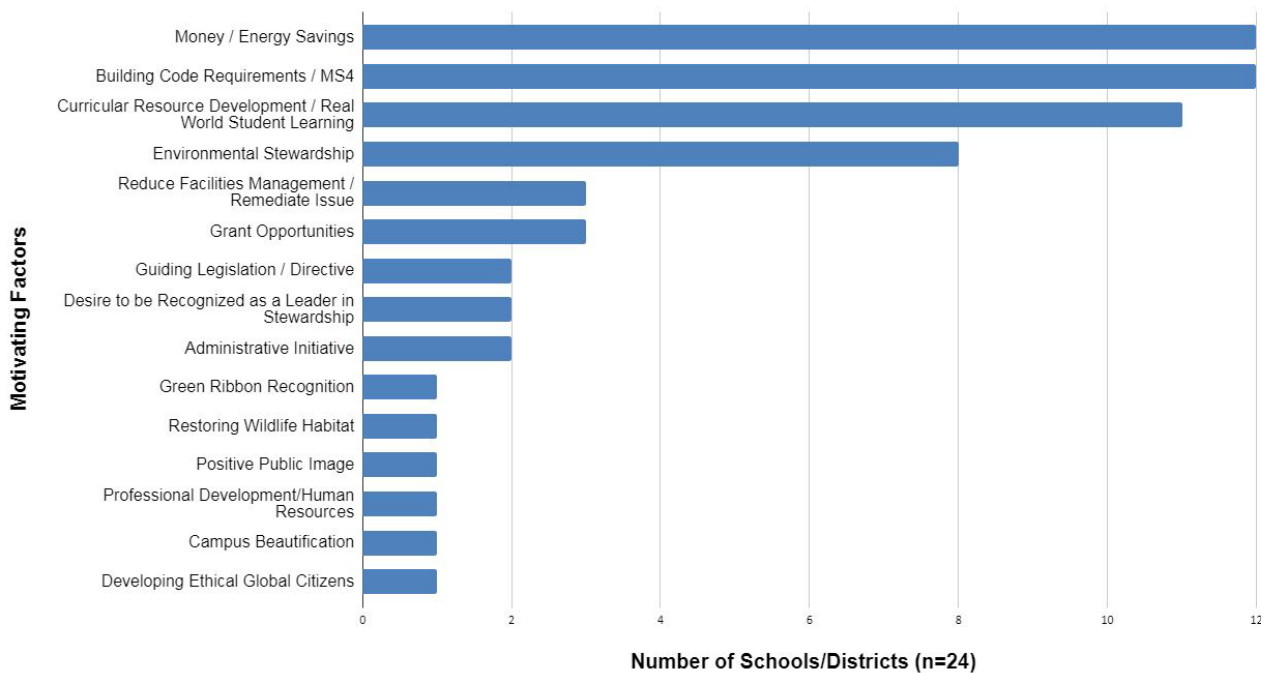
INTERVIEWEE: "Um, yeah. And I think you should find that each school in Maryland will, and possibly in the entire watershed just based on the Bay agreement, which was signed by I believe the six governors and District of Columbia. So they charge us with reporting every two years. And basically they provide the information that creates our sustainability plan. So we actually just submitted the last iteration of that within the last I don't know 45 days."

-Maryland

"So I guess the answer that I would say probably not formally but as we do capital projects are approximately every five years. There is definitely direct attention towards all these things to do the right thing and improve. And all that's there's a certain amount of sustainability now so we're probably ahead of the game compared to other states, I imagine, right. So we don't have, like a strategic plan or anything, you know, or even a mission regarding you know in relation to this, I mean, what [second interviewee] just said is, like, you know, as we do, we were planning for a project right now. Those are the kinds of things that we would be taking into consideration. Okay, so I'm not sure if that answers what you're looking for."

-New York

Figure 1. Motivating Factors for Implementing Sustainability Plans



Interview participants were asked to identify the motivating factors for implementing sustainability plans and projects at their schools/districts (Figure 1). Saving money/energy and meeting building code/MS4 requirements were the predominant motivating factors, each being cited by 12 of 24 (50%) of the schools/districts interviewed. Developing resources for curricula that provide real world learning opportunities for students was reported as a motivating factor by 11 of the 24 (46%) schools/districts. Eight of 24 schools/districts (33%) stated responsible environmental stewardship as a catalyst for implementing sustainability plans and projects. Two schools/districts (8%) reported the desire to be recognized as a leader in stewardship as a motivating factor, and two schools/districts cited legislation or directives from bodies of administrative oversight and leadership as factors that drive the implementation of sustainability plans.

"At this point, I think the only motivating factor is the money savings. Our school district is not energized right now into the other kinds of ideas. We'll see, we'll see if we can drum up some more support. That's what I'm hoping for."

-West Virginia

"I definitely say you know money savings. If there is a connection to curriculum, because it is important to get that stuff out, you know, to the kiddos early, you know, and really focus on that. So I think those would be the two."

-New York

"To meet the [building code/MS4] requirements. But we have been making an effort, and we have been installing several different facilities during new construction, in providing opportunity for curriculum too, so we changed that recently."

-Maryland

"So certification would definitely have been one of those. I should say recognition, because that's green ribbon, that's not certification. Money savings for sure, connection to curriculum for sure, and really sustainability is using the land better, creating more learning places for our students outside the four walls of a crowded classroom. And restoring habitat for the sake of restoring habitat."

-Delaware

"Certainly a large driver for sustainability plans/goals is saving money. Projects that reduce energy costs are attractive and accomplish at least two goals, savings of course and possible recognition. Between those two are possible connections to curriculum and educational opportunities for students to learn about current environmental issues. The possible recognition I am referring to is the public perception that we are doing all we can to save dollars and reduce our "environmental footprint." No one likes wasteful use of resources."

-Delaware

"Well, from my point of view, I believe that the primary driver, you know, the primary reason that we implemented [sustainability plans and projects] is for the environment. I'm not particularly focused on winning awards, even though that may be more of an incentive on other types of projects. But from our point of view... the primary factor is to keep our environment clean, as clean as possible, and being responsible."

-Virginia

"Our ... commitment to environmental stewardship makes us a national leader ..."

-Maryland

"Education is going to be one of the things that we want the kids all to learn to do the right thing and includes we had solar projects and things that we've tried to make that a large part, educational, and then savings would be another thing that we look at, what helps the district with savings. And this is always on our mind."

-New York

"Money savings, of course, is one. We do keep in mind, as much as possible, what nature will do to us and we're governed by each individual township. So that's what drives us."

-Pennsylvania

Table 16. School District Encouragement for Sustainability Plans Summary

School District Encouragement For Implementing Sustainability Plans & Projects	Number of Schools/Districts (n=24)
Promotes sustainable policies, energy saving and/or conservation	7
Integrates sustainability/environmental education within district-wide curriculum	7
Encourages collaborations with local organizations and/or municipal, county, or state level departments or agencies	6
Created division/department with funding and multiple staff responsible for developing and implementing sustainability projects	5
SD or School Board established sustainability plan, goal, or policy to guide progress and institute sustainable policies	5
Established initiative and program to improve environmental literacy or outdoor education	4
Promotes environmental stewardship	4
Supports initiatives derived from teachers or staff (curriculum or projects), no specific staffing or push provided by district	4
No direct or neutral encouragement mentioned	4
Encourages cooperation and collaboration between departments - Facilities, Construction, Sustainability, Curriculum	3
Encourages participation of students and staff in planning and implementing environmental sustainability plans and projects	3
Push from Administrator (Superintendent or Principal), forwards potential projects and opportunities	3
Funded one staff position responsible for developing and implementing sustainability projects throughout the school district	2
Established initiative to have schools or district earn state or national green schools recognition	2
Established initiative to have all buildings and renovations earn sustainability certification (LEED, EPA ENERGY STAR, etc.)	2
Hosts district-wide contests or incentive programs to promote initiatives and highlight successes	2
Meets building code requirements set forth by municipalities, county, or state without additional initiative	1
SD administration is mindful of environmental sustainability when considering projects without formal policy or procedures	1
Educates administration and facilities staff to improve plant operations efficiency and sustainability	1
Established school-based green teams	1
Supports extra-curricular or informal learning initiatives	1

A wide range of responses were provided for how school districts (or bodies of administrative oversight and leadership) are encouraging schools to be involved in sustainability plans and projects (Table 16). Promoting policies and practices that result in energy conservation and saving money, and integrating district wide environmental or sustainability curriculum, were cited most often by schools/districts interviewed (7 of 24, 29%) as forms of encouragement. School district encouragement of collaborations and partnerships with local organizations and agencies was described by 6 of 24 interviewees (25%) in forwarding sustainability plans or projects. Four of 24 school districts interviewed (17%) reported no direct or neutral encouragement for implementing sustainability plans or projects from school district administration. Only one school district (0.4%) cited an initiative to provide education and training to school district administration and facilities staff to improve efficiency and sustainability of plant operations. Continuity exists between the motivation factors for implementing sustainability plans and the school district's encouragement to participate in these plans as energy savings and educational initiatives were pronounced in both sets of responses.

Table 17. School District Encouragement Responses

State	District Encouragement Responses from School Entities in each State
MD	<ul style="list-style-type: none"> SD established sustainability policy, created a division/department (multiple staff) responsible for developing and implementing sustainability projects throughout the school district, encourages participation of students and staff in planning and implementing environmental sustainability plans and projects, established school-based green teams, and hosts district-wide contests to promote initiatives and highlight successes. SD funds staff for STEM Coordinator and Outdoor Education Facility, encourages cooperation between departments, STEM Coordinator helps to identify and install BMPs on school grounds with curricular connections, and set a goal to have all schools earn state green school status. SD established sustainability policy to direct multiple divisions to implement practices, projects and curriculum that will model conservation and sustainable practices, establish a culture of environmental stewardship, and boost environmental literacy for students and staff. SD policy encourages cooperation with county government programs and community organizations to enhance sustainability projects and learning opportunities.
DE	<ul style="list-style-type: none"> Push from Administrator (Superintendent or Principal). SD created a staff position responsible for developing and implementing sustainability projects throughout the school district and funded the initiative with a budget. Set goals for green ribbon schools and district recognition. SD educates administration and facilities staff to improve efficiency and sustainability with plant operations and upgrades to save money and demonstrate to the public their efforts to reduce their environmental footprint. SD connects curriculum and educational opportunities to enhance student learning about current environmental issues and funds an Outdoor Education Center with staff to provide students with meaningful learning experiences in nature.
DC	<ul style="list-style-type: none"> SD established a sustainability policy to improve health, nutrition, and environment in all schools. Policy guides construction and renovations with emphasis on energy conservation and LEED Certification. State level departments and programs established to support SD operations, sustainability initiatives, and education. Most encouragement comes from school staff and administrators. Some SD mandates are given but encouragement reported as neutral.
VA	<ul style="list-style-type: none"> SD encourages cooperation and collaboration between departments (facilities, construction, and curriculum) to reduce carbon footprint and support conservation. School district adopted project based MWEE's district wide at three levels (4th, 7th, 9th grades). No specific staffing for project development and integration. SD created a division/department (multiple staff) responsible for developing and implementing sustainability projects throughout the school district. SD encourages cooperation and collaboration between departments (facilities, construction, sustainability, and curriculum) and partnered with a national program to engage students in environmental action projects. SD sustainability program hosts 1-2 district-wide incentive programs each year to boost environmental stewardship. SD promotes energy saving and conservation, and works with the county on stormwater management projects. SD encourages schools to participate in sustainability projects (stewardship) and integrates environmental education throughout the K-12 curriculum.
PA	<ul style="list-style-type: none"> School board established a sustainability policy to guide construction and renovations (LEED Certification), SD integrates programs and curriculum to teach sustainability and collaborates with local partners and state agencies to provide educational opportunities. School district supports initiatives from facilities and educators to save money and raise environmental sustainability awareness. SD created and continues to fund an environmental center with staff to develop and implement programs, integrated curriculum, and sustainability projects (stewardship) on school grounds SD provides support as much as possible within reason. SD implements improvements to school grounds as required by code and supports environmental clubs, curriculum, and projects proposed by staff.
NY	<ul style="list-style-type: none"> No direct encouragement mentioned, Administration is mindful of sustainability in considering projects and planning as situations arise. No direct encouragement mentioned, sustainability included in the science curriculum, students proposed recycling and food waste composting programs. No direct encouragement mentioned, teachers integrate sustainability as good community practices throughout the K-12 program.
WV	<ul style="list-style-type: none"> SD with motivated Superintendent & Principal funds watershed education program with local organization, field trips, and BMP installation projects on school grounds - development of district wide policies on no-idling, and energy conservation and resource management. SD promotes sustainable policies, resources, and collaborations with local watershed organizations. SD promotes energy conservation; Teacher leads efforts at school and works with partner organizations. SD Administration and staff support sustainability projects and forwards potential projects and opportunities.

Table 17 provides a review of all responses given for how school districts (or bodies of administrative oversight and leadership) are encouraging schools to be involved in sustainability plans and projects sorted by state. This state level response view allows for quick analysis to see patterns in the responses provided. Schools/districts in Maryland demonstrate a concerted effort to implement sustainability plans and programs through departmental infrastructure, funding and appointments of staff, and established sustainability plans or goals. Schools/districts in Virginia display consistent levels of encouragement for implementing sustainability in their schools. All West Virginia schools/districts demonstrated encouragement from district administration although infrastructure to implement sustainability projects is minimal and progress is led by motivations from individual staff or administrators. Noteworthy is the consistency demonstrated in New York State where all school district interviewees reported no direct encouragement from school district administration towards implementing sustainability plans or projects. This reinforces the findings from school district sustainability success as there are no school districts in New York State located in the Chesapeake Bay Watershed that have earned US Department of Education Green Schools recognitions. None of the schools in the school districts interviewed from New York State were registered participants in the Eco-Schools USA program and only one district reported earning an “other” recognition (EPA’s ENERGY STAR Award).

Table 18. Sustainable School Recognition Participation

State	# of Districts	# of Schools in Districts	# of US DE Green Ribbon Schools in Districts	# of US DE Green Ribbon Districts	MAEOE Green Schools OR VA Naturally	# of Eco-Schools USA in Districts Awards	EPA ENERGY STAR
MD	3	328	13	2	149	<u>136</u> 2 Green Flag	-
VA	4	327	2	1	21	<u>147</u> 3 Permanent Green Flag 16 Green Flag 37 Bronze or Silver	-
DC	3	120	3	0	n/a	<u>5</u> 1 Bronze	-
DE	3	47	1	1	n/a	<u>4</u> 1 Green Flag	-
PA	4	26	1	0	n/a	<u>2</u> No Awards	1
WV	4	31	1	0	n/a	<u>2</u> No Awards	-
NY	3	11	0	0	n/a	0	1
Totals	24	890	21	4	182	296	2

Table 18 is a summary of schools/districts reported achievement in earning various sustainable school recognitions (Eco-Schools USA data was verified via the Eco-Schools website). States that have robust sustainable school recognition programs that predate the US Department of Education Green Schools program (NGRSP) demonstrate significantly more participation and recognition success

(MAEOE Green Schools (MD) and VA Naturally). School districts in Maryland demonstrate the most success in earning sustainability recognitions. The Delaware State Green Schools recognition program has a partnership with a non-profit NGO to help schools earn NGRSP recognitions. Pennsylvania and New York State each had one school district reporting an “other” earned recognition as being EPA’s ENERGY STAR awards. The District of Columbia has a few state level programs in different agencies to support schools in implementing sustainability projects and plans.

Table 19. School District Demographics and Sustainable School Participation

Statistics by State	Number of Districts Interviewed	Total Number of Schools in Districts Interviewed	Total Number of Students in Districts Interviewed	Districts Interviewed with Sustainability Plans/Goals	Districts Interviewed with US DE Green School Recognitions	Districts Interviewed with Other Recognitions	Districts interviewed by State with BMPs Integrated in Curriculum
MD	3	328	249,367	3	3	3	3
VA	4	327	289,000	1	1	4	4
DC	3	120	53,065	1	2	1	2
DE	3	47	30,564	1	1	1	3
PA	4	26	16,194	2	1	1	3
WV	4	31	9,219	1	1	0	4
NY	3	11	4,900	0	0	1	1
Totals	24	890	652,309	38%	38%	46%	83%

The table above (Table 19) compares the size of school districts, the existence of sustainability plans or goals, with their level of success in earning US Department of Education Green Ribbon and other sustainable school recognitions and the integration of BMPs in the curriculum in their district. School district size differed by state, which is important to note as bigger districts tend to have more resources available to support sustainability efforts than smaller districts. Additionally, most schools and school districts reported the integration of BMPs into the curriculum with the exception of New York State. School districts that serve larger student populations demonstrate more success in earning sustainable school recognitions.

Summary of findings: The analysis of school/school district interviews regarding the integration of sustainability plans and goals demonstrated a wide implementation range including a number of variables (staffing, infrastructure, support, oversight, initiatives, funding, partnerships, and motivation). Although a majority of school/districts interviewed (15 of 24, 63%) do not have published or defined sustainability plans or goals, 21 of 24 schools/districts (88%) reported some level of participation in sustainability plans or projects (Table 15) and all 24 school districts demonstrated integration of environmental or sustainability education. Only 9 out of 24 (38%) schools/districts interviewed reported having a published or defined sustainability plan or goal.

A pattern was noted (Table 13) between schools/districts with the staffing and infrastructure in place to advance sustainability plans and initiatives and the success rate in earning sustainable school recognitions (US Department of Education Green Ribbon School or District recognitions, State Sustainability Recognitions, and/or Eco-Schools USA Flags). The ability for school districts to support sustainability goals comes from a combination of factors including: state department of education oversight and initiatives, larger school districts with more staffing and departmental infrastructure, or

internal motivation from staff, supervisors, or district governance oversight. Eight of the nine districts interviewed (89%) who reported having an established sustainability plan or goal had also earned US Department of Education Green Ribbon Schools recognitions. All four (100%) of the school districts with US Department of Education Green Ribbon District recognition had established sustainability plans and a “Fully Integrated” implementation infrastructure (Table 13).

Maryland, Virginia, and the District of Columbia have adopted the most rigorous standards, policies, and programs for advancing the goals of the Chesapeake Bay Watershed Agreement (2014) including Environmental Literacy and water quality, and school districts in these states benefit from the state oversight. These states also had more developed state and county programs to advance watershed management goals through detailed reporting procedures (WIPs) and organized BMP installation and tracking programs. Maryland, Virginia, and the District of Columbia share a similar “county” based school district organizational model that results in larger student populations per district with more divisional oversight. Larger school districts (ex. Maryland and Virginia) were observed to have facilities and construction divisions with civil engineers on staff and “sustainability” divisions charged with developing and implementing “green initiatives” across all schools in the district. Larger “county” based school districts also demonstrated more success in earning sustainable school recognitions as 18 National Green Ribbon Schools (NGRS) were identified in schools/districts interviewed in Maryland, Virginia and the District of Columbia, while only 3 NGRS were found in the schools/districts interviewed in Delaware, Pennsylvania, West Virginia, and New York State combined (Table 18). New York, Pennsylvania, and Delaware have multiple school districts in each county with greater autonomy, less students, and less district level staff to oversee facilities and grounds or implement “green initiatives.” Smaller schools and districts (PA, NY, DE, WV, Independent & Charter Schools) demonstrated greater success towards sustainability initiatives when led by motivated staff, supervisors, or district governance oversight.

Interviewed schools and school districts cited many motivating factors for implementing sustainability plans and projects within their districts (Figure 1). The most common motivating factors included: saving money or energy, meeting building code requirements, developing curricular resources to provide real world opportunities for student learning, and being responsible stewards of the environment. Sustainable school success was defined by the number of recognitions that schools and districts attained, yet only one interview referenced “green ribbon recognition” as a motivating factor for implementing sustainability plans or goals. The motivating factors could be classified as “external” and “intrinsic.” External motivating factors would be those that are imposed by local, state, or federal “codes” and may or may not reflect enthusiasm for sustainability (money/energy savings and building code requirements). Intrinsic motivating factors (environmental stewardship, curricular resource development, restoring wildlife habitat, and developing ethical global citizens) may suggest a higher purpose in implementing sustainability plans and projects such as enlightening future generations, conserving resources, and making a difference in the world.

Encouragement from school districts (or bodies of administrative oversight and leadership) to their schools for participating in the implementation of sustainability plans or projects was found to mirror the motivating factors reported by schools/districts for implementing sustainability initiatives as promotion of sustainable policies and energy savings/conservation as well as the push to integrate sustainability and environmental education within district-wide curriculum were cited most often (7 of 24, 29%). Encouragement to collaborate with local organizations and/or municipal, county, or state level department agencies was another common response. Establishment of a sustainability plan, goal, or policy as well as developing and staffing the departmental infrastructure were also often mentioned

as examples of ways that school district or administrative leadership encourage schools to participate in implementing sustainability plans and projects (Table 16). Three of the four schools/districts that reported no direct encouragement from school district administration towards implementing sustainability plans were in New York State. This highlights a gap found in sustainable school recognitions as there are no schools in New York State located in the Chesapeake Bay Watershed that have earned US Department of Education Green Schools recognitions. None of the schools/districts that were interviewed from New York State have schools registered to participate in the Eco-Schools USA program.

“We have integrated economic, social, and environmental considerations in all our decisions to provide healthy, safe, and sustainable learning and working environments for our students, staff, and communities.”

-Maryland

“INTERVIEWER: Do you have a sustainability plan? And do you want to just give a summary of that?”

Um, yeah. And I think you should find that each school in Maryland will, and possibly in the entire watershed just based on the Bay agreement, which was signed by I believe the six governors and District of Columbia. So they charge us with reporting every two years. And basically they provide the information that creates our sustainability plan. So we actually just submitted the last iteration of that within the last I don't know 45 days.”

-Maryland

“Education is going to be one of the things. That we want the kids all to learn to do the right thing. This includes, we had solar projects and things that we've tried to make that a large part, educational, and then savings would be another thing that we look at that helps the district with savings. And this is always on our mind.”

-New York

“The primary factor is to keep our environment clean, as clean as possible, and being responsible.”

-Virginia

B. BMP Implementation on School Grounds

This section of interview questions addresses the installation of BMPs on school grounds to understand what types of BMPs have been installed, why BMPs are installed, and the factors and motivations involved with installing BMPs on school grounds. The reporting in this section does not follow the original sequence of the interview questions (as listed below) as responses were reorganized and combined in this report to create a more logical flow through the information gathered from schools/districts. Each table and figure title in this section will be followed with a listing of the original interview question(s) structure in parentheses (e.g. Table 28. *BMP Implementation Knowledge Support and Services Summary (B.5, B.5.a, B.5.c)*).

It is important to note that the role of the personnel interviewed at each school or school district was not consistent (e.g. facilities managers vs. teachers vs. administrators, etc.) and answers were affected by the interviewees level of understanding and expertise. Some interviewees were educators who had limited knowledge of BMPs, construction, and maintenance policies and procedures. Others were facilities managers or construction planning/engineering personnel who had limited knowledge of curricular integration.

The types of BMPs installed on school properties could be described as “mandated” or “voluntary.” Mandated BMPs are those that were typically installed to meet building codes or MS4 program goals as dictated by site plan revisions due to new construction or renovations. Voluntary BMP installations were typically not required by any modifications of site plans, and often originated from educators, partner organizations, or district initiatives with curricular goals.

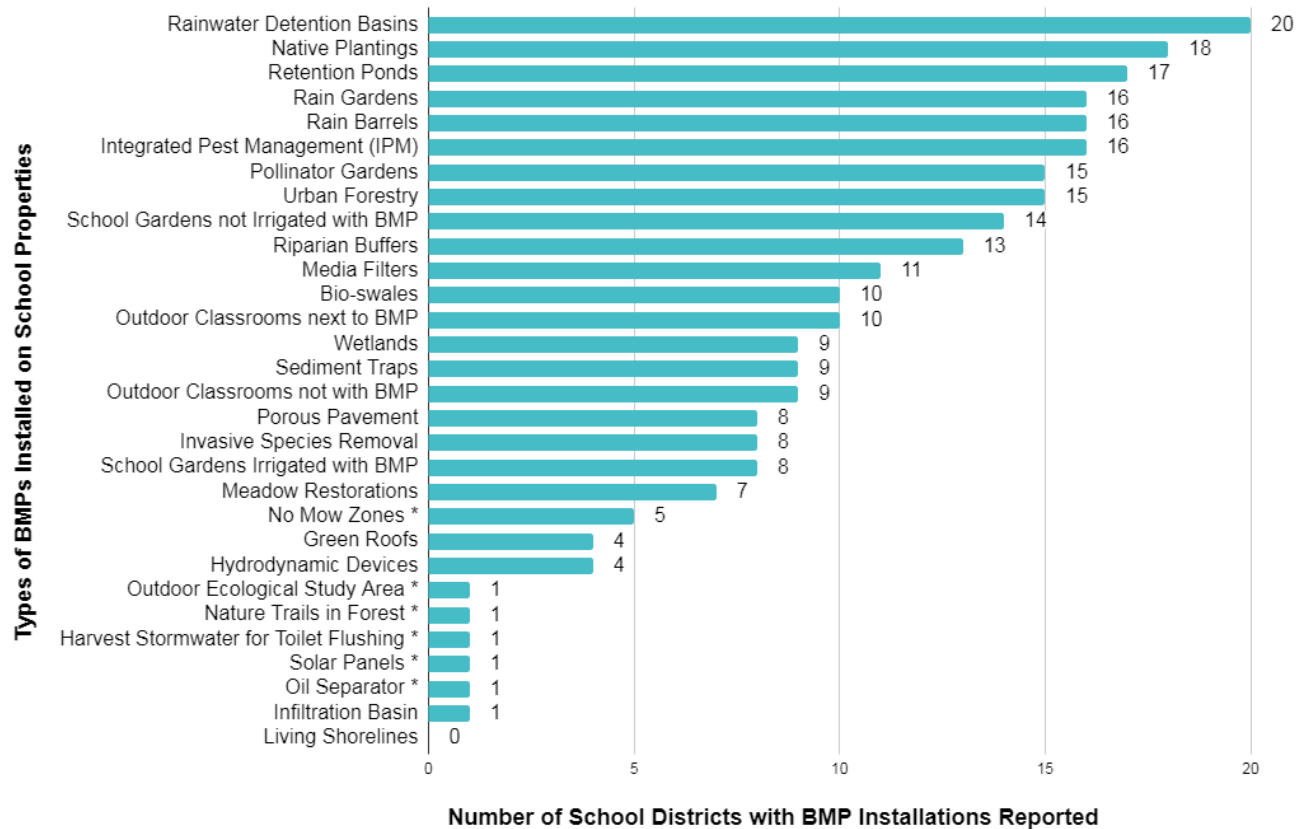
B. Do you have any BMP's installed on school properties in the district?

- | | | |
|--|---|---|
| <input type="checkbox"/> Rainwater Detention Basins | <input type="checkbox"/> Media Filters | <input type="checkbox"/> Porous Pavement |
| <input type="checkbox"/> Retention Ponds | <input type="checkbox"/> Rain Gardens | <input type="checkbox"/> Green Roofs |
| <input type="checkbox"/> Hydrodynamic Devices | <input type="checkbox"/> Wetlands | <input type="checkbox"/> Pollinator Gardens |
| <input type="checkbox"/> Riparian Buffers (tree plantings) | <input type="checkbox"/> Sediment Traps | <input type="checkbox"/> Rain Barrels |
| <input type="checkbox"/> Meadow Restorations | <input type="checkbox"/> Native Plantings | <input type="checkbox"/> Living Shorelines |
| <input type="checkbox"/> Integrated Pest Management (IPM) | <input type="checkbox"/> Invasive species removal | <input type="checkbox"/> Bio-swales |
| <input type="checkbox"/> Urban Forestry (tree planting) | | |
| <input type="checkbox"/> School Gardens if irrigated with water collected in a BMP | | |
| <input type="checkbox"/> Outdoor Classrooms in or next to a BMP for use with watershed lessons | | |

1. Is the installation of BMPs part of your school district's sustainability and/or facilities management plans?
2. Are there any additional BMPs you have considered installing on your school properties?
3. What challenges have you faced with installing BMPs?
4. How do you make decisions about what BMP's to implement?
5. How did you know how to implement the BMP?
 - a. Who provided support in the design and construction of the BMP?
 - b. Did any municipal or community groups assist with the planning or implementation of the BMPs on your school grounds?
 - c. How did you access services to help with design, permits, construction, etc.?
 - d. Who paid for the BMP?

6. How did particular school(s) (instead of another school in the district) get chosen for the BMP implementation?
7. Are your BMPs included in your schools' applications/awards?
8. Does the existence of award programs influence your decision to implement BMPs on school properties?
9. What other environmental improvements to school grounds have you made?

Figure 2. Frequency of BMPs Installed on School Properties (B)



NOTE: Responses with an asterisk (*) indicates the BMP type was not on the list in the provided interview questions and was added by interviewee.

The 24 schools/districts interviewed were asked to identify BMP types that are installed on any of their school properties, and to add any BMP types that did not appear on the interview list (Figure 2). The most common types of “mandated” BMPs installed on school grounds includes: rainwater detention basins, retention ponds, rain gardens, and media filters. The “voluntary” BMPs most often installed include: native plantings, rain barrels, pollinator gardens, urban forestry, and school gardens (with or without being irrigated by a BMP or rain barrel). Rain gardens may be installed as part of construction requirements or through initiatives from educators, staff, or outside agencies in an effort to beautify school property, improve stormwater management, and/or as an educational resource. Eight of the 24 (33.3%) school districts interviewed reported installations of porous pavement on school properties.

Table 20. Installations of BMPs on School Grounds Reported by State (B)

Types of BMPs Installed on School Properties	State Abbreviation (number of schools/districts interviewed)							Totals	% of SD with BMP Type Installed
	DE (3)	DC (3)	MD (3)	NY (3)	PA (4)	VA (4)	WV (4)		
Rainwater Detention Basins	3	2	3	2	4	3	3	20	83%
Native Plantings	3	1	3	1	2	4	4	18	75%
Retention Ponds	3	1	3	2	3	4	1	17	71%
Rain Gardens	3	2	3	-	3	3	2	16	67%
Rain Barrels	3	2	3	-	2	3	3	16	67%
Integrated Pest Management	1	1	3	3	3	2	3	16	67%
Pollinator Gardens	2	2	3	1	2	4	1	15	63%
Urban Forestry	1	2	3	1	3	2	3	15	63%
School Gardens not Irrigated with BMP	1	2	2	1	4	2	2	14	58%
Riparian Buffers	2	1	3	1	1	1	4	13	55%
Media Filters	2	-	2	1	1	4	1	11	46%
Bioswales	3	1	2	-	2	2	-	10	42%
Outdoor Classrooms next to BMP	3	1	3	1	1	1	-	10	42%
Constructed Wetlands	2	-	3	-	-	3	1	9	38%
Sediment Traps	2	-	2	1	1	3	-	9	38%
Outdoor Classrooms not with BMP	-	2	1	-	1	2	3	9	38%
Porous Pavement	-	1	2	-	3	2	-	8	33%
Invasive Species Removal	2	-	3	1	1	1	-	8	33%
School Gardens Irrigated with BMP	2	1	1	-	-	2	2	8	33%
Meadow Restorations	1	1	1	1	2	1	-	7	29%
No Mow Zones *	1	-	2	-	1	1	-	5	21%
Green Roofs	-	1	2	-	1	-	-	4	17%
Hydrodynamic Devices	1	-	1	1	-	1	-	4	17%
Infiltration Basin *	-	-	1	-	-	-	-	1	4%
Nature Trails in Forest *	-	-	-	-	-	1	-	1	4%
Oil Separator *	-	-	1	-	-	-	-	1	4%
Outdoor Ecological Study Area *	-	-	-	-	1	-	-	1	4%
Solar Panels *	-	-	-	1	-	-	-	1	4%
Harvest Stormwater for Toilet Flushing *	-	1	-	-	-	-	-	1	4%
Living Shorelines	-	-	-	-	-	-	-	0	0.00%
Total BMP Types Installed	40	25	56	19	41	52	33	266	

NOTE: Responses with an asterisk (*) indicates the BMP type was not on the original list in the provided interview questions and was added by interviewee.

The inventory of all types of BMPs installed on school grounds at schools/districts interviewed for this report was sorted by individual states and the District of Columbia (Table 20). School districts interviewed in Maryland and Virginia reported the largest number of BMP types installed on school grounds. New York State had the least variety and numbers of BMPs installed on school grounds. One possible explanation for this could be the age of the school sites. Many schools in New York were built before MS4 requirements took effect and site plans have not been updated due to a lack of construction or renovations on school grounds. Most of the states (6 of 7) in the Chesapeake Bay Watershed have state mandated Integrated Pest Management (IPM) regulations or plans required for buildings and school grounds, or they must use certified personnel when spraying pesticides. Not all interviewees were aware of the IPM requirements in their state as only 16 of 24 (66.7%) interviews cited IPM as part of their BMPs on school grounds. Twenty-two of 24 (92%) schools and school districts interviewed reported school gardens installed on some school grounds, although only 8 of 22 (36%) schools/districts reported having school gardens that include irrigation from a BMP (rain barrel or cistern). “No mow zones” were the most cited BMP (5 of 24, 21%) that was not on the interview list. School districts that reported the use of “no mow zones” discussed benefits including reducing personnel time and costs, reducing their carbon footprint, and improving habitat for wildlife.

Table 21. *Installations of BMPs on School Grounds by State Summary (B)*

State (Number of Districts Interviewed)	Total Reported Types of BMPs Installed in Each School District	Average Number of BMP Types Installed / District Interviewed	Total Number of Schools in Districts Interviewed
MD (3)	56	18.67	328
VA (4)	52	13.00	327
PA (4)	41	10.25	26
DE (3)	40	13.33	47
WV (4)	33	8.25	31
DC (3)	25	8.33	120
NY (3)	19	6.33	11

The table above provides a summary of the total BMP types reported by state as installed on school grounds for the schools and school districts interviewed and the average number of BMP types. Maryland and Virginia had the highest average number of BMP types installed per school district interviewed which may reflect the number of schools and size of school properties. West Virginia, the District of Columbia, and New York State had the least variety of BMP types installed on school grounds. Schools in the District of Columbia may have less land and space to work with for installing BMPs due to the urban location.

Table 22. *Summary of BMP Installations as Part of School Districts Plans (B.1)*

BMP Installations Part of Plan	Number of Schools/Districts (n=24)
Yes - Facilities Management Plan (F)	8
Yes - Sustainability & Facilities Plan (S&F)	5
Yes - Sustainability Plan (S)	1
No - Construction or Site Improvement (C)	4
No - Initiative of Individual or Partner (IP)	3
No - Construction or Individual/Partner (C or I)	2
No - School Leases Property (L)	1

School districts were asked if the installation of BMPs is part of the district's sustainability and/or facilities management plan (Table 21), and if installations were not part of the plan what prompts the school district to install BMPs on school grounds (Interview Question B.1). Fourteen of 24 districts interviewed (58%) reported BMP installations were part of their facilities management or sustainability plans.

Table 23. Installation of BMPs as Part of School Districts Plans Responses (B.1)

Location	Yes/No	Response Summary from School Entities in each State
MD	Yes	<ul style="list-style-type: none"> • (S&F) District sustainability program and facilities division collaborate with county program to install BMPs and integrate into curriculum
	Yes	<ul style="list-style-type: none"> • (S) Sustainability plan triggered by construction projects
	Yes	<ul style="list-style-type: none"> • (S&F) Sustainability and facilities management plan driven by renovations, site improvements, or new construction with input from county agency
DE	No	<ul style="list-style-type: none"> • (C) BMP installation driven by construction - requirements to meet building codes with input from state agency
	Yes	<ul style="list-style-type: none"> • (F) Facilities management plan with input from state agency
	Yes	<ul style="list-style-type: none"> • (F) Facilities management plan initiated by construction code requirements, facilities improvements, or individual projects
DC	Yes	<ul style="list-style-type: none"> • (S&F) Triggered by construction projects OR through District partner programs. District initiative/legislation is systematically reviewing all school properties for renovations to earn LEED Gold rating.
	Yes	<ul style="list-style-type: none"> • (F) Site master plan and then staff initiatives
	No	<ul style="list-style-type: none"> • (L) School leases building and is not responsible for grounds or building management
VA	No	<ul style="list-style-type: none"> • (C) BMP installations triggered by construction/renovation projects
	Yes	<ul style="list-style-type: none"> • (F) Facilities management plan OR driven by renovations and renewals
	Yes	<ul style="list-style-type: none"> • (F) Facilities management plan triggered by site renovations/construction and county government program completes periodic inspections and maintenance
PA	No	<ul style="list-style-type: none"> • (IP) School district approached by a conservation district program
	Yes	<ul style="list-style-type: none"> • (S&F) District school board resolution to have all future building projects LEED certified - BMP installations part of LEED certification
	Yes	<ul style="list-style-type: none"> • (F) Facilities management plan - construction projects OR issue mitigation
NY	Yes	<ul style="list-style-type: none"> • (S&F) Sustainability & facilities management plan - initiated by staff to improve conservation and environmental education on school grounds OR construction projects
	Yes	<ul style="list-style-type: none"> • (F) Facilities management plan - maintenance improvements OR construction/renovation projects
	Yes	<ul style="list-style-type: none"> • (F) Facilities management plan - triggered by site improvement or renovations
WV	No	<ul style="list-style-type: none"> • (C or IP) No district policy, district is considering plans in collaboration with Chesapeake Bay partners
	No	<ul style="list-style-type: none"> • (IP) BMP installations derive from curricular initiatives and watershed group partnerships
	No	<ul style="list-style-type: none"> • (IP) BMP installations driven by teacher initiatives
	No	<ul style="list-style-type: none"> • (C or IP) Individual projects OR triggered by construction code requirements

Table 23 provides a review of all responses with regards to BMP installations being part of the school district's sustainability or facilities management plans displayed by each interviewed state plus DC. Five of 7 states (71%) had at least 50% of districts reporting that BMP installations were included in facilities management or sustainability plans. West Virginia and New York State reported the least integration of BMP installations as part of district facilities management plans and attributed the installation of BMPs as a result of constructions or site renovations, or from individual projects initiated by staff or community partnerships. Six of the districts interviewed (25%) reported collaborating with a county or state government program on BMP installations and two of the districts (8%) mentioned collaborating with community or watershed organizations on past or future BMP installation projects.

Table 24. *Site Selection Rationale for BMP Installation Summary (B.6)*

BMP Site Selection Rationale	Number of Schools/Districts (n=24)
Capital Project: Construction / Renovation	18
Teacher/Staff/Student Initiative	10
County/Local Government Program	5
Stormwater/Erosion Issue Mitigation	3
Watershed or Community Group	1

The responses from school districts interviewed for the rationale in selecting the school sites for BMP installations (Table 24) highlights the impact of mandated BMP installations on school grounds. Eighteen of 24 districts (75%) reported that BMP installations on school properties resulted from capital projects (new construction or renovations) on school sites. Ten of 24 districts (42%) reported BMP installations initiated by teacher, staff, or student projects. Five of 24 districts (21%) mentioned county or local government programs as a factor in site selection and instigation for BMP installations.

Table 25. Site Selection Rationale for BMP Installation Responses (B.6)

Location	Response Summary from School Entities in each State
MD	<ul style="list-style-type: none"> Initiated by Construction/Renovation OR In-house Staff/Teacher/Student Project OR County Program [County Agency] maintains a Watershed Health Index - SD refers to agency when choosing a site. If the project is large enough the site plan kicks in regulations for ESD. County takes over maintenance of BMPs and logs the BMPS into their GIS tracking system Teacher/student initiative OR construction/renovation project County government paid a consultant to review all school sites and select sites, designs, and facilities and county pays for installation and school district maintains BMPS OR triggered by construction/renovation projects
DE	<ul style="list-style-type: none"> Construction/Renovation - Increases in student population drives new construction, design team takes over School devised project with principal's support (by Environmental Education Specialist) OR construction/renovation code requirements Construction/Renovation OR Personal Interest Involvement (teacher or parent initiated)
DC	<ul style="list-style-type: none"> Triggered by construction projects OR through District partner programs. District initiative/legislation is systematically reviewing all school properties for renovations with LEED Gold rating. Landlord initiates project OR school asks to install a project Site improvement (renovation) project OR District partner programs
VA	<ul style="list-style-type: none"> Teacher led projects OR renovation/construction project OR issue mitigation Schools selected for installations of BMPs are those sites undergoing renewal and/or expansion projects, those with site improvements such as playgrounds and athletic fields OR sites experiencing other ground disturbances and sites experiencing nonpoint source pollution conditions where meeting or exceeding current code will not otherwise be achieved. Renovation/Construction projects OR county has issue with MS4 and is looking for a space to comply with Chesapeake Bay protection act. School approached by soil and water conservation district program
PA	<ul style="list-style-type: none"> BMP installations triggered by Capital Building Projects Construction projects OR issue mitigation (potential for new MWEE/Student Driven initiatives in watershed unit) Site possibilities by managers or student intern initiated ideas OR through construction/renovation projects Triggered by construction/renovation projects - site improvement plans
NY	<ul style="list-style-type: none"> BMP installation triggered by site renovations/construction BMP installation triggered by site renovation BMP installation triggered by site renovations/construction OR issue mitigation
WV	<ul style="list-style-type: none"> Schools decide themselves to install projects Watershed group invitation based on topography and geography and school decides Self-chosen School secretary applied

Table 25 includes a complete review of all responses given for how school sites are chosen for BMP installations. Only one school district reported BMP installations being initiated by watershed or community groups, although 11 of 24 districts (46%) reported receiving assistance from watershed groups or community organizations and volunteers with the installation of BMPs on school properties (Table 29).

Table 26. BMP Installation Challenges Summary (B.3)

Challenges Installing BMPs	Number of Schools/Districts (n=24)
Funding - Installation	10
Maintenance	8
Poor Installation or Design	6
No Challenges	6
Space for Installation & Student Activities	2
Funding - Maintenance	2
Working with Volunteers / Students	2
Integrating BMPs into Curriculum	2
BMP Installation Creates Security Risk	2
Population Growth Rate - Need for Buildings	1
Design Teams avoid Integrating Learning Spaces	1
Poor Record Keeping	1
Lack of Personnel with Maintenance Expertise	1
Lack of BMP Understanding in Community	1
Site Issues / Stormwater Runoff Volume	1
Time	1

Schools/districts interviewed were asked to name the challenges they faced when installing BMPs on school grounds (Table 26). Funding the initial installation of BMPs (10) and subsequent maintenance (8) were the two most frequently cited challenges. Poor installation or design (6) was mentioned as often as no reported challenges (6). Two interviewees referred to the challenge of balancing space because the installation of BMPs can reduce the usable area for student activities and learning. One interviewee mentioned the lack of consideration for learning spaces by design teams when planning BMPs on school grounds. One school/district reported a lack of understanding the value and purpose of the BMP in the community. Two respondents referred to issues working with volunteers or students, and one of the challenges entailed a contractor that would not warranty the installation of the plants if they did not complete the installation themselves.

“...we were talking about challenges, and... ..what I said was maintenance and the other is conserving open space in our, in our case, open spaces, classroom space outside, you know... ..where can we do our programs. So, you know, there's a lot that goes into that component, and when we eat it [space] up with a BMP, we don't have it so, there's a balance that has to be maintained on school sites.”

-Maryland

“Architects can get away with this feature, which is really cool. Right. But whenever you start talking about outside like, oh, we want to build a cool low deck that goes over a bio retention area, you know, that kind of like, and actually talk about incorporating that into nature, people are like, whoa, we're out of money. So it's a tough sell to do anything extra just for the sake of it outside, in a way that I feel like the architects are encouraged to do inside of the building. So that's been kind of tough.”

-District of Columbia

"In the past we have done small bio retention facilities and gotten the kids out to plant them. We probably are not going to do that moving forward just because when our contractor does it, we get a one year warranty on all plant material. If we let the kids plant it as soon as they touch the plants, the one year warranty goes away. So I'd rather not kind of potentially lose a year's worth of warranty work on potentially thousands of plants."

-Maryland

Table 27. BMP Installation Decision Process Summary (B.4)

BMP Installation Decision Process	Number of Schools/Districts (n=24)
Building requirements by local, county, or state codes	13
Consultant - Design team recommendations (architectural/civil engineers)	10
School District Staff (civil engineers, construction division, maintenance)	5
Site issue/needs to improve stormwater management	5
Create learning space/curriculum connection	4
Cost/Funding	4
Tax/Wetland Credits	2
Balance between Space for Installation & Student Activities	2
County stormwater/watershed program	2
Maintenance concerns (minimizing liability)	2
Student input	2
Space	1
LEED certification points	1
BMP Installation Creates Security Risk	1
BMP Installation Creates Security Haven	1
Personal experience/knowledge	1
Teacher/Staff led initiative	1
Conservation district grant program	1
Landlord decision	1

Table 27 summarizes the rationale given for how schools/districts make decisions about what BMPs to implement on school grounds (B.4). Thirteen of 24 school districts (54%) cited following building requirements imposed by local, county, or state codes as a determining factor in deciding which BMPs to implement on school grounds. Recommendations of civil engineers or architects factored in 15 of 24 responses (63%) whether this is from in-house staff (construction division or facilities/maintenance personnel), or from design teams contracted to plan capital improvement projects. Two school districts (8%) referenced the role of tax or wetland credit programs as a factor in the BMP installation decision process. Security issues stood out as an interesting response to challenges with installing BMPs as well as in making decisions about what BMPs to implement on school grounds. One school district reported having to remove a BMP installation due to a security risk posed by tall plants that might provide a place for would-be attackers to hide when approaching the school. This response was countered by another district who described installing trees to provide a place for students to hide in case the school was attacked.

"I don't know if you'll hear from other people about, recently, with some of the garden type things, native plantings, and, and other gardens, is security. We've had gardens taken down because they were "security risks" because potential bad persons could hide in them. So it's all about line of sight and making sure the perimeter of the school is very safe and secure. And no one could sneak up onto the school property."

-Maryland

"For two reasons [we are planting trees] and in two places on our campus. One between the middle school and high school. We have adjoining campuses to the east, and then our southern exposure is a drop off into a shallow valley. And so we're going to be doing some things out there. There are also, it sounds a little gory, but one of the things that we do in drastic emergencies. If we should ever have to evacuate the building for violence, we need a place for kids to hide. So we've asked for some conifers that will allow us to provide a place for children to go if we should ever need that. Horrendous to think about, but that's 2019."

-West Virginia

Table 28. BMP Implementation Knowledge Support and Services Summary (B.5, B.5.a, B.5.c)

BMP Implementation Support Category	BMP Implementation Knowledge	Who Provided Support in Design and Construction of BMP	How Do You Access Services to Help With Design, Permits & Construction?
Consultants/Design Group (Architectural/Civil Engineers and/or Construction Project Managers)	16	17	16
School District Engineering or Construction Department	9	4	5
District Staff with Professional Knowledge/Experience	6	3	3
County or State Agency	8	5	7
Local/Municipal or County Code and Zoning Review	5	-	1
Federal Agency	1	-	1
Conservation District	2	1	1
Watershed Group Collaboration	1	1	1
Project / Construction Manager	-	2	2
Construction Contractors	-	-	13
Trial and Error	1	-	1
Community Volunteers	-	-	1
School Staff & Students	-	1	1
Extension Office	-	-	1
Trainings / Conferences	2	-	-
Research	1	-	-

Table 28 provides a summary of the responses given to three of the interview questions (B5, B5.a, and B5.c). These responses were consolidated into one table due to the overlap of answers given with regards to the BMP implementation knowledge. Most schools/districts interviewed (16 of 24, 67%) hire consultants or design groups to facilitate the development of site plans for capital improvement projects (new constructions and renovations on existing buildings or grounds). Some schools/districts have in-house construction or facilities divisions with civil engineers on staff (9 of 24, 38%), and 5 out of 9 of these (56%) still hire outside consultants to support the design and construction of BMPs on school grounds. In some instances, BMP installations were completed in-house where projects were small enough that a site plan revision was not required and the school district had trained and knowledgeable personnel on staff. Other examples include in-house staff planning and guiding the design of small

BMP projects with actual construction being bid out to contractors. Most schools/districts access services from consultants or project managers to help with design, permits & construction (16 of 24, 67%), and use contractors to install the BMPs (13 of 24, 54%).

Table 29. Municipal/Community Assistance With BMP Implementations (B.5.b)

Did Municipal or Community Groups Assist with Planning or Implementation of BMPs on School Grounds?	Number of Schools/Districts (n=24)
County Agency / Environmental Program (g)	6
Watershed/River Organization (v)	6
Community Volunteers / Organization (v)	5
Municipal/Township Office/Program (g)	4
PTO / PTA / Parent Volunteers (v)	4
State Agency (g)	3
Federal Agency (g)	2
Conservation District (g)	2
Extension Office / Master Gardeners (v)	2
No Assistance from Outside Groups	2
School Clubs / Classes	2
Chesapeake Bay Foundation (v)	1
Scouting Groups (v)	1
Total	40
Government (g)	17
Volunteer (v)	19

Interviewed schools/districts were asked if any municipal or community groups assisted with the planning or implementation of BMPs on school grounds (Table 29). County agencies or environmental programs and watershed/river organizations were cited most often as assisting schools/districts with BMP implementation projects (6 of 24 responses each, 25%). Community volunteers or organizations were identified as providing assistance by 5 of 24 schools/districts interviewed (21%). The responses were further categorized as being either government entities (g) or volunteer organizations or groups (v). Government entities were reported in 17 of 40 responses (43%) while volunteer organizations were mentioned in 19 of 40 responses (48%). Many school districts are eager to take advantage of opportunities to collaborate with partners (county or state agencies, community groups, and watershed organizations) to further sustainability projects and provide educational opportunities for their students.

"People in the town... helped us as far as the town... tree project. We've had people from master gardeners help us. We've had people from... [county extension offices]. We've had local growers, we've had people that worked with forestation projects as far as working with state or government agencies, so we just pull in resources from where ever, and if somebody pops up and says, I know something about it, the first thing I do is ask for their phone number and email. So, we pull people in."

-West Virginia

Table 30. BMP Installation Funding Responses (B.5.c)

Who Pays for BMP Installations	Number of Schools/Districts (n=24)
School District / Capital Project Budget	20
Watershed/Community Grants	6
County/Local Government Program	4
Federal Grant	2
Conservation District Grant	1

Table 30 lists the funding sources for BMP installations as reported by the schools/districts interviewed. School district funds or capital project budgets were cited most often as the source for funding (20 of 24, 83%). This corresponds with earlier reported findings as 75% of schools/districts reported that BMP installations on school properties resulted from capital projects (new construction or renovations) on school sites. Watershed or community grants were mentioned by six of the 24 schools/districts (25%), and county or local government programs were cited in four of the 24 interviews (17%). The Conservation District Grant was not included in the county/local government program because this was a one-time special grant opportunity, whereas the county/local programs are on-going. One of the responses described a funding format where the county government pays for the design and installation of BMPs on school grounds and the school district is responsible for maintenance.

Table 31. BMPs Included in Sustainable School Applications or Awards (B.7)

Are BMPs Included in Applications/Awards	Number of Schools/Districts (n=24)
Yes	11
No	13

Schools/districts were asked if BMPs are included in their sustainable school recognition applications or awards (Table 31). Sustainable school recognitions include: US Department of Education Green Ribbon Schools, state green ribbon or sustainable school programs, or Eco-Schools USA Flag awards. Twelve of 24 schools/districts (50%) interviewed had earned some sustainable school recognitions (not including EPA ENERGY STAR). Ten of the 12 schools with recognitions (83%) reported including BMPs in their applications or awards. One of the school districts responding “Yes” in this table included BMPs in the application but had not earned any awards to date.

Table 32. Award Program Influence on Decisions to Install BMPs Summary (B.8)

Do Sustainability Award Programs Influence the Installation of BMPs on School Grounds	Number of Schools/Districts (n=24)
Yes	6
Probably/Possibly	3
No - Influenced Other Changes	1
No	14

Schools/districts were asked if the existence of sustainability award programs has an influence on the school/district's decision to install BMPs on school properties (Table 32). Six of 24 schools/districts (25%) stated that award programs did influence their decision to install BMPs on school grounds, and three of 24 schools/districts (13%) said that the existence of award programs could possibly or probably influence their decision to install BMPs. Notably, five of the nine schools who reported either a probable/possible or affirmative influence on BMP installations from award programs have not applied for, or earned, sustainable school recognitions (indicated with an asterisk (*) in Table 32 below). Fifteen of 24 (63%) responded that the existence of award programs had no influence on the installation of BMPs on school properties. One school/district reported that completing the award program application influenced other changes to their building management, specifically towards improving indoor air quality.

"No, I mean BMPs and there were things, like some of the stuff, we already did that. I can give you an example of something that we started to do because of the grant. And that was, we moved our HVAC filters from like MERV nine which is, you know, pretty okay level filter to MERV 13. MERV is the filter rating for HVAC filters. We went to MERV 13 which is among the strongest, if not the strongest filter you can use. And, those are the filters, they use in hospitals, you know, so it's a hospital grade filter so we're able to really get out most of the pollutant allergens from the area. We weren't doing that until we filled out the green ribbon application and we continue to use MERV 13 still."

-District of Columbia

Table 33. Responses to BMPs Inclusion in Award Applications and Influence of Award Programs on BMP Installations on School Grounds (A.3, B.7, B.8, B., & D.2)

Interviews by State	School/District Earned Sustainable School Recognition	BMPs Included in Sustainable Schools Applications and Awards	Award Program Influence on BMP Installations	BMPs Installed on School Properties	BMPs Integrated into Curriculum
DC	Yes	Yes	No	Yes	Yes
	Yes	Yes	No, influenced other changes	Yes	Yes
	No	No	No	No	No
DE	No	No	No	Yes	Yes
	Yes	Yes	Yes - to get more funding	Yes	Yes
	No	Yes	No	Yes	Yes
MD	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes
NY	No	No	Possibly, Interview Planted Seed*	Yes	No
	No	No	Probably*	Yes	No
	No	No	Yes*	Yes	No
PA	Yes	Yes	No	Yes	Yes
	No	No	No	Yes	Yes
	No	No	Yes*	Yes	Yes
	No	No	Could help, probably*	Yes	No
VA	Yes	Yes	No	Yes	Yes
	Yes	Yes	No	Yes	Yes
	Yes	No	No	Yes	Yes
	Yes	No	No	Yes	Yes
WV	Yes	Yes	No	Yes	Yes
	No	No	No	Yes	Yes
	No	No	No	Yes	No
	No	No	No	Yes	Yes
Total Yes Responses (n=24)	12	11	6	23	18

NOTE: Responses indicated with an asterisk (*) came from schools/districts that have not applied for, or earned, sustainable school recognitions.

Table 33 provides a complete review of the answers given to questions related to the impact of sustainable school award programs on the decisions of schools/districts to install BMPs on school grounds. This table includes the responses for the following interview questions: A.3 (have you earned any sustainable school recognitions?), B.7 (are BMPs included in your award applications?), B.8 (did the existence of award programs influence the decision to install BMPs?), B (are there any BMPs

installed on school grounds?), and D.2 (do your schools integrate BMPs into the curriculum?). Every school/district (11 of 11, 100%) that included BMPs in their sustainable school recognition applications reported having BMPs installed on school grounds and integrating BMPs into their curriculum. Four of the ten schools/districts (40%) that have earned sustainable school recognitions and included BMPs in their applications reported that the existence of award programs influenced their decision to install BMPs on school grounds. Whereas a majority of the schools (60%) with awards that included BMPs in their applications said award programs did not influence their decision to install BMPs on school grounds. The sample of responses below, given when schools/districts were asked if the existence of award programs influence their decision to implement BMPs on school properties, are listed as the responses were classified.

Responses Classified as “Possibly” Influencing BMP Installation Decisions. Three of 24 schools/districts (13%) stated that the existence of award programs could possibly or probably influence their decision to install BMPs on school properties. One school district responded that participating in this research interview and becoming aware of sustainable school award programs is “planting the seed” for their district to consider BMP installations as educational resources and may influence future decisions with property management and curriculum planning.

“I mean, I don’t know. I mean, I, the fact that you’re raising these questions with us and we’re starting a new project is planting that seed. So I don’t know. I mean, obviously this. Well, I was just thinking this whole list of things will be on our mind when moving forward.”

-New York

Responses Classified as “No” Influence on BMP Installation Decisions. Fifteen of 24 schools/districts (62.5%) reported that the existence of award programs had no influence on their decisions to install BMPs on school properties.

“I say awards, no. I would say, now I think things could be different if we had if there were grants or startup money somewhere when we were building these schools to be able to say, hey, we really like you to put in a pollinator garden and here’s a grant that can be part of it since you’ve got this new school wouldn’t it be great too. I think our community and our school district would be open to things like that”

-Delaware

“Not so much. I mean it’s great that those organizations are out there, but I’ve done LEED buildings in the past and that’s gotten more of a struggle I think to accomplish that, and especially in a school. And if you get to the point where you’re actually buying credits, it’s not worth it. So, I think we can do the best thing with the tax dollars we have and we can implement those methodologies and work in all that into the project, but we don’t necessarily have to have a plaque on the wall.”

-Pennsylvania

“I would say no. It’s not the awards, but it’s the you know situations and the opportunities to improve the environmental footprint of the school district.”

-Virginia

Responses Classified as “Yes” Existence of Award Programs Influenced BMP

Installation Decisions. Six of 24 schools/districts (25%) responded that the existence of award programs did influence their decision to install BMPs on school properties. One of these respondents mentioned the ability to bring in more money through grants and awards by highlighting the sustainability recognitions they have earned.

INTERVIEWEE: “Yes, to some extent.”

INTERVIEWER: “But it's not the real motivation?”

INTERVIEWEE: “Of course not... I mean, I will say the connection there would be yes... ..we wanted the Green Ribbon because it is a great thing to have, because then you can use that from the US Department of Education Department of Ed to go and get grants. So, indirectly, yes, we want that because we want more money. Because you can't build what we're really trying to build up and the kids have envisioned and what's going to happen without you know without a flow of funding, right. So, you know, getting those recognitions does help build the program. Recognitions, whether it be, you know, something that I got or a teacher got or whatever, we want to build that kind of presence so that the kids are going to get something really remarkable as we develop the program.”

-Delaware

“Yes, to some extent, like, as I said, those four teachers... ..have been assigned... ..between seven to 10 schools, and their principal has given them the charge that... ..every school in the county hold green school status through [State Sustainable Schools Program]. So as a result, they'll approach the principal or the school improvement team or someone and say, hey, are you interested in trying to become a green school. And of course, if they say yes, then looking at the application... ..We have to accomplish... ..seven criteria for [State Sustainable Schools Program] to become a green school and one of those involves BMPs.”

-Maryland

“I would say absolutely. A huge thing with [our district] is appearance, but we really like to be the model of things. So, for example, a lot of native flower and plant people come to [a school], to even hold workshops, because of our meadows, because they're just really good, and so that's important. So if we were to gain notoriety for something, I know that would be a positive thing.”

-Pennsylvania

Table 34. Additional Environmental Improvements on School Grounds (B.9)

Additional Environmental Improvements on School Properties	Number of Schools/Districts (n=24)
Renewable Energy (Solar, Wind, Geothermal)	7
Lighting Efficiency Upgrades or Switches	5
High Tunnels/Greenhouse/Garden	4
Energy Efficient Heating/Cooling or Boilers	3
Outdoor Classrooms	3
Trails, Bridges, Play Areas	3
Oil Separator	2
Urban Forestry - Permaculture	2
Installing Bicycle Lanes/Racks	2
Water Bottle Refilling Stations	1
Roof Coatings (Energy Savings)	1
Removal of Petroleum Storage	1
Purchase Renewable Energy	1
Install Low-Flow Toilets	1
No-Idle Zone	1

Schools/districts were asked if any additional environmental improvements have been made to their school grounds (Table 34). Energy efficiency upgrades (combining lighting and switches with heating/cooling and boilers) were reported by 9 of 24 schools/districts (38%). Renewable energy installations were cited by 7 of 24 schools/districts (29%). In many cases these are energy generating installations. One school district reported the construction of a separate classroom structure that modeled renewable energy systems including geothermal, solar, and winds although the size of these systems were for demonstration purposes only and did not contribute significantly to energy efficiency or supply for the site or district.

Summary of findings: As reported by schools/districts interviewed, the installation of BMPs on school properties are initiated most often by construction or renovation projects on school grounds that require site plan revisions and code compliance (75%), or through a curriculum initiative connected to learning goals (42%) driven by a motivated educator (teacher or curriculum specialist) with or without student input or assistance. Less often the installation of BMPs on school properties results from county or local government programs to help meet MS4 requirements (21%), remediation of a stormwater or erosion site issue (13%), or an outside agency or watershed group brings forward a project proposal with funding (4%). Schools could benefit from more municipal, county, or state based agencies providing opportunities to install BMPs on school grounds that would help municipalities meet MS4 requirements and help schools connect BMPs installations with the curriculum. Outside agencies or watershed groups could provide a critical link between programs for BMP installations and integrating BMPs into the curriculum.

Capital projects that include site plan revisions (new construction or renovations) lead to installation of more “structural” BMPs (rainwater detention basins, retention ponds, rain gardens, media

filters, and bioswales). Most schools/districts hire consulting/design groups to provide the BMP implementation knowledge and provide support in the design and construction of the BMPs on school grounds. Most hire contractors to install BMPs during site renovations and new construction projects, and hire a consultant to oversee construction projects. Individual projects by teachers more often resulted in BMP installations with less requirement of underlying infrastructure (native plantings, rain barrels, pollinator gardens, school gardens, and rain gardens).

School districts interviewed in Maryland and Virginia had the largest number of BMP types installed on school grounds, demonstrated the most support from county programs to facilitate BMP installations, and were most successful in earning sustainable school recognitions from the US Department of Education, state programs, and NWF's Eco-Schools USA. School districts in Maryland and Virginia are also county-based larger districts with more organizational infrastructure and staffing to support BMP implementation on school properties and integration into curriculum. An emerging trend found when interviewing facilities managers is the implementation of "No-Mow Zones" as these reduce maintenance workload and costs, although this may require a "re-education" of the public to understand the purpose and value for stormwater control and wildlife habitat. One way this BMP could be supported is with an education campaign and making signage available to schools and districts to be installed in these areas and help educate the community at large about this best management practice and the benefits to the community and wildlife. Many school districts are eager to take advantage of opportunities to collaborate with partners to further sustainability projects and provide educational opportunities for their students.

"People in the town... helped us as far as the town... tree project. We've had people from master gardeners help us. We've had people from... [county extension offices]. We've had local growers, we've had people that worked with forestation projects as far as working with state or government agencies, so we just pull in resources from where ever, and if somebody pops up and says, I know something about it, the first thing I do is ask for their phone number and email. So, we pull people in."

-West Virginia

C. Maintenance of BMPs on School Grounds

This section of the interview questions sought to understand how schools/districts handle the maintenance of BMPs on school grounds, the challenges they face with BMP maintenance, and if the BMP installations meet expectations. As noted in Section B, BMP installations tend to concentrate into two categories: “mandated” installations resulting from site improvements (renovations or new construction) which must meet building codes and standards, and “voluntary” installations that were not mandated and often the result of motivated staff (educator or administrator) or through partner organizations or agencies. The maintenance that results from these different types of projects often affected the answers given by the interviewees. The position of the personnel interviewed (facilities manager, administrator, curriculum specialist, sustainability coordinator, or teacher) also affected the responses provided.

C. How are the BMPs on your school property maintained?

1. Is the upkeep of BMPs part of your school sustainability and/or maintenance plans?
 - a. Who maintains the BMP? Faculty, staff, students?
2. What challenges have you faced with the maintenance of your BMPs?
3. Are you pleased with the final result of your installed BMPs? Does it meet your desired outcomes? If so, please list examples. (Examples: student learning goals, meeting MS4 stormwater requirements for their local area, addressing an area of their schoolyard that is always wet and unusable for other activities, etc.)

Table 35. *BMP Maintenance Included in Sustainability/Maintenance Plan Summary (C.1)*

Part of Plan	DC	DE	MD	NY	PA	VA	WV	Total (n=24)
YES	M	M	M, M	M	S/M, M, U, U	-	-	9
NO	Landlord	-	-	-	-	1	3	5
Undefined	1	2	1	2	-	3	1	10

*NOTE: Plan types in the table above are indicated with an **M** for maintenance, **S** for sustainability, and **U** if the interviewee indicated yes but the plan type was undefined.*

Schools/districts were asked if BMP maintenance was included in their sustainability and/or maintenance plans (Table 35). Many interviewees were vague in their responses to this question. Nine of 24 schools/districts (38%) reported including BMP maintenance in their district’s plans, and seven of these identified the plan type in which BMP maintenance is included. Five of 24 schools/districts (21%) interviewed responded that BMP maintenance is not included in their sustainability or maintenance plans, and 10 of 24 (42%) responded with an undefined answer or did not answer the question. One interviewee described a division of BMP maintenance responsibilities and plan inclusion as some BMPs are installed and maintained by the sustainability team while other BMPs are part of the facilities team’s responsibilities.

“It is not part of our plans. It’s individuals and volunteers.”
-West Virginia

"We maintain those with our ground staff. It is part of our maintenance plan. I have three gentlemen on my grounds crew that maintain those, make sure that inlets are clear, outlets are clear, you know. Our one township actually comes around and does inspections. In some cases we may have to go and remove some invasive species that have cropped up."

-Pennsylvania

Table 36. *Who Maintains BMPs on School Grounds Responses (C.1.a)*

Who Maintains BMP Installations	Number of Schools/Districts (n=24)
SD Facilities/Maintenance Staff	20
Teachers and/or Students	14
Funding Reduced or Removed	4
Contracted Company	4
Parent/Community Volunteers	4
Watershed/Community BMP Project Partners	4
County/Local Government Program	2
Individual School Administrator	1
State Agency Assistance	1
Landlord	1

Schools/districts were asked to explain who maintains the BMPs on school properties (Table 36). Many interviewees discussed a separation between mandated BMP installations (associated with site improvements to meet code requirements) and curriculum based "volunteer" BMP installations (school gardens, pollinator gardens, community organization BMP installation projects). Twenty of 24 schools/districts (83%) reported BMP maintenance is completed by facilities management staff. Fourteen of 24 schools/districts (58%) cited teacher and student involvement in maintaining BMPs. Four schools/districts (17%) mentioned a reduction or elimination of budget funding for school grounds maintenance that shifted responsibilities and created a challenge for maintaining BMPs. In one of these schools/districts the principal of the school reported that he maintains the BMPs personally due to funding cuts. Four of 24 schools/districts (17%) stated that contracted landscape or BMP maintenance companies are involved with BMP maintenance on school grounds, especially if vegetation overgrowth occurs or for more technical maintenance. Parent and community volunteers were cited in maintaining garden projects by four schools/districts (17% of responses). Two schools/districts (one each in MD and VA) stated that county agencies maintain BMPs on school grounds, and two schools/districts (one each in MD and PA) mentioned BMP inspections by county or township personnel. Assistance with BMP maintenance by project partners (watershed groups or community organizations) was cited in four interviews, especially when caring for initial BMP installations during the summers when school is out of session. One school/district, partners with a state agency to complete annual meadow burning as the agency uses this site for training purposes.

"BMPs are maintained by the county [agency]. So that's basically the county has a big maintenance group that maintains county properties. And so what they do is, there will be periodic inspections of the BMPs as required for whatever regulation, they will inspect them and if they need to be modified or replaced, they are in charge of that. So the county funds the school districts, and the county maintains the school districts BMPs."

-Virginia

"I [School Principal] do most of the maintenance. In the past, we have had custodians do that. That role has been taken away from the maintenance department because of decreased funding. So we have fewer maintenance dollars available and fewer maintenance personnel. I do most of the upkeep now and then we do classwork. There are times when we have classes to do some of the project's themselves. Moving materials, moving the trees for the [watershed group] project, irrigation, those types of things. So the kids do that as a part of the whole program."

-West Virginia

INTERVIEWEE: "We don't have anyone who's in charge of the grounds."

INTERVIEWEE: "How do they [the BMPs] get maintained?"

INTERVIEWEE: "PTO, staff volunteering, we even have community people like [local bank], come in during the summer and they do one school a year. So, we have eight schools in the county and so one school a year they will do a project over the summer to maintain, but that's it."

INTERVIEWER: "So is the upkeep of BMPs part of your school sustainability or maintenance plan and who maintains them?"

INTERVIEWEE: "It is not part of our plans. It's individuals and volunteers."

-West Virginia

"The maintenance is performed by the [district's] grounds department. And sometimes we often ask teachers and students and volunteers to maintain the gardens that they put in that they install for various groups. It could be the scouts could be the PTA could be the gifted and talented program because it's, you know, we feel as part of the environment, it's a service kind of, they get experience from putting it in, a good experience from maintenance. I would say most of the maintenance is performed by our department. And if there's something we cannot do. I don't usually go in the underground storage because of confined space and it's just a hassle and we do contract repairs out."

-Maryland

Table 37. BMP Maintenance Challenges Responses and Summary (C.2)

BMP Maintenance Challenges	DC	DE	MD	NY	PA	VA	WV	Total
Time/Funding Personnel	-	2	2	1	2	3	2	12
Knowledgeable/Trained Staff	2	2	2	-	2	1	2	11
Conditions - Too wet, Slopes	-	1		-	2	1	-	4
Teacher Commitment Fades or Job Change	-	2	2	-	-	-	-	4
New Technology or Materials Issues	1	-	-	1	-	1	1	4
Delegation or Communication Issues	1	1	-	-	-	1	-	3
No Challenges Reported	-	-	-	2	1	-	-	3
Lack of Proper Equipment	-	1	-	-	-	1	-	2
Public/Educator/Student Understanding	1	-	-	-	1	-	-	2
Damage from Wildlife	-	-	-	1	1	-	-	2
Weeds / Invasive Plants	1	-	-	-	-	-	-	1
Plants installed in poor location	-	-	-	-	-	-	1	1
Access Limited for Students & Teachers	1	-	-	-	-	-	-	1
Insufficient Organization of Volunteers	-	1	-	-	-	-	-	1
Lack of Standardized Signage Communication and Education Tools	1	-	-	-	-	-	-	1
Total # of schools/districts who responded	8	10	6	5	9	8	6	52

Table 37 catalogs all of the responses given by schools/districts for the challenges with BMP maintenance on school grounds separated by each state and DC. Half of the schools/districts (12 of 24, 50%) reported time or funding of personnel as the biggest challenge. Most school properties are maintained by district staff and the responsibilities of the personnel are numerous. BMP maintenance was often mentioned as being lower on the priority list. Lack of knowledgeable and/or trained staff was the second most often cited challenge with BMP maintenance (11 of 24 responses, 46%). Some schools/districts reported situations where a knowledgeable staff member was involved with the BMP project installation and maintenance and then left their position leaving the school without personnel to take over the project. Site conditions at schools (slopes or wet ground) and changes in BMP technology or materials were both cited as maintenance challenges by four schools/districts (17%). BMP installations in urban settings can create safety hazards and are surrounded by fencing to prevent issues. The fenced BMPs create a barrier preventing teachers and students from accessing the BMP to complete maintenance (and interact in learning opportunities). One school/district discussed a lack of understanding in the community with “low or no mow grasses” as a maintenance challenge.

“We have had issues with low or no mow grasses. And just public understanding of you know what they're intended to do, and basically getting calls. Like, why aren't you cutting your grass? And educating staff where they are to cut and where they are not to cut. So I think that's probably been our biggest challenge.”

-Pennsylvania

“Well, it has been an area of either funding, funding the maintenance, because we don't receive any additional funding so many of the BMPs that have been installed are additional workload for the department and... ..from a manpower standpoint... ..that can be a challenge, depending on the nature of the BMP.”

-Virginia

“So BMPs for the most part, they don't need a ton of maintenance right but they need some and so, and when they're on schoolyards we actually do usually fence them off a little bit. They'll be integrated into the fencing, they will have a gate, but we don't want kids just wandering in them. It's a supervision thing... ...Like when you see a bunch of trash blocking that, you know, or downed trees or whatever blocking that drain, you should totally want to climb down there and pull that stuff out right on top of everything is what they have to do. It's kind of a tough sell. And they're not supposed to go down there. Yeah, they're not allowed there.”

-District of Columbia

Table 38. BMP Installation Outcomes Summary (C.3)

Responses	Number of Schools/Districts (n=24)	Rationale Given
Yes - Pleased	19	
No	1	Not sure of educational impact
Mixed	2	Construction issues, negative feedback, bee stings Some BMPs create maintenance / equipment issue
Other Comments	<ul style="list-style-type: none"> ● Improved institutional understanding of BMPs ● Integration into curriculum is not fully systematized yet ● Tweaking for efficiency and increased implementation in learning opportunities ● Prefer more rain gardens and less ponds ● Enabling us to meet the MS4 permitting for one thing, reducing or eliminating community complaints about pollution runoff. ● There's always room for more [improvement] 	

Table 38 summarizes the responses given when asked if the school/district is pleased with the final result of the BMP installations on their school grounds. Most schools/districts (19 of 24, 79%) reported being satisfied with BMP installations on their school grounds. One school/district reported not being satisfied with BMP installation due to not knowing the educational impact of integrating a school garden irrigated with a rain barrel in student learning opportunities. Two of 24 schools/districts (8%) cited mixed feelings about their BMP installations because of construction issues, negative feedback, creating bee sting hazards, and creating maintenance issues due to a lack of proper equipment. Two of the schools/districts interviewed did not address this question.

“So far as I know, they [BMPs] are not meeting [desired outcomes]. Like I was looking for a curriculum outcome. And I wasn't sure because, of course, I'm starting with five year olds. I don't know if or when they get it. I don't know how to find out. Yeah, you know, how it plays out.”

-West Virginia

“You know, usually yes if there's a problem with [a BMP] because there was a construction issue or something that can be corrected, and usually does get corrected before we accept it. But otherwise, yeah. I mean, you know, everybody enjoys these natural areas for the most part. You know, we do have some issues with bee stings and that kind of stuff from our pollinator garden but you know it's one of those things you have to explain to them is like, well, when you attract pollinators you attract all pollinators.”

-Maryland

Table 39. BMP Installation Goals Responses and Summary (C.3)

BMP Outcome Goals	DC	DE	MD	NY	PA	VA	WV	Number of Schools/Districts (n=24)
Meeting MS4 / building code Requirements	1	3	3	3	4	3	1	17
Student Learning Goals	1	2	3	1	3	2	4	16
Improving Stormwater Management / Addressing a Grounds Issue	2	1	2	3	2	3	2	15
Improved Outdoor Spaces/Habitat	1	2	3	1	1	1	3	12
Reducing Environmental Impact/Footprint	1	1	1	-	1	1	1	6
Benefit to Community	1	1	-	-	1	1	1	5
Reducing Grounds Management Workload	-	1	1	-	-	-	-	2
Avoid bad press / reducing complaints	-	-	-	-	1	1	-	2
Helps Meet Green School Recognition Requirements	-	-	2	-	-	-	-	2
Addressing an insect issue	-	1	-	-	-	-	-	1

Schools/districts were asked which desired outcomes were met by the installation of BMPs on school properties and responses were sorted by each state and DC (Table 39). Meeting MS4 goals and building code requirements was the most frequently reported outcome by schools/districts (17 of 24, 72%), followed by meeting student learning goals (16 of 24, 67%). Improving stormwater management or addressing a grounds issue was cited by 15 of 24 schools/districts (63%) as a desired outcome and 12 of 24 schools/districts (50%) mentioned improving outdoor spaces and habitats on school grounds. One third of schools/districts (6 of 24) discussed reducing their environmental impact or footprint as an outcome of BMP installations, and five of 24 (21%) cited BMP installations were a benefit to the community. Only two of 24 schools/districts (8%), both in Maryland, discussed how BMP installations helped meet requirements for sustainable/green schools recognition awards. Avoiding bad press and reducing workload on grounds maintenance staff were also cited by two schools/districts.

INTERVIEWEE: "I would say yes. We had a situation at our high school where, and this was prior to a detention basin being installed, I called it a retention basin, but it's almost more of a rain garden when you really look at it, just a large rain garden. Prior to that, I had actually seen water going out on the road in heavy storms. I mean, several inches high. And that's a major impact on the neighborhood across the street and their backyards were getting flooded. Since we've had that basin installed, and it's gotten into its full growth, we haven't had that issue. So yeah, I'm definitely pleased with how they're working."

INTERVIEWER: "And would you say that that's mostly just your interest in trying to maintain or minimize impacts on your neighbors or were there MS4 requirements that you were addressing?"

INTERVIEWEE: "No we weren't necessarily meeting MS4. I mean, there were township requirements too for us to make the basin as large as it was, and everything, but the fact that we were able to minimize what's going on with the neighbors across the road was huge. Less phone calls is not a bad thing. Yup. Stay out of the newspaper."

-Pennsylvania

"Yeah. Anytime they fail, it's typically a man-made problem like plowing a bunch of snow and sand into a bio retention area, you know, that's created by our maintenance folks, but other than that I don't see any issue. I think they work as they're supposed to."

-Virginia

"Results are never final. They are ongoing. That is a part of sustainability. And so as the campus changes and needs change. For instance, we were talking earlier about eradication of invasive species, it's at a point now where I really feel that there are so many invasive species that they are impacting the native species. And they always do even, even in infancy, but to a point now where they're starting to control areas of our campus. And that's ongoing. And if we remove those, it will be a new phase and that'll be ongoing. It is a never ending final thing. So what I'm pleased with is we're able to reach out to kids and teachers and the community about these things."

-West Virginia

"They've been a pleasure to work with really to be honest... ..It does give us opportunities to really reduce some of the maintenance. Like the reforestation [project], we don't mow those areas anymore so that cuts, that cuts our mowing and saves our fuel... ..So there's some benefits from doing a lot of those things... ..they're cutting our funding for a lot of things, our labor funding, our supplies and so these little things like this help out. It's also a benefit to the environment. So there you go."

-Maryland

Summary of findings: The analysis of interview data from questions regarding the maintenance of BMPs on school grounds found dichotomies exist between the origins of BMP installations (mandated vs curriculum initiatives), and the schools/districts size and infrastructure. The first difference noted was based on the origin of the BMP installation. In most cases the maintenance of mandated BMPs that derive from capital projects (new construction or renovations) to meet code requirements falls to the responsibility of the buildings and grounds or facilities departments (ex. detention basins, media filters, retention ponds). BMPs that originate from classroom initiatives or partnerships with outside organizations that are integrated with instructional or curricular goals are often maintained by teachers, students and staff (ex. school gardens, pollinator gardens, rain gardens). This is reflected in the data as 83% of schools/districts interviewed stated BMP maintenance is completed by facilities staff and 58.3% cited student & teacher participation in maintenance. Four of 24 schools/districts (17%) reported BMP maintenance assistance from watershed or community partners who helped install the BMP projects on school grounds. The second division recognized in the data stems from the size and organizational infrastructure of the school districts which varies by each state and DC. Those with large county based school districts typically have more staffing and funds to manage facilities and complete maintenance of BMPs installed on school grounds. Smaller school districts have less staffing to conduct inspections and maintenance of BMPs. County-based school districts were found to have more support and collaboration with county agencies to forward the installation, inspection, and maintenance of BMPs. Two county-based school districts (MD & VA) reported that county agencies maintain BMPs installed on school grounds to meet stormwater management goals. Four of 24 schools/districts (17%) stated that contracted landscape or BMP maintenance companies are involved with BMP maintenance on school grounds, especially if vegetation overgrowth occurs or for more technical maintenance. One school/district partners with a state agency to complete annual meadow burning as the agency uses this site for training purposes. Most schools/districts interviewed (15 of 24, 63%) do not include the maintenance of BMPs as part of their schools sustainability or maintenance plans. Only one of the nine schools/districts interviewed identified the maintenance of BMPs as part of their sustainability plans, most (7 of 9) stated BMP upkeep was included in maintenance plans.

Most schools/districts interviewed (19 of 24, 79%) reported being pleased with the outcomes from BMP installations of BMPs on school properties. The most frequently cited responses of desired outcomes included: meeting MS4 and/or building code requirements (17), facilitating student learning goals (16), improving stormwater management or grounds issues (15), and improving outdoor spaces or habitat (12). Six schools/districts mentioned reducing their environmental impact or footprint, and five interviewees discussed the benefit to the community. Only two of 24 schools/districts (8%) discussed how BMP installations helped meet requirements for sustainable/green schools recognition awards. Other important outcomes that were mentioned include an improved institutional understanding of the function and benefits of BMPs and eliminating complaints about pollution runoff. The rationale given from interviewees who were not pleased with the outcomes from BMP installations included: being unsure of educational impact, issues with construction, an increase in insect stings, and maintenance issues due to a lack of proper equipment.

The most commonly identified maintenance challenges for both mandated and curricularly derived BMPs were time (funding personnel to complete the maintenance), and expertise (having knowledgeable and trained staff to complete maintenance properly). School maintenance staff reported maintenance of BMPs as a lower priority action item which may not be completed when time is limited. Lack of proper training often led to mowing or removal of desired vegetation. The installation of the BMP is often aided by grant funding, but does not include funding opportunities for long-term maintenance of BMPs. Curricular based BMP projects are often initiated by specific teachers or administrators who may retire or relocate and the remaining personnel may lack the knowledge to maintain the projects properly.

D. BMP Integration in Student and Community Learning

BMPs installed on school grounds provide a rich resource to enhance student learning through a real-world application of best management practices implemented to limit human impact on the environment and watersheds. This section of interview questions sought to understand 1) if and how BMPs are used to support learning at their schools and in their districts 2) determine if BMPs are integrated into the curriculum, and 3) understand how students are involved in BMP implementations on school grounds. These questions also asked if BMPs on school grounds are included in informal learning or used to educate the public in any way. The position of the personnel interviewed (facilities manager, administrator, curriculum specialist, sustainability coordinator, or teacher) affected the responses provided as many facilities and construction personnel did not have direct knowledge of curricular integrations of BMPs. Attempts were made to follow up with school districts when interviewees lacked the knowledge to respond in detail.

D. Are BMPs used to support student learning at your school?

1. Were students engaged in the identification of a local watershed issue?
 - a. If so, were they engaged in developing ideas and implementing improvements?
 - b. Did students have a role and voice in the process?
2. Do your schools integrate the BMPs into the curriculum (required, Encouraged, Not Required by the State standards, District standards, or Principal?)?
 - a. Is it aligned to specific standards?
3. Are the BMPs included in informal learning (after school clubs, scouting, etc.)?
4. Are the BMPs used to educate the community? (passively - signage, trails, or actively community outreach or events)

Table 40. BMP Integration in Curriculum Summary (D.2)

<i>Are BMPs Integrated into Curriculum?</i>	
Response	Number of Schools/Districts (n=24)
Yes	20
No	4

Schools/districts were asked if BMPs are integrated into the curriculum and used to support student learning in their schools/districts (Table 40). Twenty of 24 schools/districts (83%) reported that BMPs are integrated into the curriculum. Only four schools/districts (16.7%) responded that BMPs are not integrated into the curriculum. These schools/districts are located in three of the seven state entities interviewed PA (1), NY (2), and the District of Columbia (1), and three of these interviews were conducted with facilities managers only who had limited knowledge of curriculum in their schools/districts. None of these four schools/districts had earned any sustainable/green school recognitions, and only one school from these schools/districts is registered in Eco-Schools USA. All of the schools/districts interviewed that have earned US Department of Education Green Ribbon or “other” sustainable school recognitions (12 of 24, 50%) responded that BMPs are integrated into the curriculum at their schools.

Table 41. BMP Integration in Curriculum Requirement Summary (D.2)

BMP Integration Required, Encouraged, Not Required?			
Location	Required	Encouraged	Not Required
DC	-	District	2
DE	District	District	1
MD	State Standards	District	1
NY	-	District	2
PA	District	District	2
VA	State Standards	District, Principal	1
WV	-	Principal, Principal, District	1
Total (n=24)	4	10	10

Schools/districts were asked if the integration of BMPs in their curriculum was required, encouraged, or not required by either state standards, district standards/policies, or by school principals (Table 41). Only four of 24 schools/districts interviewed (17%) reported that BMP integration was required. Two schools/districts cited the BMP integration requirement coming from the district level and two cited state standards. Ten schools/districts (42%) responded that BMP integration was encouraged, and ten cited BMP integration as not required. The table demonstrates inconsistencies in understanding and interpreting state standards and curriculum requirements, although some confusion could stem from the interviewee's lack of direct knowledge with curriculum and instruction departments.

Table 42. BMPs Integration in Curriculum Qualification (D.2)

District / School	BMPs Integrated into Curriculum	BMP Integration Requirement	BMP integration Qualification
DC 1	Yes	Not required	Examples exist but may not be standardized across all schools. [state level government agency] program does work with schools on integrated projects. District wide MWEE implementation encouraged.
DC 2	Yes	Encouraged	Yes, as a lead in for inquiry. School is PK3-5.BMPs aligned in IB curriculum
DC 3	No	Not required	Pre-K to 8 School is on leased land, landlord manages property with no reported stormwater BMPs. School has no reported watershed curriculum.
DE 1	Yes	Encouraged by district, not required	Not fully integrated throughout the district in specific grades. "I'd say encouraged, but it's really not required by the standards. I know I've tried." MWEE integration attempted.
DE 2	Yes	Not Required	Not fully integrated throughout the district but there are examples, MWEEs were piloted, BMP integration is encouraged by District's Env. Ed. Specialist
DE 3	Yes	Required by district	Yes, BMPs are integrated through outdoor school experiences and MAY be implemented at specific school sites.

Table 42. (Continued)*BMPs Integration in Curriculum Qualification (D.2)*

MD 1	Yes	Not required, but integrated	Watershed Education seems very embedded in the curriculum. BMPs are integrated. "MWEE like" district wide programs mentioned in elementary, middle and high school.
MD 2	Yes	Required by state standards	Well Integrated - MWEEs throughout although action plan not always completed
MD 3	Yes	Encouraged	BMPs can be integrated throughout the curriculum but not required or standardized across all schools. MWEEs cited in elementary and high school, not sure if action plans happen.
NY 1	No	Not Required	No integration reported
NY 2	No	Do not believe so.	The district is building its first outdoor classroom and is looking to integrate studies of the retention pond. Follow-up was requested but not received.
NY 3	Yes	Encouraged	BMPs are included in curriculum but implementation is encouraged not mandated
PA 1	Yes	Not aware of requirement	New standards being adopted. BMP integration is not systematized at all schools, one school described BMPs in their curriculum of their Green Ribbon Application.
PA 2	Yes	Required in district curriculum plan	Yes, well integrated with MWEEs
PA 3	Yes	Encouraged	Yes, well integrated, a MWEE like program described
PA 4	No	Not required	No integration of BMPs in curriculum reported.
VA 1	Yes	Required by state standards	District wide MWEE unit in 6th grade
VA 2	Yes	Encouraged by district, not required	Reportedly required (US GREEN RIBBON Application). District is huge so may not be standardized across the whole district. BMPs connected to state standards
VA 3	Yes	Not Required, (class by class basis)	Integration seems limited to elective classes in High School, interviewee was a civil engineer in the construction dept. in facilities. MWEEs are discussed in District Curriculum Guides online.
VA 4	Yes	Encouraged by Principal	Yes, MWEEs embedded in 6th grade, although this interview was with one school who had an example of a BMP integrated with a horticulture class.
WV 1	Yes	Encouraged by Principal	"Curriculum is integrated into the BMPs." The principal has a large influence on integrating natural resources in curriculum. A local watershed organization assists with projects: urban forestry and watersheds.
WV 2	Yes	Encouraged by Principal	Yes, through programs with local watershed organization and an emphasis on riparian buffer and urban forestry
WV 3	Yes	Not required	Integrated in curriculum but limited BMPs - a rain barrel attached to a small school garden and tree plantings.
WV 4	Yes	Encouraged	Yes, limited documentation

Table 42 catalogues all of the responses and includes additional information provided by interviewees that qualifies their integration of BMPs in the curriculum. Many schools/districts reported that BMPs are integrated into the curriculum, although diverse levels of BMP integration and implementation within the curriculum were reported. Schools/districts from two states had contradictory responses as each had one report of BMP integration being required by state standards and one report of no requirement. Meaningful Watershed Educational Experiences (MWEEs) were cited as being implemented district-wide by five of 24 schools/districts (21%). Four of 24 schools/districts (17%) reported that MWEEs are encouraged, included in curriculum guides, or attempted. Two of the schools/districts (8%) described a MWEE like watershed education program as embedded in their curriculum.

INTERVIEWEE: "State standards, just because of the bay agreement we have through our Maryland State Department of Education and environmental literacy coordinator who coordinates things across the state and keeps us abreast of policies and the role of that in education. So the State of Maryland values that and we have to report to them. So I would say the state is probably the leader there."

INTERVIEWER: "And there's actual state standards, specific to BMPs or watershed issues?"

INTERVIEWEE: "Yes, there are state standards. I know we have the environmental literacy standards. I just call them the ELit standards and I'm pretty sure there are specific to Maryland. I imagine they're widely shared across the entire Bay watershed, given the bay agreement."

-Maryland

"I do not believe that they do. Being in facilities, I'm not really that involved with the curriculum."

-New York

"We're not there yet. Okay. And it is not required. The BMPs physically, no. Everything is done in a classroom. There are a few examples where we've got teachers taking the kids out to the BMPs but you know it is not the norm, by far, and we're now looking into doing that within the next couple of years. Using the MWEEs as a vessel, to that, we don't want to really adopt the whole curriculum, we're not. There's really no real push for required environmental literacy, no graduation goal. Maryland's got some really cool things going on that we are looking at. And we, [our state], are having a conversation. Should we have something that's required? And the answer is yes, we should have something. And we're really looking at, for Pre-K to 12, to build an immersive culture. Like, you don't just learn math and get your math requirements, taking high school math classes, or even a couple classes. You've got to think analytically and use math in other places. So we really just want to infuse environmental education, sustainability, outdoor education into what we are doing, you know, so it's non-threatening. You don't have another curriculum to squeeze in."

-Delaware

"It is more the other way where the curriculum is integrated into the BMPs."

-West Virginia

"In a school system of 165,000+ [students], there are many examples of schools with students investigating watershed issues. In the curriculum, we have built in systemic watershed focused project based learning units in grade 4, 6, and in high school chemistry. I would not say that the students identify the watershed issue; rather, they are more led. For example, in Grade 4, the unit is called [name of watershed based unit]. Students learn that the Bay is in trouble, and that every small watershed plays a part. A letter from the Governor asks students to help improve the bay right from their "school shed." They discover how water flows on their school site as it moves to the school's closest stream, and discover areas of erosion. That brings them to learn about the multiple issues with runoff and some mitigation features."

-Maryland

“So I reached out to a number of folks here who were in charge are in charge... ..our director of science has told me that yes, there are courses that have specifics about watershed management and BMPs and that would be in our 11th and 12th grades. It would be our environmental science and our AP Environmental science courses. So that's only at the high school level, where they have an actual course curriculum. Although I'm told that, from middle school up, that individual teachers as a part of their program are free to educate them on what these things [BMPs] are.”

-Virginia

Table 43. BMPs in Curriculum Alignment to Standards Summary (D.2.a)

Are BMPs In Curriculum Aligned to Standards?			
Location	Yes	No	Other
DC	2	-	-
DE	2	-	In development
MD	2	1	-
NY	-	-	Not sure
PA	3	-	-
VA	1	2	Can be made
WV	4	-	-
Total (n=20)	14	3	3

Only 14 of 20 schools/districts (70%) who reported BMPs are integrated into their curriculum reported an alignment to standards exists (Table 43). Three of the 20 schools/districts (15%) noted no alignment with specific standards for their BMP integrated curriculum. One school/district is in the process of aligning their curriculum with the new NGSS standards. One school/district was unsure about the alignment to standards, and one school/district responded by saying BMPs are not specifically mentioned in standards, although alignments with state standards “can be made.”

Table 44. BMPs in Curriculum Alignment to Standards Responses (D.2, D.2.a)

School / District	BMPs Integrated into Curriculum	BMPs Aligned to Standards? Which Standards?
DC 1	Yes	Yes - NGSS
DC 2	Yes	Yes - IB Curriculum
DC 3	No	No
DE 1	Yes	In Development - NGSS
DE 2	Yes	Yes - Undefined
DE 3	Yes	Yes - NGSS
MD 1	Yes	Yes - NGSS and state STEM standards
MD 2	Yes	Yes - MD State ELit.
MD 3	Yes	No - Not aligned to specific standards.
NY 1	No	No
NY 2	No	Not sure
NY 3	Yes	No
PA 1	Yes	Yes - PA State Standards
PA 2	Yes	Yes - PA State Standards
PA 3	Yes	Yes - PA State Standards & NGSS
PA 4	No	No
VA 1	Yes	Yes - State Standards
VA 2	Yes	BMPs not specifically mentioned in any standards, but can be connected to state standards
VA 3	Yes	No specific standards, possibly AP Env.
VA 4	Yes	No, not directly aligned with state standards, possibly AP Env.
WV 1	Yes	Yes - state science and social studies standards.
WV 2	Yes	Yes - NGSS
WV 3	Yes	Yes - state standards
WV 4	Yes	Yes - state standards

Schools/districts were asked if BMPs are integrated into the curriculum and if this aligned to specific standards (Table 44). Fourteen of the 20 schools/districts that reported having BMPs integrated into the curriculum said alignment with standards existed. Seven of the 14 schools/districts (50%) cited alignment with state standards (including science, STEM and ELit), three of the 14 schools/districts (21%) reported alignment with NGSS standards, and two of the 14 schools/districts (14%) mentioned alignment with both NGSS and state standards. One school/district out of the 14 schools/districts (7%) stated BMP integrated curriculum aligns with International Baccalaureate (IB) standards and practices, and one school/district did not define the standards with which they align. Four of the 20 schools/districts (20%) that reported having BMPs integrated in the curriculum cited no specific alignment with standards, although two of these schools/districts reported possible alignment with AP Environmental Science content. Schools/districts often discussed that BMPs are not specifically mentioned in standards, although connections can be made to standards including: World Cultures

(geographic representations, human-environment interactions) Science (human impacts on Earth systems, Earth materials and systems, Biogeology), Environment & Ecology, STEM, and Environmental Literacy.

“NGSS includes environmental standards and processes of science are included in the performance standards. There are also [state] STEM standards that have students solving solutions to problems using engineering design. So, yes, our curriculum is aligned to standards but none that talk of BMPs.”

-Maryland

“Oh, absolutely. Yeah, we have a lot of standards that are on the state website that may not be officially adopted by a county, but they are there, so I try to go there and pull them out and use those.”

-West Virginia

Table 45. Students Identify Watershed Issues and Solutions Summary (D.1, D.1.a, D.1.b)

Responses	Do students identify a local watershed issue?	Are students engaged in developing solutions and implementing improvements?	Did students have a role or voice in the process?
Yes	14	13	9
Some/Possibly	3	1	3
Hypothetical, Not local	1	3	2
No	4	6	8
Not Identified	2	1	2

A combination of questions was posed to investigate student engagement in watershed education (Table 45). Schools/districts were asked if students were engaged in the identification of a local watershed issue, if the students engage in developing ideas for solutions and implementing improvements, and if students had a role of voice in the process. Eighteen of the 24 schools/districts (75%) reported some or possible student engagement in identifying watershed issues. Fourteen of 24 schools/districts (58%) reported active student engagement, three of 24 (13%) cited this occurs at some of the schools, and one school/district (4%) mentioned a hypothetical project that was about a watershed issue, but not in a local setting. Four of the 24 schools/districts interviewed (17%) do not engage students in identifying local watershed issues, and two of the 24 schools/districts (8%) did not respond to the question. Thirteen of 24 schools/districts (54%) reported students are engaged in developing solutions to local watershed issues and implementing improvements, and nine of 24 (38%) cited that students have a voice or role in the process.

Table 46. Watershed Issues & BMP Implementation in Curriculum Responses (D.1, D.1.a, D.1.b)

District/ School	Do students identify a local watershed issue?	Are students engaged in developing solutions and implementing improvements?	Did students have a role or voice in the process?
DC 1	Some: Yes, but may not be in all schools	Yes, in some schools, likely not student led	Possibly
DC 2	Yes	Yes	Yes
DC 3	No	No	No
DE 1	Hypothetical, not based on actual location	Yes, for a hypothetical situation	Some, more opportunities in development
DE 2	Somewhat - not fully integrated	Yes - not always BMPs	Yes
DE 3	Yes	Yes, at Outdoor School	Somewhat
MD 1	Yes	Yes - but not clear if designs are actually implemented	Yes
MD 2	Yes	Yes	Yes
MD 3	Some: Yes, but not a standardized thing across all schools	Yes	Yes
NY 1	No	No	No
NY 2	No don't believe so	No, not for BMPs within the curriculum. A group of students approached facilities with a solution to reduce waste.	No, not with BMPs. A group has approached facilities with a solution to reduce waste.
NY 3	Yes	Yes	Not really
PA 1	Yes, A US Green Ribbon School Application for one school in the district references projects where students identify local watershed issues. A district-wide Earth Science project on shale investigates impacts on water quality.	Possibly or hypothetical based on follow up. "I do not know"	Yes, but not directly with BMPs, student voice reported in building project design and capacity for Green Roofs.
PA 2	Yes	Yes, but not necessarily implemented in real life. We don't get the students to action.	Yes, but not necessarily implemented in real life
PA 3	Yes	Yes	Yes, in development
PA 4	No	No	No
VA 1	Yes	Yes, but fictitious	Yes, but fictitious
VA 2	Yes	Yes	No
VA 3	Not identified	No	No
VA 4	Yes, in 9th grade, AP Environmental, and horticulture classes	No, Not in developing the project, but students helped with installation and monitoring	No

Table 46. (Continued)*Watershed Issues & BMP Implementation in Curriculum Responses (D.1, D.1.a, D.1.b)*

District/ School	Do students identify a local watershed issue?	Are students engaged in developing solutions and implementing improvements?	Did students have a role or voice in the process?
WV 1	Yes	Yes	Yes
WV 2	Yes	Yes	Not identified
WV 3	Not identified	Not identified	Not identified
WV 4	Yes	Yes, but does not seem BMP specific	Yes, but does not seem BMP specific

Table 46 catalogues the responses to the questions regarding student engagement in watershed education as summarized in Table 44. Schools/districts were asked if students were engaged in the identification of a local watershed issue, if the students engage in developing ideas and implementing improvements, and if students had a role of voice in the process. Eighteen of 24 schools/districts (75%) reported students being engaged in identifying local watershed issues to some degree. In school/districts where this occurs, most (17 of 18, 94%) engage students in some level of developing solutions and/or implementing improvements, and many (14 of 18, 78%) reported students having some level of participation (role or voice) in the process of developing and implementing improvements. Some schools/districts made the distinction that their watershed education included hypothetical or fictitious scenarios that mimic a local or global watershed issue.

Table 47. *BMP Use in Informal Learning and Community Education Summary (D.3, D.4)*

	<i>BMPs Included in Informal Learning?</i>	<i>BMPs Used to Educate Community?</i>
Response	Number of Schools/Districts (n=24)	Number of Schools/Districts (n=24)
Yes	17	11
Somewhat / Possibly / Unsure	4	2
No	3	11

Interviewed schools/districts were asked if BMPs on school properties are included in informal learning opportunities (after school clubs, scouting groups, etc.) and if BMPs are used to educate the community (either passively with signage or trails, or actively through community outreach or events) (Table 47). Many schools/districts (17 of 24, 71%) reported affirmatively that BMPs on school properties are included in informal learning. Less than half of the schools/districts (11 of 24, 46%) cited BMPs being used to educate the community.

Table 48. Informal Learning With BMPs Summary (D.3)

Examples Informal Learning Including BMPs	
Response	Number of Schools/Districts (n=24)
Green Teams/After School Clubs/FFA	10
Scouting Groups	4
Eagle Scout Projects	4
4H	2
JROTC	1
Summer Camps/Programs	1
Elective Classes	1
Student Internships	1
Student Council	1

Table 48 summarizes the examples cited by interviewed schools/districts of informal learning experiences that access BMPs on school grounds in their activities. School-sponsored groups (green teams, after school clubs, Future Farmers of America (FFA)) were cited most often (10) in including BMPs in learning opportunities. Scouting groups and Eagle Scout projects were each mentioned four times, and 4H was mentioned twice.

Table 49. Examples of BMPs Included in Informal Learning Summary (D.3)

Examples of BMPs Included in Informal Learning	
Response	Number of Schools/Districts (n=24)
Gardens	3
Ponds / Wetlands	2
Maintenance of BMPs	2
Tree Planting	2
Bioretention	2
Trails	2
Pollinator Gardens	1
Meadows	1

Some schools/districts provided examples of BMPs installed on school grounds that are included in informal learning opportunities (Table 49). The most often mentioned BMP used in informal learning was school gardens (3) as student groups assist in maintaining the gardens outside of class time. Ponds and wetlands were mentioned as places for exploration and habitat studies. Maintenance referred to projects where groups helped clean school grounds or maintain BMPs. Two schools/districts cited opportunities where bioretention areas were used to educate groups on stormwater management practices.

Table 50. Examples of Community Education With BMPs Summary (D.4)

BMPs Used to Educate Community	
Response	Number of Schools/Districts (n=24)
Passively with Signage	11
Newspaper Articles	3
Community Events	3
Television / Radio	1
Social Media	1
State Agency Training	1

Table 50 shows the various methods of using BMPs to educate the community as cited by the schools/districts interviewed. Signage on BMPs (11 of 24, 46%) was the often cited method of community education, followed by newspaper articles (3 of 24, 13%) and community events (3). One school/district reported a partnership with a state agency that trains fire crews on meadow burning BMP maintenance. Community events included a wildflower workshop, a native tree/plant sale, and presentations to community groups.

Table 51. BMPs in Informal Learning and Community Education Responses (D.3, D.4)

District / School	BMPs included in informal learning?	BMPs used to educate the community?
DC 1	Possibly: green teams and garden programs	No
DC 2	Yes	No
DC 3	No	No
DE 1	Possibly	No
DE 2	Yes	Yes
DE 3	Yes	Somewhat - only if visiting with students or scouting groups
MD 1	Yes	Yes, signage and some events
MD 2	Yes	Yes
MD 3	Yes	Yes
NY 1	No	No
NY 2	Not sure	No
NY 3	Yes, a nature trail around the wetland.	Yes, passively with signage
PA 1	Yes, some trails & pollinator garden with signs	Yes, passively with signage
PA 2	Yes, electives and summer program	No, not yet
PA 3	Yes, sustainability clubs and summer internship	Yes
PA 4	No - not specifically tied to BMPs	No

Table 51. (Continued)*BMPs in Informal Learning and Community Education Responses (D.3, D.4)*

District / School	BMPs included in informal learning?	BMPs used to educate the community?
VA 1	Yes, in the past	No, not specifically
VA 2	Yes	Some possibly, more in development
VA 3	Not sure, possibly	No, not specifically
VA 4	Yes, some	Yes, signage and publicity
WV 1	Yes	Yes - local press, presentations
WV 2	Yes	Yes - urban forestry project
WV 3	Yes	No - would like to reach out more
WV 4	Yes	Yes - signage

Table 51 catalogues the responses given (and summarized in the preceding tables) by interviewed schools/districts to the questions regarding BMPs on school properties being included in informal learning opportunities (after school clubs, scouting groups, etc.), and if BMPs are used to educate the community (either passively with signage or trails, or actively through community outreach or events). Some of the responses for each question are given below.

"That's one of the things we would like to do more, because we're not sure that we're reaching out enough into the community, we've got a senior center that we would like to join in and we've got master gardeners in the area to join in, but I'm not sure how to do that. I want to make that connection. I have tried little bits. Yeah. But again, it's the time."

-West Virginia

"Yes we do, put up a lot of signage, various groups give us the signs that we need for either the [rain gardens] or the BMP, and try to explain what's happening and why there's this, you know, particular hole, and what all is planting in it. What it is supposed to be doing. Well, those signs are there okay, we get them from [county agency]. We get them from ourselves for [rain gardens] you know there's a bunch of them around."

-Maryland

"When they first put them [solar panels] in, which has been more than 10 years now. There was a lot of focus on the community town and board presentations and every year, and we've had some educational value because we do have visibility to the amount of powers coming out of it. And I just had a class that I gave them passwords so they could go on and see it for a technology class. So there is some stuff going on with that still."

-New York

"It's still a case by case basis. We like to have secure sites that can be left open. We kind of leave that up to school communities, the relationship that they have with their neighborhood. The [state administration] has told us to make them available, but we also have playgrounds that get burned down so we have to balance that risk and security or, you know, people might drink or do drugs or something on a playground at night. And then on when they come in in the morning, the custodians are trying to pick up glass before the kids get out there, right. So you have to balance the good with the bad on that."

-District of Columbia

"Not, at this time. That really was our one goal for the one grant for the new middle school was that we would be able to create those educational kiosks. Directly with their signage and we would, actually, when we toured [a local watershed research and education center], we took pictures of the signs to talk about whether it's laminated not laminated whether it is made out of fiberglass or not coming the best signage that we could utilize if we were afforded."

-Pennsylvania

INTERVIEWEE: "I think it all again depends on the site because there are schools, you know, that do have trails that are, you know, and have developed signage. Our grounds department is in the process of creating signage that will be more informative."

INTERVIEWER: "About why that BMP is there?"

INTERVIEWEE: "Yeah, exactly. But the extent. I mean, it's not. There's not a standard approach to that right now. Although it's certainly worth it, it's worth pursuing."

-Virginia

"Yes. We've been featured many times in the local newspaper. We do it through just speaking with groups. When things were newer, I spoke with many groups at that time."

-West Virginia

"We have trails at several of our buildings which are signed appropriately and used by schools as well as the community after hours... .. Yeah, I know that there are some. I don't, I haven't personally hiked them a lot lately, but I know that you know one of them has a beehive area for some pollinators. And yeah, that's all signed."

-Pennsylvania

"We do have some signs but I would say that answer is probably no."

-District of Columbia

"We have had signage in the past. We had the [named program] signs. We have community outreach for events. With the Earth Day cleanup, there are several organizations that we all participate with."

-West Virginia

INTERVIEWEE: "We have a bio retention informational sign that we have just received that we're going to install, once, once it warms up a little bit and we can dig down about two and a half feet, we're going to install this sign that gives a side view of what this bio retention pond is and what it does for our local community."

INTERVIEWER: "Which leads us right into the next question, are you, is it going to be used to educate the community? It sounds like it with the sign."

INTERVIEWEE: "Yes."

INTERVIEWER: "Do you know if any, like articles, have been put out in the paper about it?"

INTERVIEWEE: "Um, there was an article. So yes, I was interviewed for the local radio station [name of radio station], they interviewed me and we talked about, they interviewed myself, as well as a representative from [partner agency name]. So we talked about the installation, we talked about how it was going to interact, how our students would interact with it. We also had our social media page for [school district] and took a series of pictures on the day that everything was planted and installed. Yeah, when it was planted and during the installation process that was on Facebook. It was also on [station call letters], there was a small 30 second blurb, which is our local TV channel [named affiliate]. so it was on there. And I think for me, even a small blurb in the local newspaper, very small like, maybe 150 words. So we're trying. We were trying to get let the community be very aware of what what this process was and not only would how it's going to help them in the community, but how it's going to help their students or the students in this building, learn about our local community and how their daily living affects something as silly as, the kids, we call it, is the watershed."

-Virginia

"Well, again, the same type of thing there. There may be occasional basis for signage out there, you know, that could be used, they could use like a retention pond to go out and teach them you know how the water is being filtered, but it's not part of the required program that I am aware of."

-Virginia

"So of course signage. I see that word listed there, but definitely there are signs. We should probably do a better job, but in our news articles, we do tell them what we're doing and why we're doing it."

-West Virginia

"There are. It looks different in every place. So here's the thing, like all public school campuses are public property you pay your taxes for them. So the only thing is that folks aren't allowed on during school hours because there's kids there. So there's that safety thing but after school hours, they are open. What a campus or a district is comfortable with people doing and what that looks like. But they are public campuses. So we are putting in signage, we have interpretive signage campaigns that are out there. We are dabbling in it all that so people can see like, you know, this could look like a nature center where you do not have to have a teacher. You can just walk by and passively learn. We even have one of our campuses right behind our district office, an elementary school, and we're aiming to partner with the county Park that's there. Because it's a trail that people go running down. Take our dogs on and it's right behind the school and we, we're, literally want to put like an outdoor classroom there, knowing full well that it will be much more accessible and much more geared towards the community outside of school hours, obviously, but people during school hours go back there now."

-Delaware

"There is no notification to the public and they do not use them for education purposes."

-Pennsylvania

Summary of findings: Most schools/districts (20 of 24, 83%) reported BMPs are integrated into the curriculum, and three of the four interviewees who stated BMPs are not integrated were facilities managers with limited knowledge of curriculum and instruction in their schools/districts. None of the schools/districts who reported no BMP integration in the curriculum had earned US Department of Education Green Schools recognitions, and only one school in these four schools/districts has registered with Eco-Schools USA. Only four of 24 (17%) schools/districts representing four different states reported that BMP integration into the curriculum was required (two by district, two by state standards). Of the 20 schools/districts that reported BMPs are integrated into the curriculum, seven stated that BMP integration is not required implying a voluntary inclusion. Some inconsistencies were noted within responses from schools/districts in two states (VA and MD) as each state had one district report BMP integration is required by state standards and one district report BMP integration is not required, and all four interviews included curriculum specialists or administrators. Two schools/districts from Maryland mentioned Environmental Literacy (ELit) standards as having direct or potential alignment with BMPs in curriculum. Three interviewees from Pennsylvania (1) and Delaware (2) mentioned a frustration with efforts to integrate ELit standards into curriculum in their districts as the ELit standards are not required by the state. Some of the schools/districts mentioned BMPs being aligned with social studies standards. Almost half of the schools/districts interviewed (11 of 24, 45.8%) reported Meaningful Watershed Educational Experiences (MWEEs) or MWEE "like" programs being implemented, encouraged, or attempted in their curriculum. Some of the schools/districts use an off-site location to run watershed program activities and are not sure if classroom teachers follow through on implementing action plans. Eighteen of 24 schools/districts (75%) reported some level of engaging students in identifying a local or global watershed issue, developing or implementing solutions, and including student voice or role in implementing solutions (although three of these were hypothetical or not local). Oftentimes solutions to watershed issues are identified and students are engaged in creating

potential solutions, although administrators and/or teachers plan the action or BMP installation. Students are guided to discover the predetermined solution and can be involved in implementing the BMP.

BMPs were reported to be included in informal learning by 17 of 24 schools/districts (70.8%), with four more interviewees (16.7%) citing a “possible, somewhat, or unsure” response. After school activities (green teams, clubs FFA) were mentioned by 10 of 24 schools/districts (41.7%), scouting groups and Eagle Scout projects were each cited by four schools/districts (16.7%). Examples of BMPs used in informal learning included: gardens, ponds/wetlands, maintenance of BMPs, tree plantings, bioretention installments, trails, pollinator gardens, and meadows. Eleven of 24 schools/districts (45.8%) reported BMPs being used to educate the community, and two schools/districts (8.3%) responded that community education may be happening with BMPs installed on school grounds. The most commonly cited method of educating the community was passively via signage installed on the BMP (11), followed by newspaper articles (3) and community events (3). Community events included a wildflower workshop, a native tree/plant sale, and presentations to community groups. One school/district reported a partnership with a state agency that trains fire crews on meadow burning BMP maintenance. A few of the interviewees mentioned they would like to do more community education and outreach.

“That’s one of the things we would like to do more, because we’re not sure that we’re reaching out enough into the community, we’ve got a senior center that we would like to join in and we’ve got master gardeners are in the area to join in, but I’m not sure how to do that. I want to make that connection. I have tried little bits. Yeah. But again, it’s the time.”

-West Virginia

INTERVIEWEE: “I think it all again depends on the site because there are schools, you know, do have trails then are you know and have developed signage. Our grounds department is in the process of creating signage that will be more informative.”

INTERVIEWER: “About why that BMP is there?”

INTERVIEWEE: “Yeah, exactly. But the extent. I mean, it’s not. There’s not a standard approach to that right now. Although it’s certainly worth it, it’s worth pursuing.”

-Virginia

E. Integration of Outdoor Learning Spaces in Student & Community Learning

Outdoor learning spaces (OLS) were investigated as another resource to enhance student learning which can be associated with BMPs installed on school grounds. This section of interview questions were aimed to understand if and how Outdoor learning spaces are used to support student learning at their schools and in their districts, determine if a curriculum connection exists when using OLSs, and if the use of OLSs aligned to specific standards. These questions also asked if OLSs on school grounds are included in informal learning or used to educate the public in any way. Some interviewees did not have firsthand knowledge of curriculum and instruction due to their role in the school/district (e.g. facilities management, construction division). Attempts were made to follow up with appropriate personnel to address questions that could be answered.

E. Are outdoor learning spaces used in student learning at your schools?

(if yes: what outdoor learning spaces do your schools have and how they are used?)

1. Is a curriculum connection (Required / Encouraged / Not Required) in using outdoor learning spaces at your schools?
 - a. Is using outdoor learning spaces aligned to a specific standard?
2. Are outdoor learning spaces included in informal learning (after school clubs, scouting, etc.)?
3. Are outdoor learning spaces used to educate the community? (passively - signage, trails, or actively community outreach or events)

Table 52. Use of Outdoor Learning Spaces at Schools Summary (E.)

Are Outdoor Learning Spaces Used in Student Learning?	
Response	Number of Schools/Districts (n=24)
Yes	21
Yes, first formal outdoor classroom under construction	1
Yes, some schools have formal outdoor classrooms	1
Yes, no schools have formal outdoor classrooms	1

All schools/districts interviewed (24 of 24, 100%) reported outdoor spaces being used in student learning (Table 52). One school/district reported the first formal outdoor classroom in the district is currently being built, and another school/district stated that formal outdoor classrooms are installed at some schools in the district. One school/district qualified their response by stating that no formal outdoor classrooms exist on their school grounds, although teachers do take classes outside to learn. Many districts referenced the use of outdoor spaces for physical education classes. Other outdoor learning spaces cited by schools/districts included playgrounds, greenhouses, gardens, ponds, and trails on school properties.

Table 53. Examples of Outdoor Learning Spaces at Schools

Examples of Outdoor Learning Spaces on School Grounds	
Response	Number of Schools/Districts (n=24)
Outdoor Classrooms/Labs	9
Gardens	7
Playgrounds	4
Monarch way stations	4
Courtyards	3
Pavilions	3
Nature Trails	3
School Grounds (in general - no structures)	3
Greenhouse/High tunnels	2
Pollinator Gardens	2
Nature Centers	2
Pre-K Tricycle track & tricycles	1
Pond	1
Wetland with trails	1
Natural Playground with wood chips, logs, big rocks to explore	1
Schools adjacent to river and leased open space	1
School grounds with stormwater management features	1
Conversation pit	1
Fort	1
Walking classroom with audio lessons	1
Clipboards and walk the grounds	1
Bucket Learning (mobile classroom)	1
Meadow	1
Rooftop Spaces	1

Table 53 provides a list of examples of outdoor learning spaces cited in schools/districts interviews. Outdoor classrooms were the most often referenced outdoor learning spaces (9), and one school/district described their outdoor classroom as a learning deck (a raised deck with desks and furniture). School gardens were highlighted by seven of the schools/districts and greenhouses or high tunnels were cited twice. One school/district described an outdoor mobile classroom model where students carry 5-Gallon buckets filled with materials (pencils, clipboards, measuring tools, etc.) and use the buckets as stools when they reach an activity site. Another novel outdoor classroom cited was a tricycle track with tricycles that is integrated into a Pre-K program.

Table 54. OLS Curriculum Connection Requirement Summary (E.1)

Curriculum Connection Required, Encouraged, or Not Required When Using OLS on School Grounds				
Location	Required	Encouraged	Not Required	Not Specified
DC	-	2	-	1
DE	-	2	1	-
MD	2	1	-	-
NY	-	3	-	-
PA	1	2	1	-
VA	-	2	2	-
WV	1	2	1	-
Total (n=24)	4	14	5	1

Schools/districts were asked if a connection to the curriculum was required, encouraged, or not required when using outdoor learning spaces at their schools (Table 54). Most schools/districts (14 of 24, 58%) reported that teachers are encouraged to make connections to the curriculum when using outdoor learning spaces, while only four of 24 schools/districts (17%) stated a curriculum connection was required. Five of 24 schools/districts (21%) reported a curriculum connection was not required when using outdoor learning spaces with students. One school/district did not know the status of curriculum connections mandates in using outdoor learning spaces.

Table 55. OLS Alignment to Standards Summary (E.1.a)

OLSs Aligned to Specific Standards?				
Location	Yes	No	Indirectly	Other
DC	1	1	-	Not determined
DE	1	2	-	-
MD	2	1	-	-
NY	1	2	-	-
PA	2	1	1	-
VA	2	1	1	-
WV	2	1	-	Not determined
Total (n=24)	11	9	2	2

Schools/districts were asked if the use of outdoor learning spaces in student instruction aligns to specific standards (Table 55). Almost half of the schools/districts interviewed (11 of 24, 46%) reported use of outdoor learning spaces in student instruction is aligned to specific standards, and two of 24 schools/districts (8%) stated there was an indirect alignment. Nine of 24 schools/districts (38%) responded that the use of outdoor learning spaces is not aligned to specific standards. Two of 24 interviewees (8%) did not know if the use of outdoor learning spaces were aligned to specific standards.

Table 56. OLS Integration in Student Learning Responses (E., E.1, E.1.a)

District / School	Are Outdoor Learning Spaces (OLS) used in student learning at your school?	Connection to Curriculum in using OLS Required, Encouraged, Not Required?	Use of OLS Aligned to specific standards?
DC 1	Yes	Encouraged	No
DC 2	Yes	Strongly Encouraged	Yes PE, IB Env Sys & Soc.
DC 3	Yes	Not Specified	Not determined
DE 1	Yes - formal outdoor classrooms at some schools	Encouraged	No
DE 2	Yes	Not Required	No, not yet
DE 3	Yes	Encouraged	Yes, NGSS
MD 1	Yes	Encouraged	No, but a best teaching practice
MD 2	Yes	Required	Yes ELit & NGSS
MD 3	Yes	Required	Yes, NGSS & ELIT
NY 1	Yes, but no formal OLSs and not standardized	Encouraged	Yes, shifting to NGSS
NY 2	Yes, formal outdoor classroom being built	Encouraged	No, not particularly
NY 3	Yes	Encouraged	No
PA 1	Yes	Not required	Yes, State Standards
PA 2	Yes	Encouraged	Indirectly, Environment & Ecology
PA 3	Yes	Required	Yes, State Geography Standards and NGSS
PA 4	Yes	Encouraged	Unofficially, no.
VA 1	Yes	Encouraged	Indirectly
VA 2	Yes	Encouraged	Yes, state standards at the discretion of the teacher
VA 3	Yes	Not Required	No
VA 4	Yes	Not Required	Yes, likely State Standards and AP
WV 1	Yes	Encouraged, Not Required	No, not directly, nothing formal
WV 2	Yes	Encouraged	Yes, can be
WV 3	Yes	Not Required	Not determined
WV 4	Yes	Required	Yes

Table 56 displays the responses to the questions regarding the integration of outdoor learning spaces in student learning, curriculum connection requirements, and alignment with specific standards. Any detail provided about the standards to which the use of OLSs in student learning aligns is also included. All schools/districts (24 of 24, 100%) reported outdoor learning spaces are used in student

learning, although not all schools have formal outdoor classrooms. Most schools/districts (18 of 24, 75%) stated the use of OLSs in student learning is encouraged (14) or required (4), while 25% responded with not required (5) or did not know (1). Of the schools/districts that reported an alignment with standards, state standards were cited five times, NGSS four times, Environmental Literacy (ELit) twice, and the International Baccalaureate (IB), Advanced Placement (AP) and Physical Education (PE) standards were each mentioned once. One school district reported that the use of outdoor learning spaces did not align with standards but was considered a best teaching practice.

"No curriculum requires the use of outdoor learning spaces. It is encouraged and written into the curriculum. We are always mindful of the myriad factors that impact instructional decisions at the local schools, and therefore provide options when the outdoors is not available or possible for some other reason... ..There are no standards that specifically state use of outdoor learning spaces. That being said in order to best teach certain science concepts, the outdoors becomes the learning classroom."

-Maryland

"We have 115 schools that have some kind of native wildlife habitat, 94 have an edible garden, and 105 have an outdoor classroom space."

-Virginia

"[From follow-up email] The use of outdoor learning spaces can similarly be connected to a wide variety of standards (generally at the discretion of the teacher). [From interview] We always encourage teachers to take on environmental sustainability but can only require what is in alignment with state documents. There is no requirement that teachers use BMPs or outdoor learning spaces to address state standards and doing so is generally done independently by a teacher... ..some of the professional development opportunities that we provide are in helping teachers know how to use the outdoor learning spaces and making the connections to the curriculum so that it's not viewed, it's so that they can integrate it into what they're already doing in class, rather than feeling like a whole new thing that teachers are having to do. But some of these spaces are also essential to the curriculum, like all of our second graders study the monarch butterflies and all our elementary schools are supposed to have milkweed so that they can study the monarch on its host plant. That's not technically required but strongly encouraged and common."

-Virginia

"We have the nature center which is one acre of trees and outdoor classrooms and the pond and that you know the area where we keep a lot of the water. We also have a fort. So it is a play structure of a fort that we built that on... ..kind of a higher elevation of the nature center, and there's a climbing wall to get to it. Nice and tall and then we have a, you know, we have a couple of playgrounds on campus. And one of the playgrounds is a natural playground. So one of the playgrounds for the big kids is, you know, the traditional structure, the monkey bars and stuff, a garden. We have a playground for the little ones where some things they can climb on but also as a natural playground where they just be creative. That's where the rain gardens used to be. So the kids who aren't maybe physically ready to play on those structures, they can do imaginative stuff. And we have space for them with a lot of natural materials."

-District of Columbia

"So outdoor learning spaces, I would say are twofold. Although many of our schools have formal outdoor learning spaces that might have benches or stage areas or even physical classroom type spaces that they have outdoors. I am a big believer in just getting them outside as the outdoor classroom, that they don't have to have physical space and pieces that they have to use. I try to get them to do things more like using buckets, putting everything in a bucket and turning the bucket upside down and making that your chair that you can go anywhere."

-Maryland

"We have outdoor classrooms and community gardens. Those are the two biggest learning spaces that we kind of coined some of them as learning decks, where there's an actual space above the ground. It's about the square footage of a classroom and there are desks and furniture. There are not a lot of trees, so there are lots of problems with sun... ..It's outer space for learning. So nothing. I guess if nothing's formal yet. We are making those formal connections. And we do have teachers that do go out there, we've had together, like a solar system modeling. Yep. So you need a lot of space to kind of get the scale feature of things and that kind of stuff. So there are connections. I wouldn't say they are on purpose. You know, sometimes it's mindfulness. People who go out there and do yoga, the kids or it might go out and do guitars and music. So it's just there are spaces that are there.... ..Nothing is tied to any standards yet. We're just building infrastructure so that we can officially say this is a perfect standard for here."

-Delaware

"Well, yeah, but I mean the spirit of the next generation science standards is again to, you know, make sure that like the learning is spilling over into the world. And so that you know across science disciplines that kids are seeing the real life connections to or you know what's happening in the world and environment."

-New York

INTERVIEWEE: "Um, I know they, I don't think that they have any requirement to use that space or anything in the curriculum that would require a space like that. But I know it's definitely going to be encouraged and I think everybody's really excited to use that space and to see how they're going to utilize it to influence the curriculum.Yeah, I think that they kind of built the space and had a really good vision for what the space was going to be. Now they got to figure out exactly how they're going to, you know, best utilize that space now that it exists."

Interviewer: "Is the use of the outdoor learning spaces tied to a specific standard?"

INTERVIEWEE: "Not particularly. It'll be mainly for, you know, the STEAM science and STEAM programs will be utilizing that mainly."

-New York

"Yeah, I wouldn't know [the specific standards] off the top of my head, the specifics, but I'm sure that they are there. I know there are content areas that talk about water filtering and that type of media and shorelines and rain barrels and the organisms that live in rain barrels. I know there, especially in that Advanced Placement class, they are there, that content from the college board is so massive right, that can tie into pretty much anything."

-Virginia

"I'm required as a teacher to always try to connect it to curriculum and to have a standard that I'm going toward. The students might not always know what that standard is. They may not understand why, you know, we're making Christmas wreaths. They may not know that there's a connection there to entrepreneurship and using wise use of resources and doing those things, but it is. So we always try to connect it."

-West Virginia

"But in terms of using the outdoors, it is a requirement that when we write our lessons in elementary school we specifically write for them to go outdoors at certain times, when it's appropriate. In terms of middle and high [school], I know that they do [huge projects]... ..and they're taking them outdoors to gather data... .. a curriculum connection, at least in elementary is required, specifically in some way, and aligned to standards again in the environmental literacy and then even within the NGSS state standards where appropriate. Anything that they're doing that we can get them outside, to take a nature walk, to do data collection, to use the outdoors as inspiration when they're doing an engineering project, all those things we write in."

-Maryland

"Well, on the standards under environment and ecology, many of them would be utilized for that. But again, since it's not mandated. I can't say there's a direct line of connection."

-Pennsylvania

"My big thing is a roof, is a rigid non permeable roof because then you're actually creating. It gets hot.....and it's raining right, and it's snowy, how cool would it be if it's you know, it's been snowing out but you have a space that is still covered and kids could go out in the winter. Right. So that's been my big thing, is providing that shade and creating that defined space. We did have a couple outdoor classrooms.... the first one that we built at [name of school] there was a fridge... ..there was an oven. There was a pizza oven pizza grill... .. we've been trying to do a sort of, like glorified, like a pavilion that you see in a park... ..there's a roof and there's picnic tables. And then it's a flexible space that schools can use however they want, even if it's just reading, even if it's just it's a really nice day out so the principal says, Okay, we're going to have our staff meeting outside like that is a win, right, because if you're just encouraging just being outside. And so we have a lot of ways to go on outdoor classrooms, but we've definitely got some cool spaces. Sometimes they're rooftop spaces. Right. So they're actually on the third floor of the building. And so they're next to the science lab or whatever it may be. Yeah, so we've got actually some cool outdoor learning spaces."

-District of Columbia

"I think there's a curriculum connection but it's not written into the curriculum. We primarily connect our outdoor learning spaces to our 7th grade science content. It is not required to be used, but it offers a big connection to the required content, which makes the student learning more meaningful. Well, I mean, we, I think we could find alignment to a specific standard, but as I said, it's not in the written curriculum so."

-Virginia

Table 57. OLS Use in Informal Learning and Community Education Summary (E.2, E.3)

Response	OLSs Included in Informal Learning? Number of Schools/Districts (n=24)	OLSs Used to Educate Community? Number of Schools/Districts (n=24)
Yes	20	3
Some / Passively / Attempted	-	8
No	2	13
Not Known / Identified	2	-

Schools/districts were asked if outdoor learning spaces on school properties are included in informal learning opportunities (after school clubs, scouting groups, etc.), and if OLSs are used to educate the community (either passively with signage or trails, or actively through community outreach or events) (Table 57). Most schools/districts (20 of 24, 83%) reported affirmatively that OLSs on school properties are included in informal learning. Two of 24 schools/districts (8%) stated that OLSs were not used in informal learning and two schools/districts (8%) did not specify in their response. Only 3 of 24 schools/districts (13%) reported outdoor learning spaces on school grounds being used to educate the community, and 8 of 24 (33%) cited that there have been some attempts to educate the community with outdoor learning spaces. Thirteen of 24 schools/districts (54%) reported that outdoor learning spaces on school grounds were not used to educate the community.

Table 58. OLS Use in Informal Learning and Community Education Responses (E.2, E.3)

District/School	OLSs Included in Informal Learning	OLSs Used to Educate the Community?
DC 1	Yes	Attempted
DC 2	Yes	No
DC 3	Yes	No
DE 1	Yes	Some, passively
DE 2	Yes	No, nothing formal, developing ideas
DE 3	Yes	No, nothing formal
MD 1	Yes	Yes
MD 2	Yes	Yes, but not alot.
MD 3	Yes	Yes, somewhat
NY 1	Yes	No
NY 2	Yes, likely	No, not yet
NY 3	Yes	Yes
PA 1	Not identified	Yes, passively
PA 2	Yes	Yes, passively
PA 3	Yes	No
PA 4	No	No
VA 1	Yes	Yes, passively
VA 2	Yes	Yes
VA 3	Not known	No
VA 4	Yes	No
WV 1	Yes	No
WV 2	Yes	No
WV 3	No	No
WV 4	Yes	Some

Table 58 provides a catalog of the responses provided by schools/districts interviewed regarding the use of outdoor learning spaces in informal learning and in educating the community as summarized in Table 57. Examples given by schools/districts of outdoor learning spaces being used for informal education include: elective classes, after-school care, scouting meetings and activities, after-school clubs (eco team, green team, science club, outdoor club, and garden club), YMCA sports, and summer camps. Most schools/districts that discussed ways outdoor learning spaces are used to educate the community also mentioned a desire or ongoing efforts to expand and improve their outreach. Examples of ways that outdoor learning spaces are used to educate the community include: signage about the site or features, nature trails with signage, garden or meadow tours, family science nights, ribbon cutting events, and an Arbor Day celebration and tree planting event.

"A few signs. It's solar panels, rain barrel, wind turbine, But I mean, we have not done a great job in my opinion of having our signage be super informational for the public. Our website did have that and our outdoor classroom website when it was in the intranet mode, it did have a lot more of the specifics."

-Delaware

"There are several schools where trails with signage have been created. [Site name] has [an environmental education center] with 10 acres including landscape conservation areas with signage, aviary with signage, trees with signage, etc. It is used for the Grade 6 residential outdoor ed program (around 6,000 of our Grade 6 kids go here; we rent space at out of county sites for the other 6,000) and for one of the two day environmental programs that [the school district] provides. (Another 5,000 students) The staff of the [environmental education center] provides two family science nights to the community each year. One of those is focused on astronomy, so use of our observatory and outdoor telescopes brings people to the site. The [environmental education center] is surrounded by [name of park] so it receives many visits by community hikers."

-Maryland

INTERVIEWEE: "Not very often the scouts have used our properties for camping once in a while, different groups camped out in the lawn and things, but not as technically as an educational thing. I don't think."

INTERVIEWER: "The fact that they've done some of that though means that if you were to put in more infrastructure about that maybe they would do more?"

INTERVIEWEE: "Yeah, there is more focus now than we've ever had before, for such things. And I think we're kind of excited now the septic systems are eliminated as far as that which gives us a little bit more green space than we were able to use before so one of the big items I know on two different lists that I've seen is an outdoor classroom but again it's we're limited in capital projects and our school districts been known to spend a good portion of money for the necessities, the things we need to improve. It's sometimes we want it and we can't afford it. I think this time it might be a good chance."

-New York

"With our new solar field. We're actively seeking to create signage, as well as a website that will track the energy produced and whatnot. That will be open to the community."

-Maryland

"This would be both. And again, this depends on the school. But, I know that there is signage. I know that there are trails around these areas to identify what they are and then specifically I know when they're scouting groups that have come back to support a lot of our schools have done things like a ribbon cutting for their outdoor space. And they invite parents and the kids who were involved in the scouting group that did it and those sorts of things. You know, maybe towards the end of the day. So community outreach in the sense that they would be reaching out to the school to make sure the parents were aware that it existed and who built it, and then how they were using it. And then that it would be open for weekend use when they're on the trails when they're outside playing that sort of thing."

-Maryland

"We have signs for sure. Like I said, we have meadow paths and the specific reason we put those paths and signs in is to encourage the community to use it."

-Pennsylvania

"I do not think they are. No sir. No we would have a walking path, but that would just be an asphalt area around the perimeter of one of our fields. Our sporting fields, actually the perimeter of our property, and it's adjoining in a cornfield. But that would be the only thing that the public would use"

-Pennsylvania

INTERVIEWER: "Are outdoor learning spaces used to educate the community?"

INTERVIEWEE: "Again, probably not as much as should be. We have advertised. Yeah, we have advertised our grants, what, what was taking place in the newspapers. We have advertised. Honestly, again, it all comes down to time."

-West Virginia

"INTERVIEWER: Are outdoor learning spaces included in informal learning, which is out of school, school clubs scouting 4H? Do they have local outdoor learning spaces?"

INTERVIEWEE: "Not really."

INTERVIEWER: "Are there any outdoor learning spaces in this community that are used for the community to educate them?"

INTERVIEWEE: "Not to educate, no."

-West Virginia

"INTERVIEWER: Are outdoor learning spaces used to educate the community?"

INTERVIEWEE: "That is highly doubtful. The outdoor learning spaces are strictly for the children."

-Virginia

INTERVIEWEE: "Yes. And we do that in a variety of ways. I mentioned writing and similar curricular ways. We have also used outdoor spaces for some of our students with behavioral needs. Often in a very small group, two or three kids, they'll have to take on projects. In the spring, if you come by the campus, there is a hill with about a three acre embankment. Over the past few years we have planted over 500 daffodils out there, which has helped with soil retention. But it has been done by kids with behavioral needs. It's a way for them to get outside, get some exercise, get away from school, get away from family or social, or whatever is bothering them. They put something in and can come back and say I did that. We've done it with daffodils. We've also put a row of iris at the forest edge, at the edge of the mowed property."

INTERVIEWER: "Are outdoor learning spaces used to educate the community?"

INTERVIEWEE: "Not at this point."

-West Virginia

INTERVIEWEE: "I can, I can attest, because my son was in scouts and we use the outdoor classrooms often. Scout meetings are actually handled at the one elementary and they would use the outdoor classroom, but it wasn't for you know formalized instruction, they would use it for an activity or event or the scoutmaster was talking for spaces. Our outdoor spaces are used by other groups. We just got the [name of grant], we used the outdoor space for instruction, we went out and used it. But again, it's not signed up so we can't get the data."

INTERVIEWER: "Do you know if any of the outdoor learning spaces are used to educate the community so not the school groups are scouting, whether it's passively through signage or trails are actively through outreach events?"

INTERVIEWEE: "There is no signage at the outdoor classrooms. Everything that is utilized in them would be brought by the teachers or the instructors. So, um, they're available to the community to be used, but they would just be spaces at that point."

INTERVIEWER: "Gotcha. And if somebody in the community wanted to use one of those spaces. How do they sign up to use it?"

INTERVIEWEE: "There, there isn't a sign up, they're open to them. They're open, in the behind the parking lot or in the middle of the field. One of our great concerns, especially at the elementary was the damage that would be occurring from vandalism. So we actually when we instituted a new surveillance policy and added external cameras. We actually had one facing the outdoor instruction area so that we could monitor it when the evenings come by. So if there was vandalism, we could review the tape and find out what happened, so."

-Pennsylvania

INTERVIEWEE: "I know the community uses some of our nature trails. But we don't have signage or anything like that."

INTERVIEWER: "Like, interpretive trail signs to help explain to people, what's happening in those areas?"

INTERVIEWEE: "It is a goal, but we're not there yet."

-Virginia

Summary of Findings: Outdoor learning spaces (OLS) on school grounds can be an excellent resource to enhance student learning in formal and informal education settings, as well as in educating the community. All schools/districts interviewed (24 of 24) reported outdoor learning spaces being used in school led student learning. Most schools/districts (20 of 24, 83%) cited the use of OLSs in informal learning by after-school clubs (Eco teams, outdoor, science, or garden clubs), scouting groups, and summer programs. The use of OLSs in educating the community was not as prevalent (11 of 24 (46%) cited at least some community education efforts) and typically happened through passive means such as trails and signage. Not all schools have formal outdoor classrooms, although many examples were provided of school grounds that host student learning activities (courtyards, gardens, nature trails, ponds, and pavilions). Formal outdoor classroom spaces varied greatly between districts as some reported benches and/or tables positioned close in an area, while others cited constructed floors or decks with a roof structure to provide protection from weather or excessive sun. One example included an outdoor cooking space with a refrigerator, and another included a structured room with a large bay door that opened to an outside patio with tables. Another interviewee described a mobile outdoor classroom where students carry 5-gallon buckets with materials (clipboard, pencil, tools) and the class roams the school property to find a place for the activity and then sit on the buckets to create the workspace.

Most schools/districts (75%) stated a curriculum connection was encouraged or required when using outdoor learning spaces with students, although only four of 24 (17%) require a curriculum connection. Instruction supervisors and educators described the use of outdoor learning spaces as a best teaching practice as many students thrive in open learning environments and provide space and subject matter for exploratory learning, developing scientific process skills, and understanding concepts of scale (ex. Distances in the solar system). Less than half (11, of 24, 46%) of the schools/districts interviewed reported the use of outdoor learning spaces being aligned to specific standards, with state standards being cited five times, Next Generation Science Standards (NGSS) four times, and Environmental Literacy (ELit) twice. Two schools/districts cited outdoor lab spaces where students could conduct STEM (Science, Technology, Engineering, & Math) design challenges and other schools/districts described using outdoor schools for team building exercises. The use of outdoor learning spaces for informal education was most often cited with scouting groups and after school clubs. Some schools have garden programs that meet outside of school hours and some urban schools/districts reported partnerships with local organizations that manage the garden program to provide extended education and outreach within the community. Two schools/districts mentioned use of outdoor learning spaces by summer programs/camps.

Most schools/districts reported educating the community with outdoor learning spaces through passive means (signage and trails with signage). Active methods of community education cited by schools/districts interviewed included family science nights, an Arbor Day celebration with tree planting, garden or meadow tours (run by local organizations or conservation districts), and ribbon cutting events in opening new outdoor learning space facilities. Some schools/districts mentioned security or vandalism concerns with outdoor classrooms and learning spaces. One district had reports of "riff raff and hanky panky" while another installed cameras to provide surveillance to follow up on issues.

Recommendations

Below are recommendations from the researchers for supporting watershed best management practices (BMPs) on school properties. These recommendations are based on the findings of interviews with sustainable school recognition programs and school leaders across the Chesapeake Bay Watershed.

Recommendations:

- 1) Resources should focus on encouraging/supporting districts in the creation/adoption of sustainability plans to guide their efforts and implementation.
- 2) Resources should be allocated to advocate for the promotion of state level policies and state level oversight of environmental literacy and sustainability plans for school districts in DC, DE, NY, PA and WV.
- 3) BMP promotion to schools/districts should highlight cost/energy savings and the ability to meet building code requirements.
- 4) Efforts to promote BMP installation on school grounds should target capital building projects and focus on mandated BMPs and building codes.
- 5) Assist and support efforts to catalog BMP installations on school grounds in a Chesapeake Bay Watershed database to capture total improvements and potentially monitor maintenance (i.e. send inspection and maintenance reminders every three years).
- 6) Outreach needs to be differentiated for states with larger centralized school districts versus states with smaller school districts. For large centralized school districts, outreach should be focused at the district-level staff. For small independent districts, outreach should be targeted to individual schools and building staff.
- 7) Increase efforts to support small school districts that lack district level infrastructure and personnel (such as sustainability directors) with the installation and maintenance of BMPs on school grounds.
- 8) Local non-formal environmental education providers should actively assist schools in finding ways to use existing and new BMP installations and outdoor learning spaces in formal, non-formal, and informal learning. Some EE providers are also capable of assisting schools in choosing BMPs, developing plans for implementing them on school properties, and on-site construction. Resources and efforts to promote partnerships between EE providers and schools may prove effective in increasing the number and quality of BMPs on school properties.
- 9) Develop resources and efforts to promote partnerships between local government agencies and schools/school districts to increase BMP installations that help meet Chesapeake Bay restoration goals and enhance educational opportunities for students and the community at large.
- 10) Award programs need to be supported, aligned to state level-goals, supported by state-level policy and actively promoted to schools in order to increase participation.
- 11) There needs to be a central location for BMP supporting materials including information on BMP types, benefits and installation for the Bay Watershed to support school districts and recognition programs.
- 12) Expand efforts to promote benefits of BMPs on school grounds as an educational resource for students and the community at large. Highlight stories of successful partnerships and meaningful outcomes of BMPs (new or existing) being integrated into the curriculum at a school or in a school district. This could include resources for schools to access standardized educational signage for BMPs.

Appendix A

Stakeholder Interview Questions

Sustainable Schools Recognition Programs Interview Questions

- A. Summary of your program
 - i. What are the goals of your program?
 - ii. How did your sustainable school recognition program begin?
 1. How did your agency become tasked with facilitating the green schools recognition program in your state?
 - iii. What do schools/districts need to do to be recognized by your program?
 1. The Chesapeake Bay Program requires that certification programs have at least 2 of the three pillars of the US Green Ribbon program (**Reduced Environmental Impact and Costs, Improved Health and Wellness, Effective Environmental and Sustainability Education**). Which of the pillars does your program require?
 - a. Is the installation or integration of BMPs a requirement of certification in your recognition program?
 2. How many schools (/school districts) apply each year?
 - a. How many schools are recognized each year (is there a limit)?
 - b. What is the success rate for applicants?
 - c. What percentage of schools in the state are recognized? or How many schools have been recognized in your state?
 - d. What is the growth trajectory or goal of the program? Room for growth? roadblocks/speed bumps?
 3. How do you review the applications? Do you bring together a committee?
 - a. Who supports the school or school district in their application process?
 - b. When a school or SD applies, who is leading that effort?
 - c. Is there anything you would change with the application or application process?
 - d. How are students engaged in the application process and program?
 - i. Is student participation required in implementing BMPs as a condition of certification?
 4. Is a curriculum connection required? Encouraged? Not Required?
 - a. Is an extracurricular component required? (after-school programs, clubs, etc.) Encouraged? Not Required?
 5. Is a community connection/partnership required? Encouraged? Not Required? What would be an example of a community connection, is there one that you could highlight or describe?
- iv. How many staff support the recognition program? (i.e. paid staff, volunteers, people from other agencies)
 1. Paid Staff (full time/proportional)?

- a. What is the proportion of time allotted to staff for the recognition program?
 2. Volunteers?
 3. Other Agencies or organizations?
- v. How do you promote your recognition programs to schools?
 1. What method of promoting your recognition program is most effective/successful?
 2. Do you use social media to spread the word? If yes, which ones do you use?
 3. Do you track online traffic/hits?
- B. What resources does your program provide to schools to help them develop their initiatives around the three pillars? (e.g. financial, design, labor, curricula, website)
 - i. Do your resources include information on BMPs?
 - ii. How do you share your information? (e.g. website, emails, trainings, newsletters, social media, and conferences)
- C. What outdoor/schoolyard improvement projects do you promote in your program? (including BMPs)

<input type="checkbox"/> Rainwater Detention Basins	<input type="checkbox"/> Media Filters	<input type="checkbox"/> Porous Pavement
<input type="checkbox"/> Retention Ponds	<input type="checkbox"/> Rain Gardens	<input type="checkbox"/> Green Roofs
<input type="checkbox"/> Hydrodynamic Devices	<input type="checkbox"/> Wetlands	<input type="checkbox"/> Pollinator Gardens
<input type="checkbox"/> Riparian Buffers (tree plantings)	<input type="checkbox"/> Sediment Traps	<input type="checkbox"/> School Gardens
<input type="checkbox"/> Outdoor Classrooms	<input type="checkbox"/> Meadow Restorations	<input type="checkbox"/> Native Plantings
<input type="checkbox"/> Invasive species removal	<input type="checkbox"/> Living Shorelines	<input type="checkbox"/> Rain Barrels
<input type="checkbox"/> Integrated Pest Management (IPM)	<input type="checkbox"/> Bio-swales	<input type="checkbox"/> Urban Forestry (tree plantings)

 - i. Others: _____
 - ii. Which BMPs are most popular or commonly implemented in schools?
- D. How do you track implementation of BMPs on school properties?
 - i. What data is collected and in what units? How do you track data?
 - ii. How do you store data?
 - iii. How do you share the data?
 - iv. Do you do any follow up with schools to track maintenance of BMPs?
- E. What other sustainability practices that reduce environmental impact do you encourage schools/districts to implement?

<input type="checkbox"/> water bottle refilling stations	<input type="checkbox"/> composting
<input type="checkbox"/> vermicomposting	<input type="checkbox"/> car-pooling,
<input type="checkbox"/> biking/walking to school	<input type="checkbox"/> local foodshed procurement
<input type="checkbox"/> alternative fuel/electric transportation	<input type="checkbox"/> green cleaning products
<input type="checkbox"/> lead exposure testing	<input type="checkbox"/> radon testing
<input type="checkbox"/> indoor air quality	<input type="checkbox"/> no idling policy
<input type="checkbox"/> food services-waste reduction (recyclable/biodegradable flatware)	
<input type="checkbox"/> energy efficiency options (heating/cooling, lighting, etc.)	

- ☐ renewable energy sourcing (purchasing, installation, storage - solar, wind, hydro)
- ☐ hazardous waste management, reduction or elimination (e.g. electronics, batteries, chemicals, print cartridges)

i. Others: _____

- F. What challenges have you faced in increasing the number of schools in the program?
- G. Is there anything in this interview that I should have asked? Is there anything that you would like to add?

School District Interview Questions

A. Summary of your school district's sustainability plan/goals?

1. What are the motivating factors in implementing sustainability plans and projects in your school district (e.g. money savings, certification, connection to curriculum, Sustainability/Green Ribbon recognition)?
2. How is the district encouraging your schools to be involved in sustainability plans and projects?
3. Have any schools in your district earned any commendations from green school/sustainability recognition programs (ie. US or State Green Ribbon, State Sustainability, VA Naturally, Eco-Schools USA, etc.)?
4. How many schools are in your school district? How many students do you serve?

Now we want to ask specifically about Best Management Practices (BMPs) as this is the focus for this particular research project.

The term 'Best Management Practices', or BMPs, is a way to describe acceptable conservation practices that could be implemented to protect water quality and promote soil conservation. A BMP can be structural "things" that you install on-the-ground, or policy/procedural changes that seek to limit impacts on water quality. Examples may include runoff diversions, silt fence, planting stream buffers, reducing chemical use, enforcing a no-idling policy, or planting ground cover vegetation over bare soil areas.

B. Do you have any BMP's installed on school properties in the district?

(Go over BMP list and have school district identify which ones were installed)

- | | | |
|--|---|---|
| <input type="checkbox"/> Rainwater Detention Basins | <input type="checkbox"/> Media Filters | <input type="checkbox"/> Porous Pavement |
| <input type="checkbox"/> Retention Ponds | <input type="checkbox"/> Rain Gardens | <input type="checkbox"/> Green Roofs |
| <input type="checkbox"/> Hydrodynamic Devices | <input type="checkbox"/> Wetlands | <input type="checkbox"/> Pollinator Gardens |
| <input type="checkbox"/> Riparian Buffers (tree plantings) | <input type="checkbox"/> Sediment Traps | <input type="checkbox"/> Rain Barrels |
| <input type="checkbox"/> Meadow Restorations | <input type="checkbox"/> Native Plantings | <input type="checkbox"/> Living Shorelines |
| <input type="checkbox"/> Integrated Pest Management (IPM) | <input type="checkbox"/> Invasive species removal | <input type="checkbox"/> Bio-swales |
| <input type="checkbox"/> Urban Forestry (tree planting) | | |
| <input type="checkbox"/> School Gardens if irrigated with water collected in a BMP | | |
| <input type="checkbox"/> Outdoor Classrooms in or next to a BMP for use with watershed lessons | | |

1. Is the installation of BMPs part of your school district's sustainability and/or facilities management plans?
2. Are there any additional BMPs you have considered installing on your school properties?
3. What challenges have you faced with installing BMPs?
4. How do you make decisions about what BMP's to implement?
5. How did you know how to implement the BMP?
 - a. Who provided support in the design and construction of the BMP?
 - b. Did any municipal or community groups assist with the planning or implementation of the BMPs on your school grounds?
 - c. How did you access services to help with design, permits, construction, etc.?
 - d. Who paid for the BMP?
6. How did particular school(s) (instead of another school in the district) get chosen for the BMP implementation?
7. Are your BMPs included in your schools' applications/awards?
8. Does the existence of award programs influence your decision to implement BMPs on school properties?
9. What other environmental improvements to school grounds have you made?

C. How are the BMPs on your school property maintained?

1. Is the upkeep of BMPs part of your school sustainability and/or maintenance plans?
 - a. Who maintains the BMP? Faculty, staff, students?
2. What challenges have you faced with the maintenance of your BMPs?
3. Are you pleased with the final result of your installed BMPs? Does it meet your desired outcomes? If so, please list examples. (Examples: student learning goals, meeting MS4 stormwater requirements for their local area, addressing an area of their schoolyard that is always wet and unusable for other activities, etc.)

D. Are BMPs used to support student learning at your school?

1. Were students engaged in the identification of a local watershed issue?
 - a. If so, were they engaged in developing ideas and implementing improvements?
 - b. Did students have a role and voice in the process?
2. Do your schools integrate the BMPs into the curriculum (Required, Encouraged, Not Required, by the State standards, District standards, or Principal?)?
 - a. Is it aligned to specific standards?
3. Are the BMPs included in informal learning (after school clubs, scouting, etc.)?
4. Are the BMPs used to educate the community? (passively - signage, trails, or actively community outreach or events)

E. Are outdoor learning spaces used in student learning at your schools?

(If yes: what outdoor learning spaces do your schools have and how they are used?)

1. Is a curriculum connection (Required / Encouraged / Not Required) in using outdoor learning spaces at your schools?
 - a. Is using outdoor learning spaces aligned to a specific standard?

2. Are outdoor learning spaces included in informal learning (after school clubs, scouting, etc.)?
3. Are outdoor learning spaces used to educate the community? (passively - signage, trails, or actively community outreach or events)

Appendix B.

Coding Framework for Interviews

Coding Framework Sustainable Schools Recognition Program Interviews

A.i & ii Summary of program:

- i. What are the goals of your program?
- ii. How did your sustainable school recognition program begin?
 1. How did your agency become tasked with facilitating the green schools recognition program in your state?

Nodes & Sub-Nodes

Summary of program: Details of their GS Recognition program goals and history.

	PROGRAM GOALS: What are the goals of your sustainable program?
	PROGRAM HISTORY: How did your sustainable school recognition program begin? How did your agency become tasked with facilitating the green schools recognition program in your state?
Sub-Nodes	

A.iii .1 Summary of Program: Requirements for Recognition

- iii. What do schools/districts need to do to be recognized by your program?
 1. The Chesapeake Bay Program requires that certification programs have at least 2 of the three pillars of the US Green Ribbon program (**Reduced Environmental Impact and Costs, Improved Health and Wellness, Effective Environmental and Sustainability Education**). Which of the pillars does your program require?
 - a. Is the installation or integration of BMPs a requirement of certification in your recognition program?

Nodes & Sub-Nodes

Description of Requirements: Details of the requirements that schools must meet to earn recognition in the program. Which pillars must schools accomplish and are BMPs reflected in their requirements.

Sub-Nodes	RECOGNITION PROCESS: What do schools/districts need to do to be recognized by your program?
	PILLAR REQUIREMENTS: Which pillars must be included for schools to be recognized?
	BMP INTEGRATION REQUIREMENT: Is the installation or integration of BMPs a requirement of certification in your recognition program?

A.iii. 4 & 5 Summary of Program: Requirements for Program Connections

4. Is a curriculum connection required? Encouraged? Not Required?
 - a. Is an extracurricular component required? (after-school programs, clubs, etc.) Encouraged? Not Required?
5. Is a community connection/partnership required? Encouraged? Not Required? What would be an example of a community connection, is there one that you could highlight or describe?

Nodes & Sub-Nodes

Description of Required Connections: Details of the curricular and community connection requirements that schools must meet to earn recognition in the program.

Sub-Nodes	CURRICULUM CONNECTION: Is a curriculum connection required? Encouraged? Not Required?
	EXTRACURRICULAR: Is an extracurricular component required? (after-school programs, clubs, etc.) Encouraged? Not Required?
	COMMUNITY CONNECTION: Is a community connection/partnership required? Encouraged? Not Required? What would be an example of a community connection, is there one that you could highlight or describe?

A.iii.2 Summary of Program: School Recognition Statistics

- A. 111.2 How many schools (/school districts) apply each year?
 - a. How many schools are recognized each year (is there a limit)?
 - b. What is the success rate for applicants?
 - c. What percentage of schools in the state are recognized? or How many schools have been recognized in your state?
 - d. What is the growth trajectory or goal of the program? Room for growth? roadblocks/speed bumps?

Nodes & Sub-Nodes

Description of School Recognition Statistics: Details of the reach of the school recognition programs.

Sub-Nodes	RECOGNITION RATE: How many schools (/school districts) apply each year? How many schools are recognized each year (is there a limit)? What is the success rate for applicants?
	STATEWIDE STATISTICS: What percentage of schools in the state are recognized? or How many schools have been recognized in your state?
	GSR Program Challenges: What is the growth trajectory or goal of the program? Room for growth? roadblocks/speed bumps?

A.iii.3 Summary of Program: Application Process:

- A. iii.3 How do you review the applications? Do you bring together a committee?
 - a. Who supports the school or school district in their application process?
 - b. When a school or SD applies, who is leading that effort?
 - c. Is there anything you would change with the application or application process?
 - d. How are students engaged in the application process and program?
 - i. Is student participation required in implementing BMPs as a condition of certification?

Nodes & Sub-Nodes

Description of the Application Process: Details of the State School recognition program process.

Sub-Nodes	Application Review: How do you review the applications? Do you bring together a committee?
	Application Support: Who supports the school or school district in their application process?
	Application Feedback: Is there anything you would change with the application or application process?
	Student Involvement in the Application Process: How are students engaged in the application process and program?
	Student Involvement in BMP Implementation: Is student participation required in implementing BMPs as a condition of certification?

A.iv Summary of program: Staffing

- iv. How many staff support the recognition program? (i.e. paid staff, volunteers, people from other agencies)
 - 1. Paid Staff (full time/proportional)?
 - a. What is the proportion of time allotted to staff for the recognition program?
 - 2. Volunteers?
 - 3. Other Agencies or organizations?

Nodes & Sub-Nodes

Description of Staffing: Details of the staffing involved in the state Green Schools recognition program.

Sub-Nodes	Paid Staff and GSR proportion of duty: Paid Staff (full time/proportional)? What is the proportion of time allotted to staff for the recognition program?
	Volunteer Involvement: Are volunteers involved in staffing your GSR program?

Involvement of Outside Agencies or Organizations: Are other agencies or organizations involved in staffing your GSR program?

A.v.2 Summary of Program: GS Program Promotion

How do you promote your recognition programs to schools?

1. What method of promoting your recognition program is most effective/successful?
2. Do you use social media to spread the word? If yes, which ones do you use?
3. Do you track online traffic/hits?

Nodes & Sub-Nodes

Description of GS Program Promotion: Details the methods agencies use to spread the word about their Green Schools recognition program and evaluate effectiveness.

Sub-Nodes	Promotion Methods: How do you promote your recognition programs to schools?
	Promotion Effectiveness: What method of promoting your recognition program is most effective/successful?
	Use of Social Media: Do you use social media to spread the word? If yes, which ones do you use?
	Tracking Traffic: Do you track online traffic/hits?

B) Provided Resources summary questions:

B. What resources does your program provide to schools to help them develop their initiatives around the three pillars?

- i. Do your resources include information on BMPs?
- ii. How do you share your information?

Nodes & Sub-Nodes

Description of Resources: Details of the resources they provide to schools to develop their initiatives around the three pillars

Sub-Nodes	RESOURCES: What resources do you provide to schools (e.g. financial, design, labor, curricula, website)?
	BMP Inclusion: Do your resources include information on BMPs?
	INFORMATION SHARING: How is information shared with schools (e.g. website, emails, trainings, newsletters, social media, and conferences)?

C & F) BMP & Other Sustainability Practices summary questions:

C. What BMPs do you promote via your program?

F. What other sustainability practices that reduce environmental impact do you encourage schools/districts to implement?

Nodes & Sub-Nodes

Description of BMP types and OTHER sustainability practices: Details the types of BMPs and other sustainability practices promoted by program

Sub-Nodes	BMP Types Promoted: What types of BMPs does the program promote (e.g. rain gardens, rain barrels, maintain or plant riparian buffer, decrease impervious surface, reduce pesticide/herbicide use)?	
	Rainwater Detention Basins	Media Filters
	Porous Pavement	Retention Ponds
	Rain Gardens	Green Roofs
	Hydrodynamic Devices	Wetlands
	Pollinator Gardens	Sediment Traps
	Riparian Buffers (tree plantings)	School Gardens
	Outdoor Classrooms	Meadow Restorations
	Native Plantings	Invasive species removal
	Living Shorelines	Rain Barrels
	Integrated Pest Management (IPM)	Bio-swales
	Other encouraged sustainability practices: What other sustainability practices that reduce environmental impact do you encourage schools/districts to implement? Addition suggestion: If yes, then 'how'?	
	water bottle refilling stations	composting
	vermicomposting	car-pooling
	biking/walking to school	local foodshed procurement
	alternative fuel/electric transportation	green cleaning products
	lead exposure testing	radon testing
	indoor air quality	no idling policy
	food services-waste reduction (recyclable/biodegradable flatware	
	energy efficiency options (heating/cooling, lighting, etc)	
	renewable energy sourcing (purchasing, installation, storage - solar, wind, hydro)	
	hazardous waste management, reduction or elimination (e.g. electronics, batteries, chemicals, print cartridges)	
	Others: _____	

D) BMP implementation tracking questions:

D.How do you track implementation of BMPs on school properties?

- i) How do you store data?
- ii) How do you track data?
- iii) How do you share the data?
- iv) Do you do any follow up with schools to track maintenance of BMPs?

Nodes & Sub-Nodes

BMP Implementation Tracking: Details of how their program tracks BMPs on school properties.

Sub-Nodes	TRACKING BMP Implementations: How do you track implementation of BMPs on school properties (e.g. database, school visits, surveys)?
	DATA STORAGE: How do you store the data captured from BMPs on school properties (e.g. network, public database)?
	DATA TRACKING: How do you track data captured from BMPs on school properties?
	DATA SHARING: How do you share the data captured from BMPs on school properties?
	BMP Maintenance tracking: Do you do any follow up with schools to track maintenance of BMPs?

E) Challenges questions:

G. What challenges has your program experienced in increasing the number of schools in your recognition program?

Nodes & Sub-Nodes

Description of Challenges: Detail the challenges your program has faced overall with the recognition program

Sub-Nodes	GSR Program Challenges: What challenges has your program experienced in increasing the number of schools in your recognition program?
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Coding Framework for School District Interviews

A) Summary of school's sustainability goals:

1. Does your school district have a sustainability plan or set of goals?
2. What are the motivating factors in implementing sustainability plans and projects in your school district (e.g. money savings, certification, connection to curriculum, Sustainability/Green Ribbon recognition)?
2. How is the district encouraging your schools to be involved in sustainability plans and projects?
3. Have any schools in your district, or your school district, earned any commendations from green school/sustainability recognition programs (ie. US or State Green Ribbon, State Sustainability, VA Naturally, Eco-Schools USA, etc.)?
4. How many schools are in your school district? How many students do you serve?

Nodes & Sub-Nodes

Summary of Sustainability goals/plan: Details of the school district's sustainability plan and goals, motivating factors in implementing sustainability plans or projects, if and how the school district encourages school participation in sustainability plans or projects, if the district or schools have been recognized, and the size of their school district.

Sub-Nodes

SUSTAINABILITY PLAN or GOALS: Does your school district have a sustainability plan or set of goals?

PROGRAM GOALS: What are the goals/plans of your school's sustainable program?

MOTIVATING FACTORS: What are the motivating factors in implementing sustainability plans and projects in your school district (e.g. money savings, certification, connection to curriculum, Sustainability/Green Ribbon recognition)?

SCHOOL DISTRICT ENCOURAGEMENT: How is the district encouraging your schools to be involved in sustainability plans and projects?

RECOGNITIONS: Have any schools in your district, or your school district, earned any commendations from green school/sustainability recognition programs (ie. US or State Green Ribbon, State Sustainability, VA Naturally, Eco-Schools USA, etc.)?

DISTRICT DEMOGRAPHICS: How many schools are in your school district? How many students do you serve?

B) BMPs implemented on School Properties:

- **Which BMPs do you have on school properties in the district?**
 1. Is the installation of BMPs part of your school district's sustainability and/or facilities management plans?
 2. Are there any additional BMPs you have considered installing on your school properties?
 3. What challenges have you faced with installing BMPs?
 4. How do you make decisions about what BMP's to implement?
 5. How did you know how to implement the BMP?
 - a. Who provided support in the design and construction of the BMP?
 - b. Did any municipal or community groups assist with the planning or implementation of the BMPs on your school grounds?
 - c. How did you access services to help with design, permits, construction, etc?
 - d. Who paid for the BMP?
 6. How did particular school(s) (instead of another school in the district) get chosen for the BMP implementation?
 7. Are your BMPs included in your schools' applications/awards?
 8. Does the existence of award programs influence your decision to implement BMPs on school properties?
 9. What other environmental improvements to school grounds have you made?

Nodes & Sub-Nodes

BMPs Implemented on School Properties: Details of the BMPs and other environmental improvements chosen to install by the school (which types and why), how they made decisions to install BMPs, how did they know how to install those types of BMPs, and the support provided for implementation including funding resources.

Sub-Nodes	BMP TYPES INSTALLED: What BMPs did you choose to install? Why?		
	Rainwater Detention Basins	Media Filters	Porous Pavement
	Retention Ponds	Rain Gardens	Green Roofs
	Hydrodynamic Devices	Wetlands	Pollinator Gardens
	Riparian Buffers (tree plantings)	Sediment Traps	Rain Barrels
	Meadow Restorations	Native Plantings	Living Shorelines
	Integrated Pest Management (IPM)	Invasive species removal	Bio-swales
	Urban Forestry (tree Plantings)		
	School Gardens if irrigated with water collected in a BMP		
	Outdoor Classrooms in or next to a BMP for use with watershed lessons		
	BMPs PART OF PLAN: Is the installation of BMPs part of your school district’s sustainability and/or facilities management plans?		
	ADDITIONAL BMPs CONSIDERED: Are there any <u>additional</u> BMPs you have considered installing on your school properties?		
	CHALLENGES INSTALLING BMPs: What challenges have you faced with installing BMPs?		
	DECISION PROCESS FOR BMP SELECTION: How did you make decisions about what BMP’s to implement (e.g. received guidance from recognition programs, staff at school, BMP professionals, websites)?		
	HOW TO IMPLEMENT BMP: How did you know how to implement the BMP (i.e. what materials and equipment to use, when and where to install)? Who provided support in the design and construction of the BMP? How did you access services to help with design, permits, construction, etc?		
	OUTSIDE SUPPORT: Did any municipal or community groups assist with the planning or implementation of the BMPs on your school grounds?		
	BMP INSTALLATION FUNDING: Who paid for the BMP?		
	SCHOOL SITE SELECTION: How did your school (instead of another school in the district) get chosen for the BMP implementation?		
	BMPs IN AWARD APPLICATIONS: Are your BMPs included in your schools’ applications/awards?		
	AWARD PROGRAM INFLUENCE: Does the existence of award programs influence your decision to implement BMPs on school properties?		
	OTHER ENVIRONMENTAL IMPROVEMENTS: What other environmental improvements to your school grounds have you made (e.g. types of BMPs)?		

C) BMP Maintenance:

- **How are the BMPs on your school property maintained?**
 1. Is the upkeep of BMPs part of your school sustainability and/or maintenance plans?
 - a. Who maintains the BMP? Faculty, staff, students?
 2. What challenges have you faced with the maintenance of your BMPs?
 3. Are you pleased with the final result of your installed BMPs? Does it meet your desired outcomes? If so, please list examples. (Examples: student learning goals, meeting MS4 stormwater

requirements for their local area, addressing an area of their schoolyard that is always wet and unusable for other activities, etc.)

Nodes & Sub-Nodes

BMP Maintenance: Details of the maintenance of BMPs installed on school grounds and the challenges faced with maintaining the BMPs, and if the outcomes meet goals.

BMP MAINTENANCE PLANS: Is the upkeep of BMPs part of your school sustainability and/or maintenance plans?

WHO MAINTAINS BMPs: Who maintains the BMP? Faculty, staff, students?

MAINTENANCE CHALLENGES: What challenges have you faced with the maintenance of your BMPs?

BMP OUTCOMES: Are you pleased with the final result of your installed BMPs? Does it meet your desired outcomes? If so, please list examples. (Examples: student learning goals, meeting MS4 stormwater requirements for their local area, addressing an area of their schoolyard that is always wet and unusable for other activities, etc.)

D) Student learning from BMPs:

● Are BMPs used to support student learning at your schools?:

1. Were students engaged in the identification of a local watershed issue?
 - a. If so, were they engaged in developing ideas and implementing improvements?
 - b. Did students have a role and voice in the process?
2. Do your schools integrate the BMPs into the curriculum (required, Encouraged, Not Required by the State standards, District standards, or Principal?)?
 - a. Is it aligned to specific standards?
3. Are the BMPs included in informal learning (after school clubs, scouting, etc)?
4. Are the BMPs used to educate the community? (passively - signage, trails, or actively community outreach or events)

Nodes & Sub-Nodes

Student learning from BMPs: Details if students were engaged in identifying watershed issues and BMP implementation, if there is a curriculum connection with the BMPs at the school and alignment with standards, if BMPs are used in informal learning or community education.

Sub-Nodes

BMPs SUPPORT STUDENT LEARNING: Are BMPs used to support student learning at your school?

STUDENTS IDENTIFY WATERSHED ISSUES: Were students engaged in the identification of a local watershed issue?

STUDENT INVOLVEMENT IN BMP INSTALLATION: Were students engaged in developing ideas and implementing improvements? Did students have a role and voice in the process?

BMP CURRICULUM CONNECTION: Do your schools integrate the BMPs into the curriculum (required, Encouraged, Not Required by the State standards, District standards, or Principal?)?

BMP ALIGNMENT TO STANDARDS: Is the use of BMPs in the curriculum

	aligned to specific standards?
	BMP INFORMAL LEARNING: Are the BMPs included in informal learning (after school clubs, scouting, etc)?
	BMP COMMUNITY CONNECTION: Are the BMPs used to educate the community? (passively - signage, trails, or actively community outreach or events)

E): Student learning from Outdoor Learning Spaces (OLS):

- **Are outdoor learning spaces used in student learning at your schools?**

(if yes: what outdoor learning spaces do your schools have and how they are used?)

1. Is a curriculum connection (Required / Encouraged / Not Required) in using outdoor learning spaces at your schools?
 - a. Is using outdoor learning spaces aligned to a specific standard?
2. Are outdoor learning spaces included in informal learning (after school clubs, scouting, etc)?
3. Are outdoor learning spaces used to educate the community? (passively - signage, trails, or actively community outreach or events)

Nodes & Sub-Nodes

Student learning from Outdoor Learning Spaces (OLS): Details if outdoor learning spaces are integrated into student learning, if there is a curriculum connection and alignment with standards, if OLS are used in informal learning or community education.

Sub-Nodes	OUTDOOR LEARNING SPACES (OLS) SUPPORT STUDENT LEARNING: Are outdoor learning spaces used in student learning at your schools? (if yes: what outdoor learning spaces do your schools have and how they are used?)
	OLS CURRICULUM CONNECTION: Is a curriculum connection (Required / Encouraged / Not Required) in using outdoor learning spaces at your schools?
	OLS ALIGNMENT TO STANDARDS: Is the use of OLS in the curriculum aligned to specific standards?
	OLS INFORMAL LEARNING CONNECTION: Are outdoor learning spaces included in informal learning (after school clubs, scouting, etc)?
	OLS COMMUNITY CONNECTION: Are outdoor learning spaces used to educate the community? (passively - signage, trails, or actively community outreach or events)

Method for Selecting BMPs for School Properties

Scott Ensign, David Kline

Stroud Water Research Center
970 Spencer Rd
Avondale PA 19311

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Abstract

A primary objective of this project is to provide a decision support tool that school district officials, school leaders, and agency staff can use to identify school properties where BMPs will have the highest benefit to the Chesapeake Bay Program. In this report we provide a method of using the CBW Public School Stream BMP Evaluation Tool in combination with other web-based modeling applications to compare the suitability of school districts, school properties, and individual BMPs for meeting various needs of the CBP.

Keywords: Best Management Practices, school grounds, stormwater, Model My Watershed[®], nitrogen, phosphorus, sediment

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Step One: Compare Suitability of School Districts for Restoration Opportunity

The CBW Public School Stream BMP Evaluation Tool (vers 1.0), developed by Stroud Water Research Center (Scope of Work 11: Quantify and support Best Management Practice (BMP) installation and restoration at schools to contribute directly to Bay restoration goals) is a web-based GIS application for displaying environmental and socio-economic attributes across the Chesapeake Bay Watershed. By visualizing these attributes across school districts and school properties, a user is able to develop a quantitative comparison that supports decision making and prioritization of restoration efforts. Because each user will have a unique focus on a subset of attributes and may weigh those attributes differently, the method we suggest here is intended to be modified to accommodate a wide range of interests.

As an example, suppose a user was interested in ranking the prioritization of two neighboring school districts in Maryland based on environmental literacy equity, current water quality (and the implied need for BMPs to improve water quality), and the conservation or restoration potential need. A user would display each of these layers individually in the CBW Public School Stream BMP Evaluation Tool, match their color code with the legend, and note the result value (or refer to the table at the bottom of the Tool as shown in Figure 1). Tables 1 and 2 show this method applied to Baltimore City and County Public Schools, respectively. The categorical metric Index of Biotic Integrity must be converted to a numeric value as shown, and the Conservation and Restoration status must be inverted ($2 - \text{VALUE}$) so that higher values indicate a greater need for restoration. Finally, a weighting factor can be applied if desired. The product of values and their weighting factors is summed. In this example, Baltimore City Public Schools had a higher composite score (2.11, Table 1) than Baltimore County Public Schools (2.035, Table 2); this may lead a user to decide that Baltimore City Public Schools should be prioritized for restoration activities and BMPs.

Figure 1. *Example of Index of Biotic Integrity data from the CBT Public School Stream BMP Evaluation Tool (vers 1.0).*

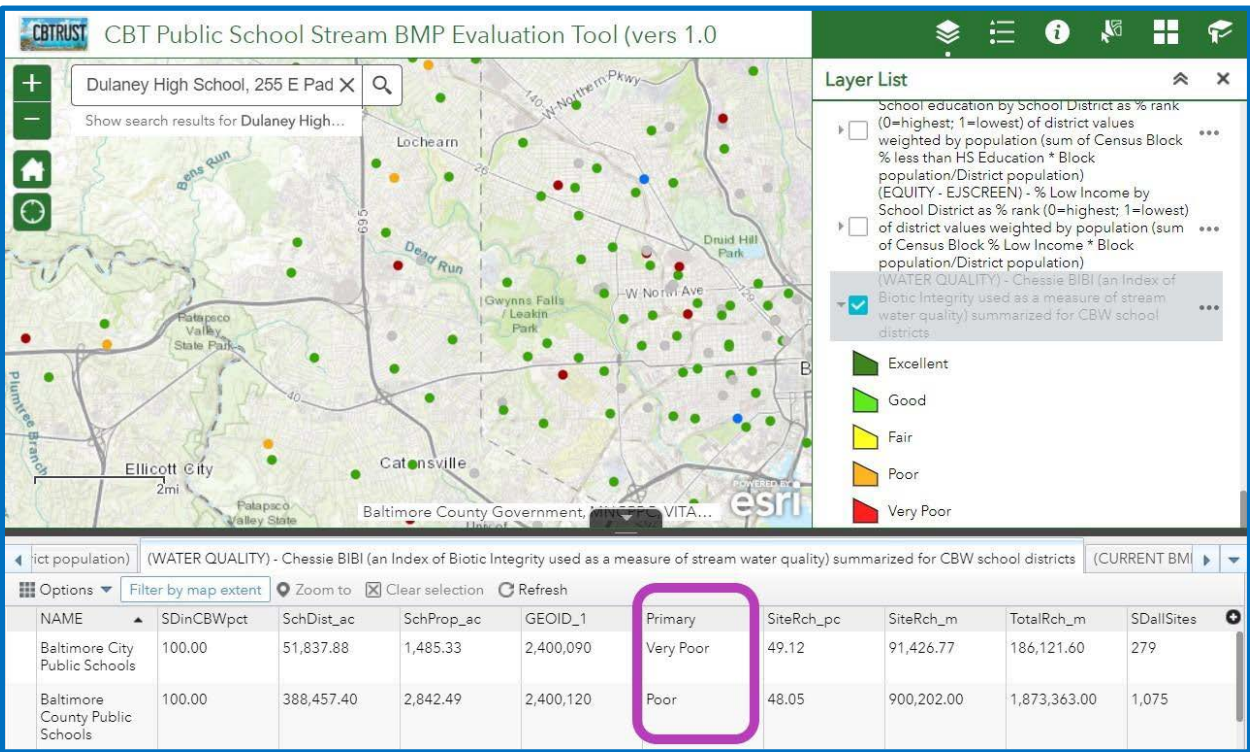


Table 1. Application of the CBW Public School Restoration Evaluation Tool to Baltimore City Public Schools. In this hypothetical example, three criteria were selected for calculating a composite score representing the need for BMPs. It was assumed that lower environmental literacy equity created an opportunity for and greater impact of BMPs. It was also assumed that the conservation and restoration status carried twice the weight as environmental literacy equity and index of biotic integrity, hence the weighting factors. Finally, the conservation and restoration status VALUE needed to be inverted ($2 - \text{VALUE}$) so that the higher the modified value the greater the restoration need.

Criteria	VALUE from Evaluation Tool	Interpretation of VALUE	Interpreted or Modified Value (where blank, user must determine if higher or lower number indicates greater need for BMP)	Weighting Factor (value between 0 and 1; all weightings used must sum to 1)	Modified Value X Weighting Factor; higher result indicates greater need for BMPs
Environmental Literacy Equity 2019 (19PLNGRP)	3	scale: 0=no data, 1=unprepared, 2=somewhat prepared, 3=well prepared		0.25	$3 \times 0.25 = 0.75$
Index of Biotic Integrity	very poor	scale: very poor (5), poor (4), fair (3), good (2), excellent (1); lower integrity indicates higher need for BMPs	very poor = 5	0.25	$5 \times 0.25 = 1.25$
Conservation and Restoration status	1.77	scale: 0 to 2; higher number indicates lowest conservation need	$2 - 1.77 = 0.23$	0.5	$0.23 \times 0.5 = 0.115$
				TOTAL	$0.75 + 1.25 + 0.115 = 2.11$

Table 2. Application of the CBW Public School Restoration Evaluation Tool to Baltimore County Public Schools. In this hypothetical example, three criteria were selected for calculating a composite score representing the need for BMPs and all assumptions match those in Table 1.

Criteria	VALUE from Evaluation Tool	Interpretation of VALUE	Interpreted or Modified Value (where blank, user must determine if higher or lower number indicates greater need for BMP)	Weighting Factor (value between 0 and 1; all weightings used must sum to 1)	Modified Value X Weighting Factor; higher result indicates greater need for BMPs
Environmental Literacy Equity	3	scale: 0=no data, 1=unprepared, 2=somewhat prepared, 3=well prepared		0.25	$3 \times 0.25 = 0.75$
Index of Biotic Integrity	poor	scale: very poor (5), poor (4), fair (3), good (2), excellent (1); lower integrity indicates higher need for BMPs	poor = 4	0.25	$4 \times 0.25 = 1$
Conservation and Restoration status	1.43	scale: 0 to 2; higher number indicates lowest conservation need	$2 - 1.43 = 0.57$	0.5	$0.57 \times 0.5 = 0.285$
TOTAL					$0.75 + 1 + 0.285 = 2.035$

NOTE: Appendix A contains a blank worksheet that can be printed and used for school district comparisons.

Step Two: Compare Attributes of School Properties for Restoration Potential

The next level of analysis compares two or more school properties for their suitability for restoration through BMPs. As an example, two randomly selected schools were chosen from the Baltimore region for comparison. Dulaney High School occupies a 172,000 m² parcel in a suburban region area Frederick Elementary School occupies a 15,000 m² parcel in a highly urbanized area. Stormwater runoff, suspended solids, nitrogen, and phosphorus export from these two school properties was modeled using [Model My Watershed®](https://modelmywatershed.org/) (<https://modelmywatershed.org/>). Model My Watershed® is a web app that enables citizens, conservation practitioners, municipal decision-makers, educators, and students to: 1) analyze real land use and soil data in their neighborhoods and watersheds, 2) model stormwater runoff and water-quality impacts using professional-grade models, 3) compare how different

conservation or development scenarios could modify runoff and water quality. Model My Watershed's Site Storm model predicts the volume of storm runoff, nitrogen, phosphorus, and sediment load from an area of landscape during a 24 hour rain storm and a user-defined total precipitation depth. Details on how to set up and run this model are provided in Appendix B. The boundary of the two properties was determined from this project's CBW Public School Stream BMP Evaluation Tool; those boundaries were drawn as the area of interest in two separate Model My Watershed® projects.

The output from Model My Watershed's Site Storm Model (Figure 2) will be compared for each site to determine which school property is producing the largest amount of stormwater, sediment, nitrogen, and phosphorus runoff during storms relative to the size of the school property. The stormwater runoff volume must be normalized by the total water flux (total water flux equals runoff plus evapotranspiration plus infiltration) and expressed as a percentage of the total flux. The other three metrics are expressed on a mass per area basis, making large and small properties comparable. The model predicts that Frederick Elementary School is contributing more stormwater pollution per area of property than Dulaney High School (Table 3). Thus, BMPs installed at Frederick Elementary School may achieve greater impact per area of school property than at Dulaney High School.

Figure 2. Runoff and water quality at Frederick Elementary School from the Model My Watershed® Site Storm Model.

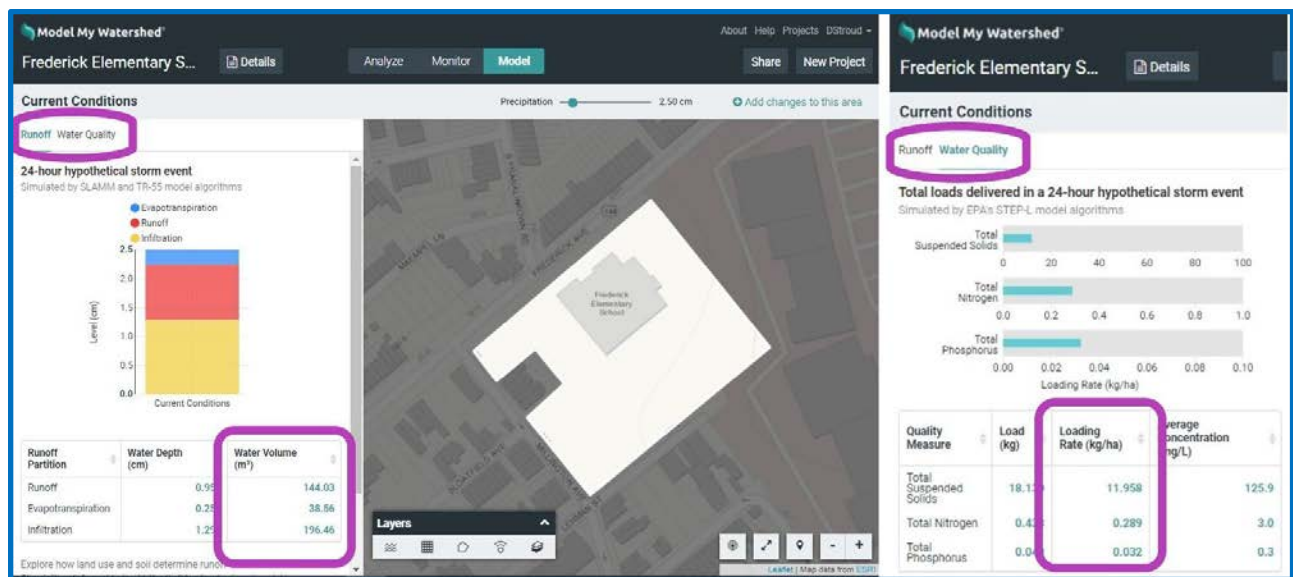


Table 3. Comparison of stormwater runoff and pollutant yield from two schools in Maryland.

	Dulaney High School	Frederick Elementary School
runoff/(runoff+ET+infiltration) = % runoff from property	1,153/(1,153+628+2,522) = 27%	144/(145+39+196) = 38%
Total suspended solids (kg/ha)	8.347	11.958
Total nitrogen (kg/ha)	0.196	0.289
Total phosphorus (kg/ha)	0.024	0.032

Step Three: Compare the Benefits of Different BMPs on a School Property

Best Management Practices are actions and decisions made during the design, preservation, construction, and management of built areas to reduce negative impacts on the environment. Some structural BMPs are also referred to as green infrastructure or low impact development; see the EPA's Green Infrastructure Wizard Website (<https://cfpub.epa.gov/giwizard/>) to explore this topic. The Stakeholder Interview Report provides a list of BMPs that can be used on school properties (Figure 2, page 34). Local and regional water quality can benefit from each type of BMP, and at least one type of BMP is suitable for every school in the Chesapeake Bay watershed.

In the context of water quality for the Chesapeake Bay and its tributaries, this method for selecting BMPs for school properties will focus on BMPs that can reduce sediment, nitrogen, and phosphorus loading to surface waters. Individual rivers that drain to the Chesapeake Bay may have other causes of impairment. Only one of these other causes of impairment, disruption of hydrologic regime by stormwater flow, will also be discussed here. The first step in narrowing the BMP options for a particular school property is to predict the relative benefits of different BMPs on water quality, specifically the volume of stormwater and the nitrogen, phosphorus, and sediment it carries. Each type of BMP has a different effect on these pollutants based on how the BMP: 1) enhances infiltration of precipitation into groundwater, 2) slows water runoff to enhance deposition of sediment before reaching water bodies, and 3) maximizes exposure of water runoff to vegetation and soils where removal of nitrogen and phosphorus occur. Each type of BMP has a unique combination of these three effects which will make it more (or less) suitable for a particular school's property.

Model My Watershed® allows the user to generate multiple BMP scenarios to compare pollutant load changes relative to the current condition. Appendix B provides a tutorial on generating BMP scenarios in Model My Watershed's Site Storm Model; note that BMPs can include both conservation practices and land cover changes. For example, planting trees (changing the land cover to forest) can be considered a BMP that affects stormwater just as green roof (a conservation practice) is also a BMP. Here we consider two examples of BMPs applied to Frederick Elementary School in Baltimore, Maryland: a vegetated infiltration basin (Figure 3) and porous paving (Figure 4). The vegetated infiltration basin was drawn on-screen adjoining the parking lot on the northwest corner of the property assuming that this BMP would capture runoff from that parking lot; the porous paving was drawn to cover that parking lot. The Site Storm model was run with the default 2.50 cm of precipitation in 24 hours.

Figure 3. Model My Watershed® Site Storm Model scenario showing implementation of a vegetated infiltration basin in the upper right corner of the scene (green striped square).

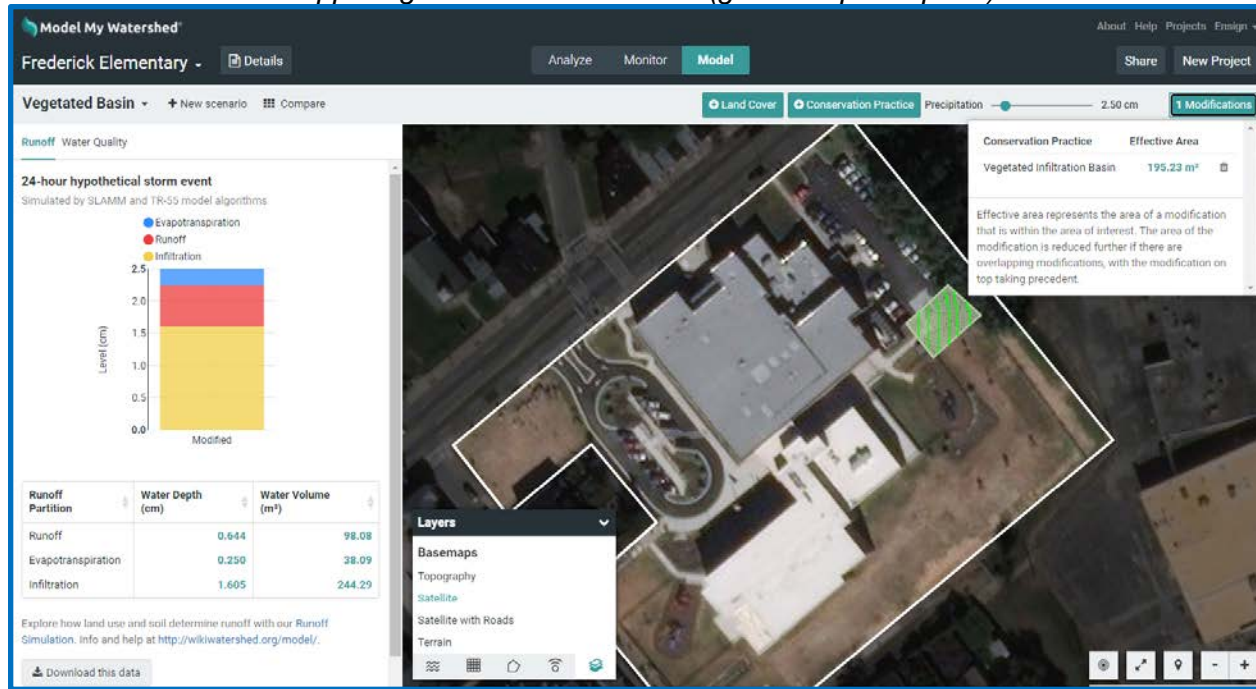
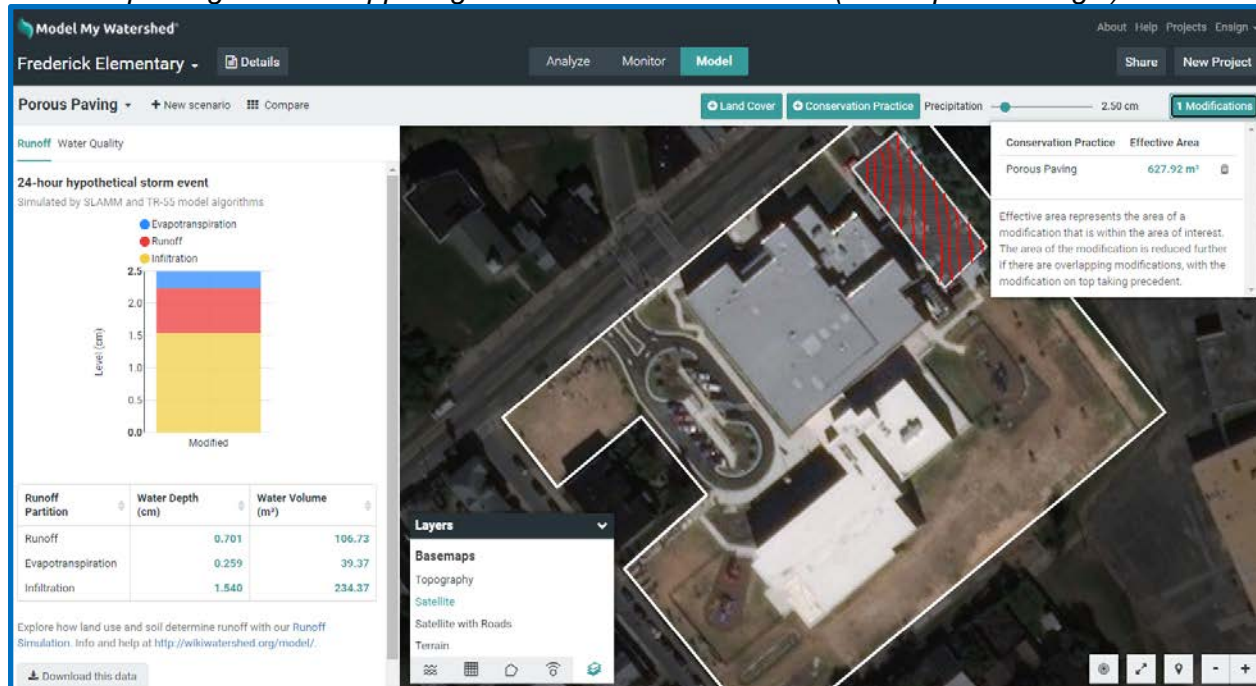


Figure 4. Model My Watershed® Site Storm Model scenario showing implementation of Porous Paving across a parking lot in the upper right-hand corner of the scene (red striped rectangle).



The model output allows comparison of the reduction in all four metrics of stormwater pollution. There is no significant difference in how these two BMPs affect stormwater runoff, nitrogen, and phosphorus (Table 4).

Table 4. *Model My Watershed's Site Storm model results for two BMP scenarios on the grounds of Frederick Elementary School, Baltimore, Maryland; scenario was for a 2.5 cm precipitation event over a 24 hour period.*

	Current Conditions	with Vegetated Basin only	with Porous Paving only	% reduction by vegetated basin	% reduction by porous paving
area (m ²)	15,214	94	385	-	-
stormwater runoff (cm)	0.95	0.819	0.816	14%	14%
total suspended solids (kg/ha)	11.917	10.274	10.235	14%	14%
total nitrogen (kg/ha)	0.288	0.248	0.247	14%	14%
total phosphorus (kg/ha)	0.032	0.028	0.028	13%	13%

Six different conservation practice BMPs and their combinations can be compared in this way. Additionally, changes in land cover can be explored as conservation practices, such as the replacement of grass with forest. The relative impact of these BMPs on stormwater pollution may change with the amount of precipitation modeled (controlled with a slider in Model My Watershed's Site Storm Model). Therefore, the user may want to use a 24 hour precipitation that corresponds with a statistical frequency of occurrence (e.g., one with a 20% chance of occurring in a given year). Details on determining the 24 hour precipitation to use are mentioned briefly below. With the results of Model My Watershed's Site Storm Model as predictions of the benefit of a BMP for water quality, the next step is to determine the most cost-effective of those BMPs.

Step 4: Estimate and Compare the Costs of BMPs on a School Property

EPA's National Stormwater Calculator (swcweb.epa.gov/stormwatercalculator/) is a web app for estimating stormwater runoff under different development scenarios and concomitant estimates of the capital cost of BMP implementation and operating expenses. The web app provides a detailed user guide and technical documentation which won't be reviewed here. The National Stormwater Calculator implements a hydrologic model similar to the one used by Model My Watershed's Site Storm Model, and similar scenarios can be developed in both models. However, the National Stormwater Calculator does not provide estimates of sediment, nitrogen, and phosphorus loads. Therefore, our purpose is not to compare the predictions of stormwater runoff between the two models, but rather to rely on the National Stormwater Calculator for its BMP cost estimates.

The categories and options for modeling conservation practices in Model My Watershed's Site Storm Model do not all have direct corollaries in the National Stormwater Calculator's Low Impact Development controls options. Table 5 matches comparable conservation practices and Low Impact Development controls.

Table 5. *Stormwater treatment functional equivalence between Model My Watershed's conservation practices and land cover and the National Stormwater Calculator's Low Impact Development controls and land cover.*

Model My Watershed's Site Storm Model		National Stormwater Calculator	
Conservation Practice	Rain Garden	LID Controls	Rain Gardens
Conservation Practice	Rain Garden	LID Controls	Street Planters
Conservation Practice	Vegetation Basin	LID Controls	Infiltration Basins
Conservation Practice	Porous Paving	LID Controls	Permeable Pavement
Conservation Practice	Green Roof	LID Controls	Green Roofs
Conservation Practice	Vegetation Basin	LID Controls	Rain Harvesting
Conservation Practice	Vegetation Basin	LID Controls	Disconnection
Conservation Practice	No-Till Agriculture	no corollary	no corollary
Conservation Practice	Cluster Housing	no corollary	no corollary
Land Cover	Forest	Land Cover	Forest*

*The National Stormwater Calculator does not estimate the cost of tree planting; for the mid-Atlantic region, assume a cost of \$1,000 per acre (4,047 m²).

The National Stormwater Calculator requires the user to assign land cover to a project area into four categories: forest, meadow, lawn, and desert. The difference between the sum of these categories and the total project area is automatically assumed to be impervious surfaces. Output from Model My Watershed® can help the user assign these coverages. For the grounds of Frederick Elementary School in Baltimore, Model My Watershed® summarizes the school grounds into four types: developed (open space), developed (low intensity), developed (medium intensity), and developed (high intensity). Because each of these land cover classes is partitioned into an impervious and pervious category by the National Land Cover Database as shown in Table 6, we can calculate the total impervious area (sum of the bottom row of Table 6 is 6,281 m²) and the percent of the total school property this represents (6,281÷15,214) is 41%. From the satellite imagery in both Model My Watershed® and the National Stormwater Calculator, it appears that the school grounds most closely match the lawn category available in the National Stormwater Calculator. Thus, in the National Stormwater Calculator app's Land Cover section, lawn is set to 59% and impervious will automatically be set to 41%.

Table 6. *Model My Watershed's Site Storm Model analysis of the coverage of four land cover categories on Frederick Elementary School's property; the total impervious area of the school property is the sum of the bottom row.*

	developed, open space	developed, low intensity	developed, medium intensity	developed, high intensity
NLCD class % impervious	<20%	20% to 49%	50% to 79%	80% to 100%
NLCD assumed % impervious	10%	35%	65%	90%
coverage of each category on school grounds (m ²)	5,384	1,795	5,384	1,794
calculated impervious area (m ²)	538	628	3,500	1,615

The LID Controls page of the National Stormwater Calculator app requires entry of the percent of the school property's impervious area to be treated by a BMP. We are considering two stormwater management scenarios for the 385 m² parking lot on the northwest corner of the property: infiltration basin (equivalent to the vegetated infiltration basin modeled in Model My Watershed) and permeable pavement (equivalent to the porous pavement modeled in Model My Watershed). We assume that the detention basin will capture runoff from the entire parking lot, thus capturing runoff from 6% of the property's impervious surface ($385 \text{ m}^2 \div 6,281 \text{ m}^2 = 0.06$, or 6%). Conversion of the parking lot to permeable pavement will similarly treat 6% of the impervious surface.

The Cost section of the National Stormwater Calculator provides low and high estimates for the capital cost and annual maintenance of these two BMPs (Table 7).

Table 7. *EPA's National Stormwater Calculator applied to the grounds of Frederick Elementary School.*

	Infiltration basin treating 6% of the school's impervious surface	Permeable pavement replacing 6% of the school's impervious surface
capital cost	\$5,195 (low estimate) \$11,670 (high estimate)	\$65,662 (low estimate) \$88,006 (high estimate)
annual maintenance cost	\$33 (low estimate) \$1,190 (high estimate)	\$757 (low estimate) \$4,137 (high estimate)

While it is beyond the scope of this report to thoroughly review use of the National Stormwater Calculator (a user guide is available under the Resources menu at the top right of the app), a few hints should be noted. First, summary data from the "Analyze" step in Model My Watershed® can be used to parameterize the National Stormwater Calculator's Soil Type, Soil Drainage, and Topography pages when data are not available for a particular site. Model My Watershed® will always provide a soil group and average slope which can be used in the National Stormwater Calculator; soil drainage rate can be

inferred from the soil group using information in the National Stormwater Calculator's User Guide. Second, the National Stormwater Calculator provides the return period of historic and predicted future 24 hour precipitation events on the Climate Change page. The graph showing annual maximum daily rainfall can be used to inform the Model My Watershed® Site Storm model's precipitation input (adjusted with the slider bar). Using a precipitation that corresponds with a given return period provides the user a better point of reference than the default of 2.5 cm in Model My Watershed's Site Storm Model.

Step 5. Compare the Relative Benefits and Costs of BMPs on a School Property

Model My Watershed's Site Storm Model shows that porous pavement provides a reduction in stormwater pollutants equal to a vegetated detention basin. In contrast, the National Stormwater Calculator predicts that the cost of permeable pavement is about 12 times greater than the capital cost of an infiltration basin. Based solely on this comparison of pollutant reduction benefits versus costs, the school would clearly favor the construction of an infiltration basin over the more expensive permeable pavement. However, the cost effectiveness of stormwater BMPs may not be the only criteria used for deciding which BMP to use. Educational benefits, aesthetic benefits, and site limitations are some of the additional criteria that may need to be considered. For some less technical and costly BMPs, the five steps outlined here may be adequate for decision-making and BMP installation. In cases where stormwater infrastructure must be designed and built at significant expense, the exercise described here should be considered a screening level analysis that prepares school personnel for a discussion with engineers.

Appendix A. Blank Worksheets

Table 1. Blank template for compiling information on an individual school district from the CBW Public School Stream BMP Evaluation Tool. Comparing the sum of all values in the right-hand column between school districts allows you to evaluate the suitability of a school district for BMPs. Note that it is not necessary to utilize all criteria; weighting factors are only applied to the criteria a user chooses to include.

Criteria	VALUE from CBT Public School Stream BMP Evaluation Tool	Interpretation of VALUE	Interpreted or Modified Value (where blank, user must determine if higher or lower number indicates greater need for BMP)	Weighting Factor (value between 0 and 1; all weightings used must sum to 1)	Modified Value X Weighting Factor; higher result indicates greater need for BMPs
EQUITY-ELIT 2019 Preparedness Score (19PLNGRP)		scale: 0=no data, 1=unprepared, 2=somewhat prepared, 3=well prepared			
Number of System-Wide MWEEs		scale: 0 to 3			
% of students qualifying for free and reduced lunch (pctlpqul)		scale: 0% to 100%			
% of Title 1 schools (pct_ttl1)		scale: 0% to 100%			
minority population (% Minority – descending rank)		scale: 0 to 1; higher number indicates higher minority population			
Linguistic isolation (LINGISOPCT)		scale: 0 to 1; higher number indicates less linguistic isolation			
High school education (LESSHSPCTr)		scale: 0 to 1; higher number indicates more people have a high school education			
Low income (LOWINCPCTr)		scale: 0 to 1; higher number indicates more wealth			

Index of Biotic Integrity		scale: very poor, poor, fair, good, excellent; lower integrity indicates higher need for BMPs	very poor = 1 poor = 2 fair = 3 good = 4 excellent = 5		
Conservation and Restoration status (CR_metric)		scale: 0 to 2; higher number indicates lower conservation need	2 - VALUE =		
Land Use/Cover (LUMetric)		scale: 0 to 1; higher number indicates lower disturbance	1 - VALUE =		
TOTAL:					

Table 3. Comparison of stormwater runoff and pollutant yield at potential school sites

	School Site #1	School Site #2
runoff/(runoff+ET+infiltration) = %		
Total suspended solids (kg/ha)		
Total nitrogen (kg/ha)		
Total phosphorus (kg/ha)		

Table 4. Compare results for two BMP scenarios using Model My Watershed's Site Storm model with a 2.5 cm precipitation event over a 24 hour period.

	Current Conditions	Vegetated Basin	Porous Paving	% reduction by vegetated basin	% reduction by porous paving
Selected Area (m ²)				BMP #1 / current cond.	BMP #2 / current cond.
stormwater runoff (cm)					
total suspended solids (kg/ha)					

total nitrogen (kg/ha)					
total phosphorus (kg/ha)					

Table 6. National Stormwater Calculator app requires entry of the percent of the school property's impervious area to be treated by a BMP.

	developed, open space	developed, low intensity	developed, medium intensity	developed, high intensity
NLCD class % impervious	<20%	20% to 49%	50% to 79%	80% to 100%
NLCD assumed % impervious	10%	35%	65%	90%
coverage of each category on school grounds (m ²)				
calculated impervious area (m ²)				

Table 7. EPA's National Stormwater Calculator estimated costs comparison
(swcweb.epa.gov/stormwatercalculator/)

BMP Type & % of treatment	_____ treating ____% of the school's impervious surface	_____ treating ____% of the school's impervious surface
capital cost	_____ (low estimate)	_____ (low estimate)
	_____ (high estimate)	_____ (high estimate)
annual maintenance cost	_____ (low estimate)	_____ (low estimate)
	_____ (high estimate)	_____ (high estimate)

Appendix B. Model My Watershed® User Guide


This Appendix is meant to assist a user in executing the workflow decision method described in this report. A comprehensive introduction to Model My Watershed's Site Storm Model can be found at <https://wikiwatershed.org/help/model-help/site-storm-guide/>. Additional Training Tools are available on the WikiWatershed Website Multi-Model Training Resources: <https://wikiwatershed.org/videos/#model-my-watershed>

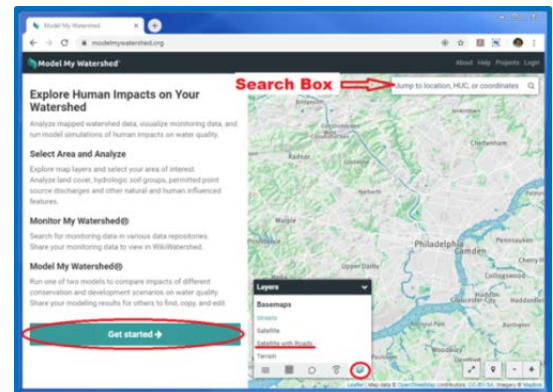
1. Launch the [Model My Watershed®](https://modelmywatershed.org/) application (<https://modelmywatershed.org/>).

2. Login to Model My Watershed® (see the [login instructions](#) in the model overview for help if needed).

3. In the left panel, click on .

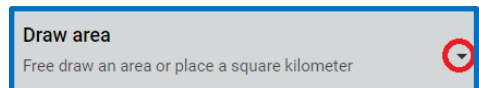
4. In the “search” box at the top right hand corner of the map enter the name and address for the property you want to map (or drag and zoom to the location).

5. In the "Layers" control box (bottom left corner of the map view), click the icon furthest to the right () to change the "Basemap" to the map that best shows the property you are mapping.



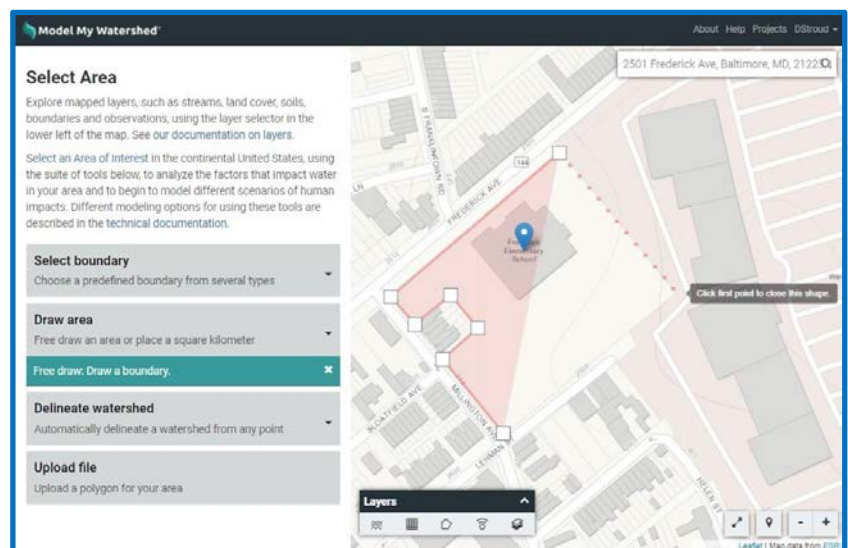
6. Zoom in or out, and drag the map to see the property in the map view screen. If the entire property is not visible, you can use the keyboard arrows (or click and drag) to move the map as you outline the property.

7. In the left panel, click on the black down area in the “Draw Area” box and select “Free draw” to create a polygon of the property you are mapping.



8. Begin by placing the cursor on one corner of the property and click once. Move the cursor clockwise around the map and click once at each of the corners around the edge of the property until you click on the first mark to close the polygon.

9. The property will be delineated and the model will automatically analyze the area and give you base information on the area selected. If you make a mistake, click on “Change area” at the bottom of the left panel and try again.



10. The “Selected Area” at the top of the analyze pane (circled in yellow) displays the total land area for the property being analyzed and must be added to Table 4 (row 1, column 1) in step 3 of the decision method in this report.
11. Click on the “Land” tab (circled in green) in the analyze pane and scroll down to see a data table of land cover data (boxed in purple). Use this base land cover data to populate row 3 of Table 6 from step 4 in this method. This data will be used with the EPA National Stormwater Calculator to determine the total impervious surface of the school grounds.

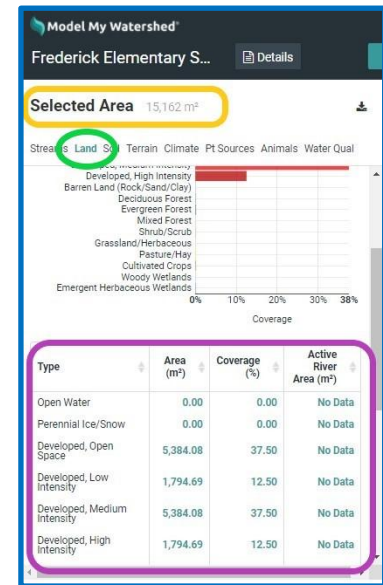
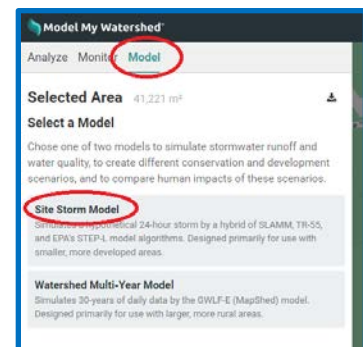


Table 6 from the decision method in this report. *Model My Watershed’s Site Storm Model analysis of the coverage of four land cover categories on a school’s property; the total impervious area of the school property is the sum of the bottom row.*

		developed, open space	developed, low intensity	developed, medium intensity	developed, high intensity
NLCD class % impervious		<20%	20% to 49%	50% to 79%	80% to 100%
NLCD assumed % impervious		10%	35%	65%	90%
Coverage of each category on school grounds (m²)	[enter data from Model My Watershed® Analyze tab]				
Calculated impervious area (m²)	[multiple row 2 by row 3]				

12. In the left panel “Analyze” pane select the “Model” tab and choose “Site Storm Model” to add changes (land cover or conservation practices) and run a simulation of a 24 hour storm event to model how these changes will affect runoff, infiltration, and evapotranspiration (Runoff tab) as well as Total Suspended Solids, Total Nitrogen, and Total Phosphorus (Water Quality Tab) from the property. Use this information to populate Table 3 in step 2 of this method, and repeat the above steps for another school.



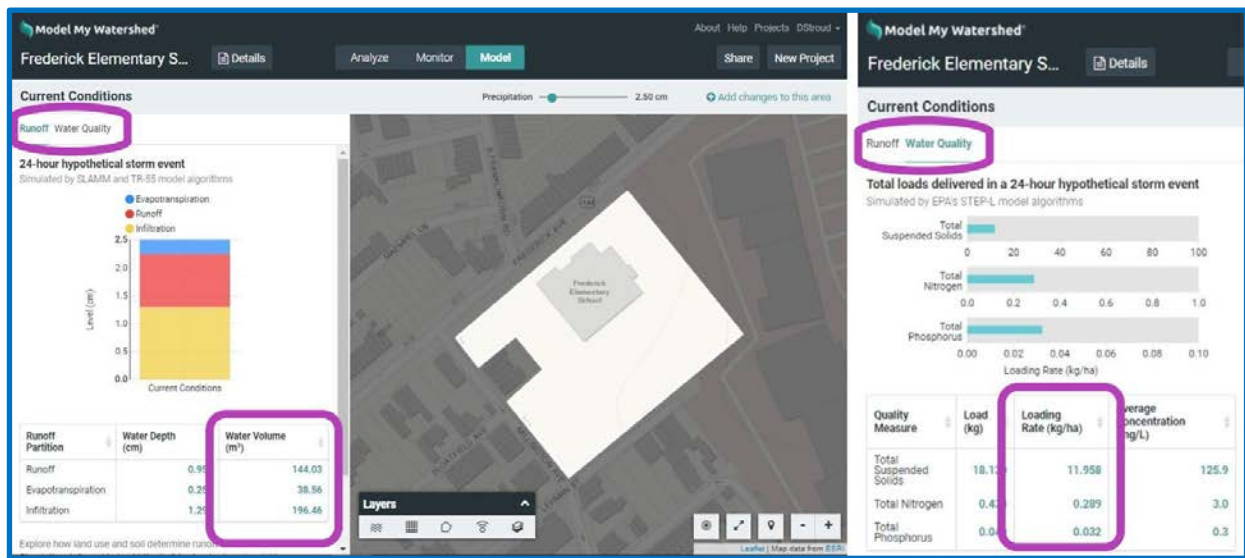
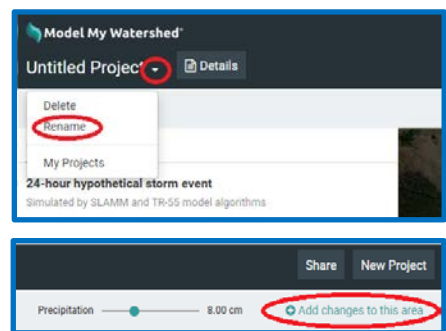


Table 3 from BMP decision method. Comparison of stormwater runoff and pollutant yield from two schools

	school #1	school #2
$\text{runoff}/(\text{runoff}+\text{ET}+\text{infiltration}) = \%$		
Total suspended solids (kg/ha)		
Total nitrogen (kg/ha)		
Total phosphorus (kg/ha)		

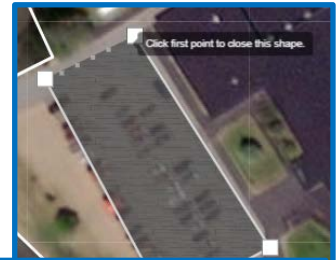
Comparing Potential BMP Projects With Model My Watershed®

- Click on the down arrow next to “Untitled Project” in the upper right hand corner to rename and save the project. This will allow you to return to your project with all changes saved and share your project with others.
- Click on “Add changes to this area” near the top right of the map (circled in red) next to the precipitation control slider.
- In the middle of the grey menu bar above the map click on the teal-colored buttons **Land Cover** or **Conservation Practice** to

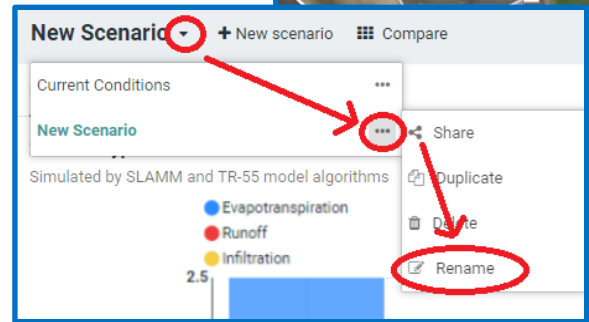


view the possible additions to the project and hover the cursor over the choices to learn more about each option.

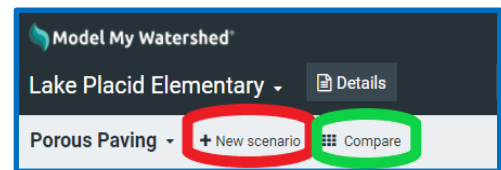
16. Select a conservation practice (BMP) to add to the project, then click the corners of the area where you want to add the feature in your project map to create a polygon and install the modification. Each time a modification is added the model will re-run the calculations and update the data.



17. The scenario you are creating will be renamed automatically as “New Scenario.” To change the name of a scenario, click on the down arrow next to “New Scenario” in the grey menu bar, move the cursor down to the three dots to the right of “New Scenario,” click on the three dots, and select “Rename.”



18. Click on the “+ New Scenario” button in the top left to reset the map and model adding a different BMP under consideration. Repeat this procedure for all proposed BMP projects and rename each scenario.



19. To compare the benefits of each proposed BMP installation, click on the “Compare” button (circled in green above) to the right of “+ New Scenario.” A compare panel will pop up showing all of the scenarios with proposed BMPs. The data can be viewed in graph form (default), table form, or in a downloaded Excel file by clicking on the toggle switches at the top right hand corner of the compare panel (circled in red above). Use the “Runoff” data to populate row 2 of Table 4.


Compare


Runoff


Water Quality


Precipitation 2.50 cm

Scenarios









Predominantly Forested

Current Conditions

Veg Basin

Porous Paving

Runoff

0.113 cm

0.95 cm

0.675 cm

0.737 cm

Evapotranspiration

0.526 cm

0.254 cm

0.241 cm

0.248 cm

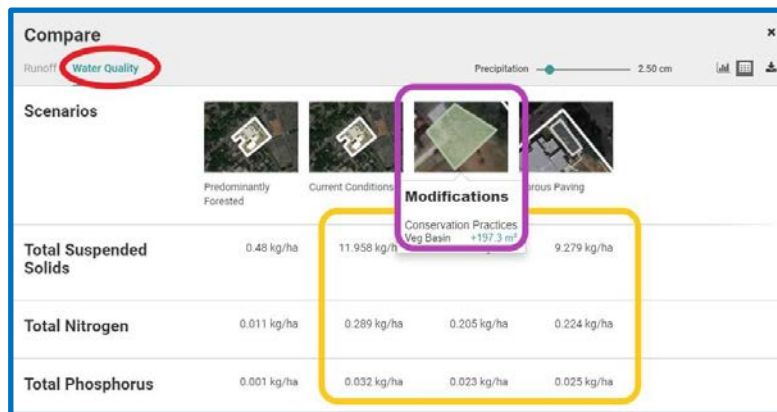
Infiltration

1.862 cm

1.296 cm

1.584 cm

1.514 cm



20. Click on a conservation practice in the map or a scenario in the compare window to see the total area for each proposed BMP and click on the “Water Quality” tab (circled in red above) to view the estimated pollution loads for each scenario and use this information to complete Table 4 (step 3 of the method explained in this report).
21. In the example above, the vegetated infiltration basin scenario will benefit the watershed the most by reducing runoff and increasing infiltration.

Table 4. Model My Watershed’s Site Storm model results for two BMP scenarios.

	Current Conditions	BMP #1	BMP #2	% reduction by BMP #1	% reduction by BMP #2
Selected Area (m ²)				BMP #1 / current cond.	BMP #2 / current cond.
storm water runoff (cm)					
total suspended solids (kg/ha)					
total nitrogen (kg/ha)					
total phosphorus (kg/ha)					

Once different BMP installation scenarios have been compared, the last step will be to use the data collected with the EPA’s National Stormwater Calculator to complete Table 7 and estimate costs of installation and maintenance (swcweb.epa.gov/stormwatercalculator/). Refer to step 4 in the method described in the report for guidance.

Rain Garden

A rain garden is a low-lying (shallow) area that slows down, soaks up, and filters **precipitation** (rain, snow, sleet, or hail) from downspouts, roofs, streets, driveways, and other **impervious** surfaces.

Designed to mimic the forest floor, rain gardens are planted in layers. These layers begin with a gravel base, a sand bed, planting soil, and mulch, followed by many different kinds of **native** flowers, shrubs, and grasses. These special plants don't mind "getting their feet wet," or getting their roots partially or fully submerged in water for long stretches of time! All of these layers work together to increase the amount of water that **infiltrates** the ground and returns to the atmosphere through the plants (**evapotranspiration**). Like coffee being poured through a coffee filter, the rain garden also acts as an incredible filter by capturing **pollutants** like sediment and chemicals before they soak into the ground and contaminate groundwater.



Benefits and Uses:

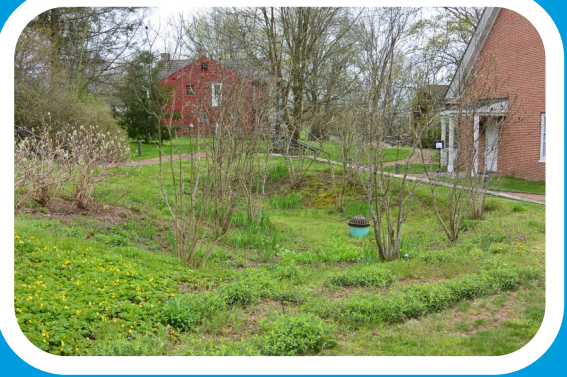
- Increases infiltration
- Recharges groundwater
- Reduces runoff
- Filters pollutants
- Reduces flooding (slows velocity *and* volume of water!)
- Prevents erosion
- Provides food and habitat to native wildlife, including pollinators
- Inexpensive to install and maintain



Vegetated Infiltration Basin

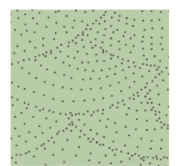
A vegetated infiltration basin is a large constructed depression (sunken land) that captures runoff from storm-drain sewers or directly from **impervious** surfaces like parking lots, roads, or sidewalks. The **runoff** is temporarily stored in the basin until it slowly **infiltrates** into the ground.

Much like a rain garden, a vegetated infiltration basin has vegetation (plants) like grasses that slow down, soak up, and filter **precipitation** (rain, snow, sleet, or hail). This helps filter pollution, reduce flooding, prevent **erosion**, and increase **evapotranspiration**, all while keeping our watersheds healthy! Basins are also specially designed with **infrastructure** to manage much greater amounts of stormwater than rain gardens! Can you spot one in your community?



Benefits and Uses:

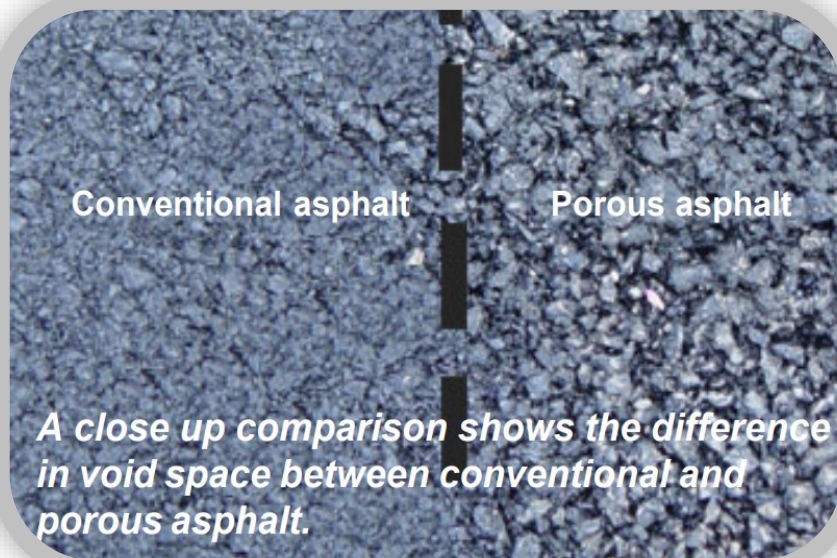
- Increases infiltration
- Recharges groundwater supply
- Reduces runoff
- Filters pollutants
- Reduces flooding (slows velocity *and* volume of water!)
- Can be done at many sites (residential, industrial, or commercial)
- Prevents sewer overflows
- Simple and inexpensive to create



Porous Paving

Porous paving, or stones, bricks, or special mixes of concrete or asphalt used in place of **impervious** paving materials, has pores for water to soak through the paving and infiltrate into the ground below. This helps reduce the pollutants carried by **runoff** into our storm drains and waterways.

There are many types of porous paving. In porous paving like **porous block paving**, blocks of brick, stone, or concrete are placed in a grid with the spaces around each block filled with **permeable** gravel (a surface liquids can pass through). In **porous asphalt** and **porous concrete**, water drains directly through a permeable surface, is stored in a stone bed below, and slowly sinks into the ground.



With the same strength and durability as impervious surfaces, porous paving can be used in parking lots, driveways, sidewalks, playgrounds, and many paved surfaces to keep our footprint small!



Benefits and Uses:

- Reduces amount of impervious surfaces
- Increases infiltration
- Reduces runoff
- Reduces flooding (slows velocity *and* volume of water!)
- Recharges groundwater supply
- Can be used in most paved spaces
- Low cost and low environmental impact
- Can be temporary (e.g., overflow parking lots)

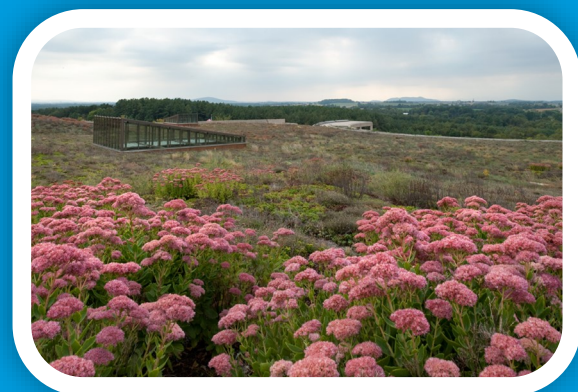
Look for this symbol in
Model My Watershed!



Green Roof

A green roof is a flat or gradually sloped roof that is partially or completely covered with vegetation. Most green roofs have layers of material that keep the interior of the building dry, slow the movement of water off the roof, keep the plants alive, and reduce runoff. These layers include a waterproof liner, drainage materials, and growing media. Green roofs have special plants that are adapted to surviving high temperatures and drought conditions, and many include plant species that absorb pollutants.

Some green roofs act as recreational spaces, rooftop decks, community gardens, and meditation paths. This conservation practice requires special planning and can cost more initially, but it protects the watershed by managing stormwater and also reduces long-term costs of heating and cooling!



Benefits and Uses:

- Reduces runoff
- Reduces heating and cooling costs
- Absorbs pollutants
- Improves air quality
- Provides food and habitat for wildlife
- Reduces greenhouse gases
- Beautifies the view
- Absorbs sound pollution
- Lowers urban air temperatures

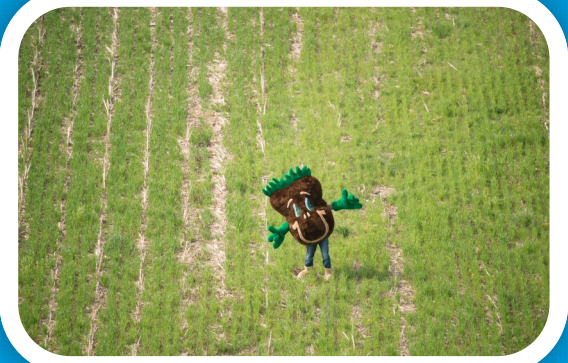


No-Till Agriculture

No-till agriculture is a conservation practice in which farmers plant crops without disturbing the soil or removing the plants that are already there. This improves the **infiltration** rate of the soil, reduces **erosion**, and builds the organic matter and **nutrient cycling** in the soil.

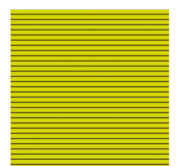
Many farmers used to till their fields every year, meaning they used plows to turn over the soil before planting new seeds. Tilling loosens the soil, causing more erosion from wind and water. However, good soil is full of worms, insects, and micro-organisms (microbes) like fungi, algae, bacteria, and protozoa that need dark, moist habitats to survive. Here, these tiny organisms play important roles in the food web: they help break down dead plants, make nutrients for new plants to grow, and prevent erosion! Tilling the soil disrupts this special ecosystem.

Now, soil scientists are spreading the word to farmers that the best way to keep their fields productive is to leave the organisms and the soil alone to work their magic.



Benefits and Uses:

- Increases infiltration
- Improves soil nutrients
- Reduces erosion
- Increases diversity of microbes
- Reduces costs to farmers
- Saves fuel costs

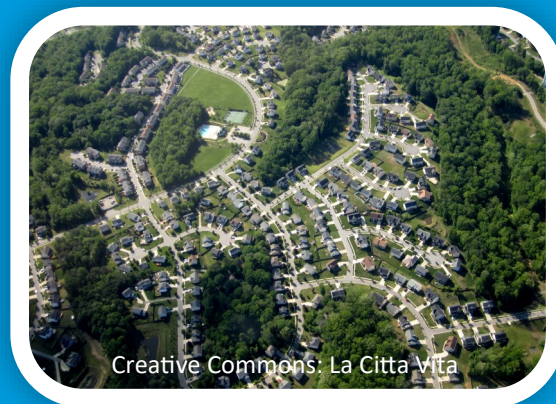


Cluster Housing

Cluster housing is a way of building residential areas where homes are built in groups closer together, which allows for larger open spaces between the buildings. The larger open spaces are often planted with trees and vegetation that enhance **infiltration**, reduce **runoff** and **erosion**, and provide recreational space for the inhabitants.

Building homes closer together makes it easier and less expensive to install the **infrastructure** needed for water supply, sewage, electricity, and roads. This also decreases the amount of impervious paved surfaces and sky-rockets the efficiency of stormwater management structures like rain gardens and vegetation infiltration basins. Cluster housing also helps neighbors develop a sense of community and provides more opportunities for kids to play together!

The large areas of open land can then be used for agriculture and recreation. More forests and native meadows improve infiltration and provide important habitat for wildlife.



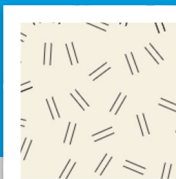
Creative Commons: La Citta Vita

Benefits and Uses:

- Focuses infrastructure
- Reduces human impact on land
- Increases spaces for recreation and/or agriculture
- Reduces impacts on wildlife habitats
- Enhances sense of community
- Conserves resources
- Prevents suburban sprawl



Google Earth



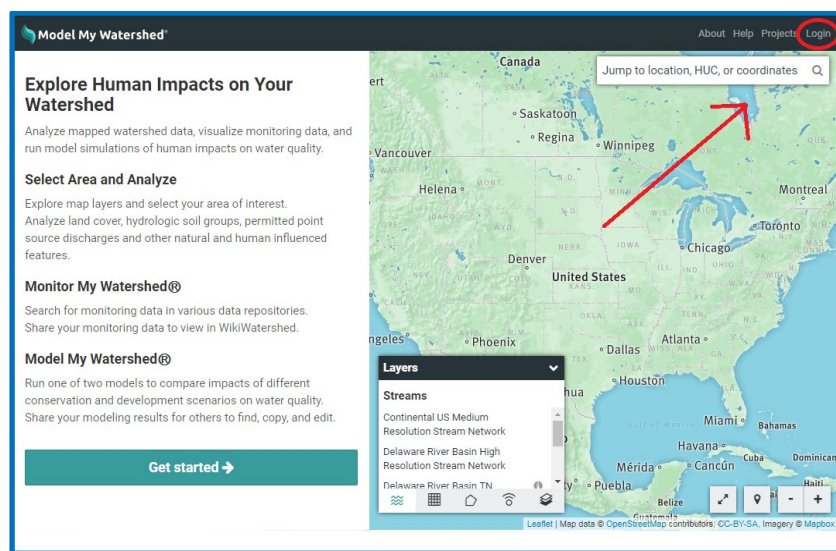
Model My Watershed® Overview

[Model My Watershed®](https://modelmywatershed.org/) (<https://modelmywatershed.org/>) is an online GIS-based component of the [WikiWatershed® Toolkit](https://wikiwatershed.org/) (<https://wikiwatershed.org/>), a suite of web browser based tools designed to help citizens, conservation practitioners, municipal decision-makers, researchers, educators, and students advance their knowledge and stewardship of fresh water. The Model My Watershed® Site Storm Model simulates storm runoff and water quality by applying the [TR-55](#) & [STEP-L](#) water quality models for a single 24-hour rain storm over a selected land area within the continental United States. The results are calculated based on actual land cover data (from the [USGS National Land Cover Database 2011, NLCD2011](#)) and actual soil data (from the [USDA Gridded Soil Survey Geographic Database](#), gSSURGO) for the selected land area of interest. The Watershed Multi-Year Model simulates 30 years of daily water, nutrient and sediment fluxes using the Generalized Watershed Loading Function Enhanced (GWLFE) model that was developed for the [MapShed](#) desktop modeling application by Barry M. Evans, Ph.D., and his group at Penn State University. The GWLFE model is also one of five watershed models available within [EPA's BASINS multi-purpose modeling application](#).

[Model My Watershed®](#) can be accessed online from any web browser at modelmywatershed.org and works best on desktop and laptop computers. It is also optimized for the Firefox browser. MMW works on touch-screen devices such as iPads, other tablets, and laptops with dual keyboard and touch-screen functionality but users may experience some re-orientation of tools or visibility due to screen size and touch-screen sensitivity.

Login to Model My Watershed®

When you first navigate to the [Model My Watershed®](#) application you may be asked to share your location data with the application. Sharing your location will automatically start the application at approximately your current location, but is not necessary for the application to work. Creating a login allows you to save your work to return to later, and to share your work with other users. Logging in as a guest gives you access to the full modeling and scenario capabilities of the application, but will you not be able to save and share any data.



Login to your account

Username

Password

Login

OR

Continue as guest

Login with ITSi

Resend confirmation email

Reset your password

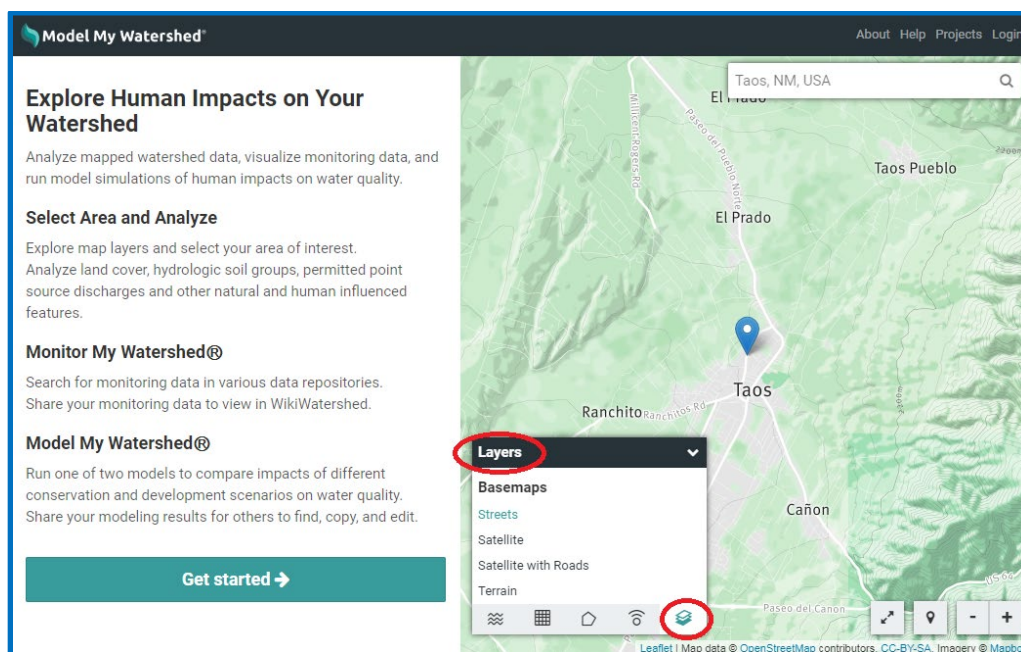
Don't have an account? Register

If you have an account already, simply type in your username and password and click "Login." New users can create an account by clicking "Register" at the bottom of the Login pop-up window. Fill in all of the required fields and submit the form, then check your inbox for an activation email. You must click


a link in the activation email to finish the registration process. Check your spam/trash folders if you do not see the account activation email in your inbox. These emails are sometimes blocked by institutional (e.g. business, agency, or school) spam filters, so you may need to contact your systems administrator.





Navigating the Model My Watershed® App


Once you have logged into the application, you will see a map looking much like Google maps. If you shared your location, the application may zoom directly to your location; otherwise it will begin by showing a map of the entire lower 48 states of the U.S. As with most online map tools, you can navigate the map by clicking and dragging and zoom by pinching, using a scroll wheel, or using the zoom buttons on the lower right. You can also search for a location by name or address using the "Search" box on the upper right. To go or return to your current location, hit the "My Location" button with a picture of a pin next to the zoom buttons on the lower left.

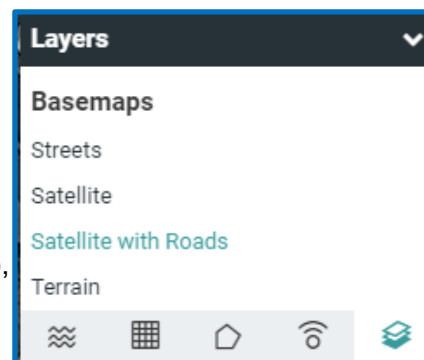



Just as Google maps allows you to switch between road and satellite maps, there are several options for both the base map and data overlays on top of the map. Use the


"Basemaps" () tab of the "Layers" control box to access these. You can select a basemap image and several different types of overlays. If you have a very slow Internet connection, the base maps may be slow to load. The overlays include boundary lines (like school districts and USGS hydrologic units) and color shading for land uses and soil types.


Other tabs in the "Layers" control box are for displaying streams (), coverage grid (), boundary (), and observations () overlays. Continental US medium resolution stream network, Delaware River Basin high resolution stream network along with other stream overlays

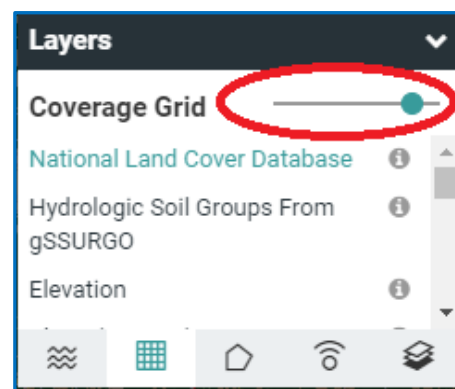
are enabled via the "Streams" tab (). The Continental US and Delaware River Basin stream network overlays are zoom dependent. Smaller streams are shown as you zoom in.



In the "Coverage Grid" tab () of the "Layers" control box you can enable color shading of the USGS National Land Cover Database, the USDA Hydrologic Soils Groups, and other data. A "Coverage Grid" slider tool allows you to adjust the transparency of the color shading of the layer displayed on the map.

Boundary lines can be added in the "Boundary" tab () of the "Layers" control box. You can add boundaries (lines show up in pink) for USGS Subbasin units (HUC-8, HUC-10, HUC-12), county lines, congressional districts, school districts, and municipalities (PA only). Additional watershed data is available in

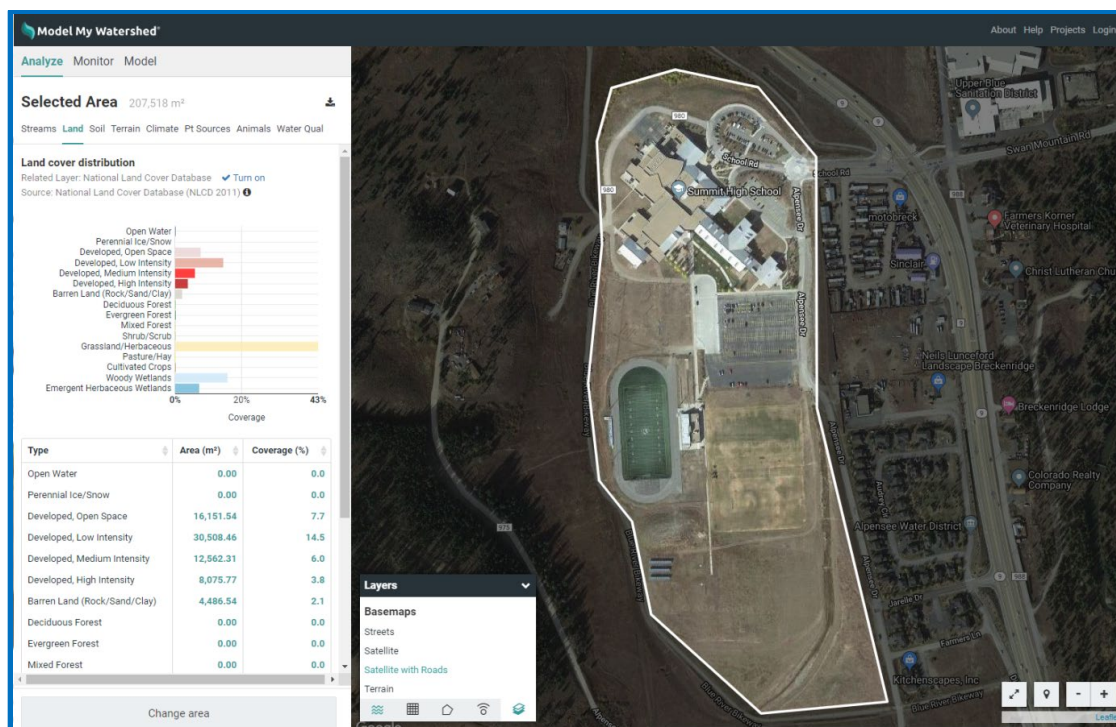
the "Observations" tab () of the "Layers" control box. These data include USGS and other national river and weather monitoring stations. Please note that observation data is not available in all locations!



Modeling Changes to the Land in Model My Watershed®

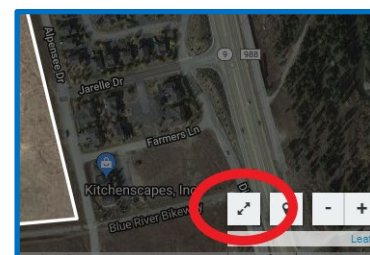
Click on "Get Started" to begin modeling and viewing additional data. Next select the type of area you would like to study and model. The first option is to "Select a boundary" area, with the same boundary options as you saw in the "Layers" control. Additionally in this "Select a boundary" tool, once you select a boundary you can then see the name of the defined areas when you hover over the map. Be aware of your zoom level when selecting by boundaries. If you are at too high of a zoom level, you may not be able to see the boundaries on your map. Your second choice is to "Draw area" with the options of free drawing a polygon of any size and shape you choose or drawing a 1 square Km area to model. Your third option is to "Delineate watershed". To use this option you must choose your stream resolution (Continental US Medium Resolution or Delaware River Basin High Resolution) then place a blue balloon anywhere on the map to define a point (purple circle). The delineate watershed function finds the most direct point (blue circle) down slope where water would runoff into a body of water. From the blue circle the app then finds the watershed boundary of all land surfaces that would drain to that point. The last option is to "Upload file" in which you can upload a shapefile from another GIS program.

As soon as you have selected an area, or closed the box of your custom area, the application will change into geospatial analysis mode. The right side of the screen will now show the area you selected in bright colors with the rest of the map greyed out. The left side of the screen will show the "Analyze" pane. The "Analyze" pane contains a wealth of data including; stream network statistics, land cover distribution, hydrologic soil group distribution, county-based estimated number of farm animals, permitted point source discharges, as well as climate, terrain, and water quality data. These calculations and analyses are done on the fly for each area based on nationally available data. You will not get some pre-computed estimate or "canned" number. These are real values based on the most recently available national land cover, soil type, and other datasets. Because of this, the analysis may take a few seconds to complete and you may see a loading wheel as this happens (It is generally very fast with a good Internet connection).

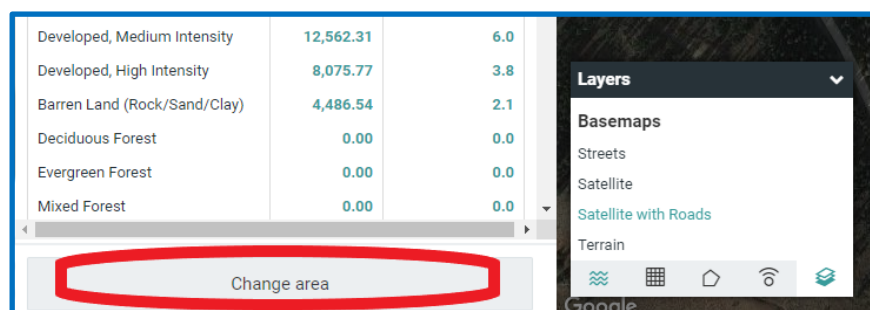


In the analyze pane, you can view the land use, soil type, stream, climate, and other data (some in both tabular and graphical form). Use the tabs at the top of the pane to switch between data types. You can sort the tabular data by type, area, coverage percent, and other units. The bar graph coloring in the land cover distribution matches the colors assigned by the National Land Cover Database and the bar graphs can be used as legends for the land cover and soil group overlays.

The title at the top of the analyze pane will list the name of the area (if selected by boundary) and the total size of the area. You can still change the map zoom and overlays in the map pane. Try turning on the NLCD overlay to compare the layout of land covers on the map to the percent of each land cover in the area. To minimize the analyze pane and see a larger area of the map and you can click on the expand/contract map arrows button near the zoom button in the bottom right of the map.

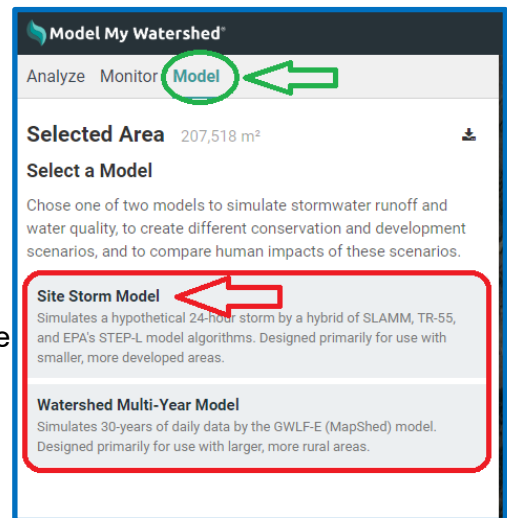


If you realize you made a mistake in selecting your area, hit the "Change area" button at the bottom left of the analyze pane. You will be taken back to the "Select Area" screen. To clear the map and start over completely at any time, click the "Model My Watershed®" title at the top left of the screen.

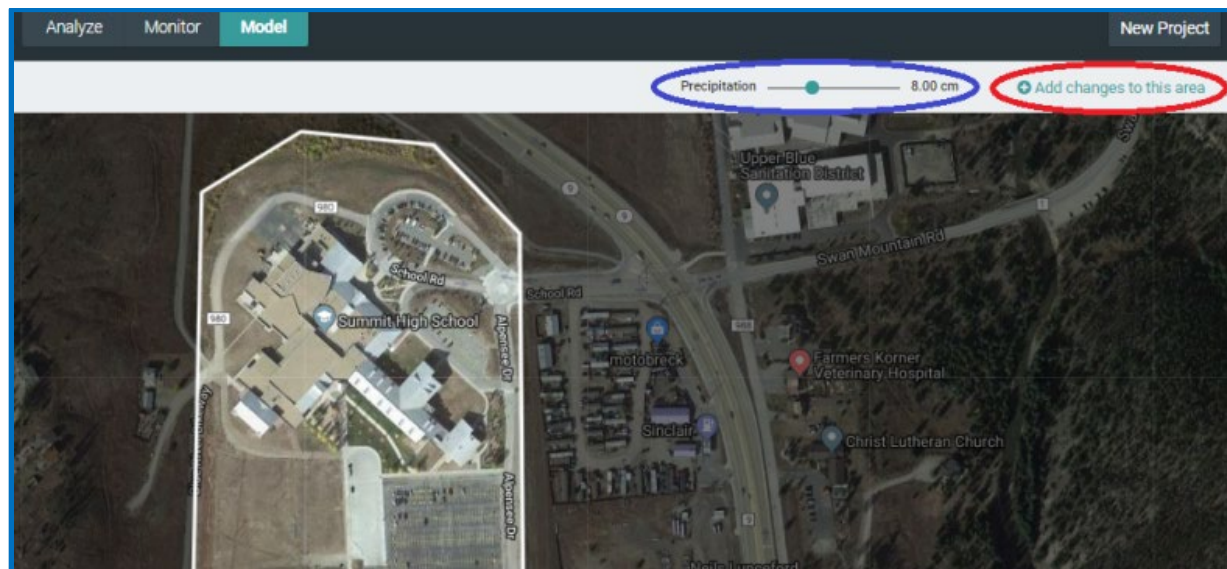


When you are happy with the area you selected, you can move on to modeling and modifying the area by clicking the "Model" tab (green circle in picture on right) in the analyze pane on the left side, then selecting from the two models available to simulate stormwater runoff and water quality, to create different conservation and development scenarios, and to compare human impacts of these scenarios.

- **Site Storm Model:** Simulates a hypothetical 24-hour storm by a hybrid of multiple algorithms; designed primarily for use with smaller, more developed areas.
- **Watershed Multi-Year Model:** Simulates 30 years of daily data by the MapShed model; designed primarily for larger, more rural areas.

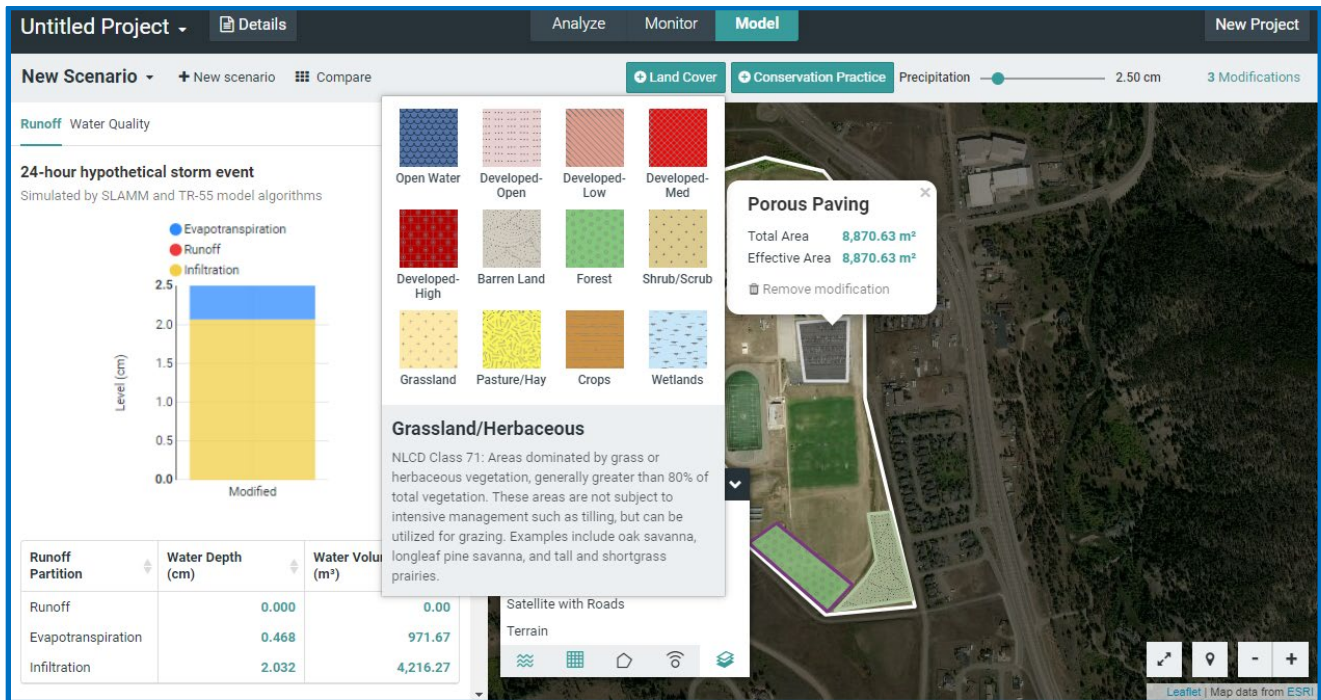


Once you have entered the modeling mode, the application will show runoff and water quality data for the current conditions. The runoff quantities are calculated using a combination of the [TR-55 runoff model](#) developed by the US Department of Agriculture and the Small Storm Hydrology Model for Urban Areas developed by Robert Pitt for a single 24-hour rain storm. The water quality parameters are calculated using the EPA's [STEP-L water quality model](#). For more information on the specifics of these calculations, see other documentation at [WikiWatershed.org](#). The runoff tab shows the partitioning of the rainwater into runoff, infiltration, and evapotranspiration as a stacked bar graph. In the water quality tab, you will see both tabular and graphical data showing predicted water quality for any streams in the selected area. Because the model is running with real data on your custom area, it may take some time for the model to run and you may see a loading icon. The 24-hour rain event model is set for 2.50 cm by default but can be changed using the slider near the top right of the map (circled in blue below).

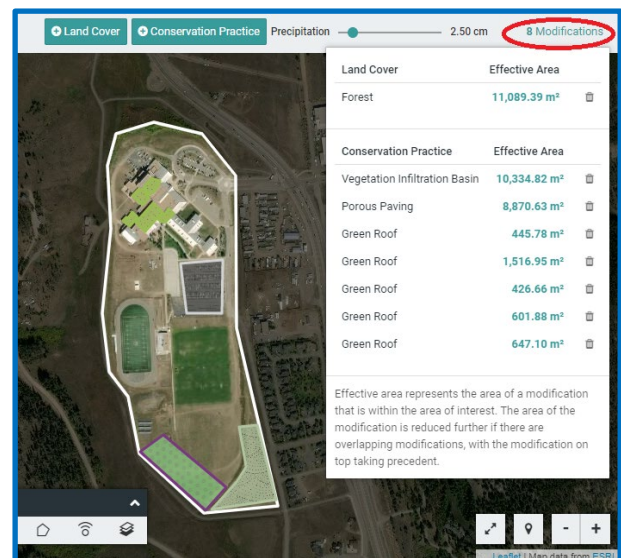


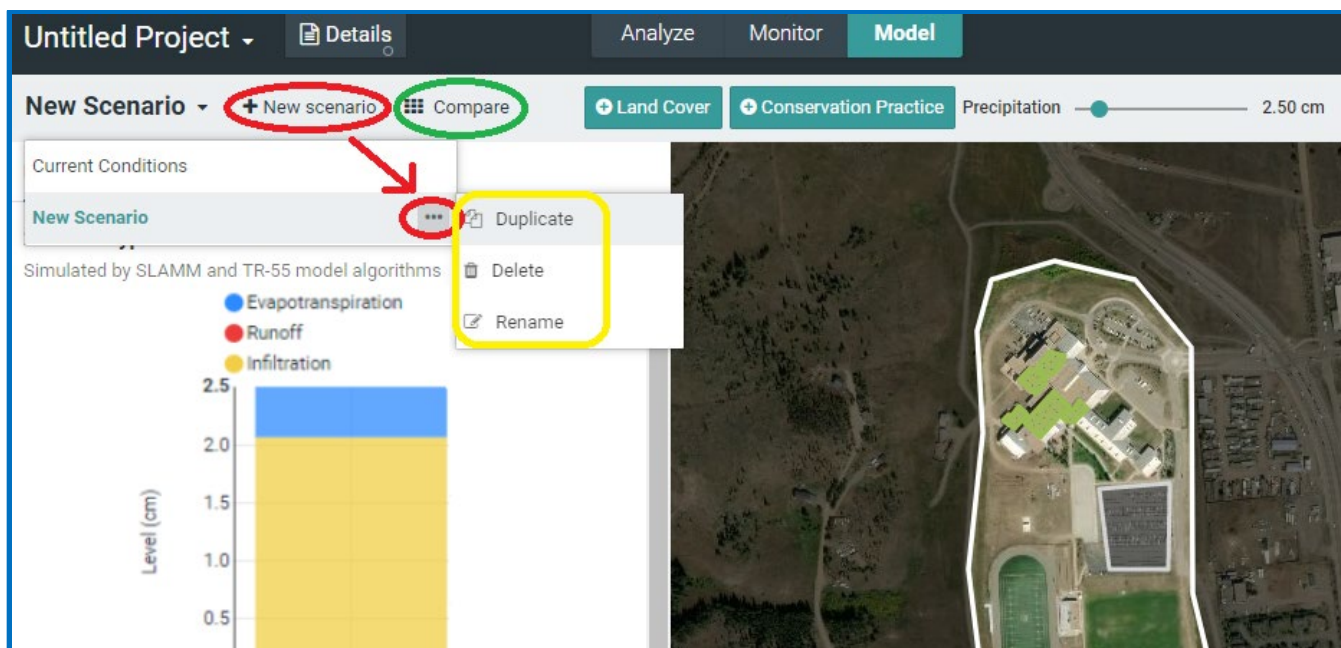
New scenarios, in which you can modify the landscape by changing the land cover type or applying conservation practices can be modeled by selecting the "Add changes to this area" button in the top right corner (circled in red above). At first, this "New Scenario" map and data look exactly like the current conditions map but with two new tool boxes above the map, one for "Land Cover" and another for "Conservation Practices". Each of these is a free-hand drawing tool to modify the current land use.

The model output pane also changes to show the original results from the "current conditions" tab and the modified results as you change the landscape. Select a land use or conservation practice from the toolboxes at the top of the screen and then click points on the map to draw an area over which to apply it. As soon as you add a new land cover or conservation practice, the model will re-run in the background to calculate what has changed and all of the plots will be updated. You will see loading icons again in the model pane as this happens. Remember that you can expand/contract the map pane to give more screen space to work on landscape modifications. See other documentation for an explanation of how the runoff and water quality contributions of conservation practices are calculated.



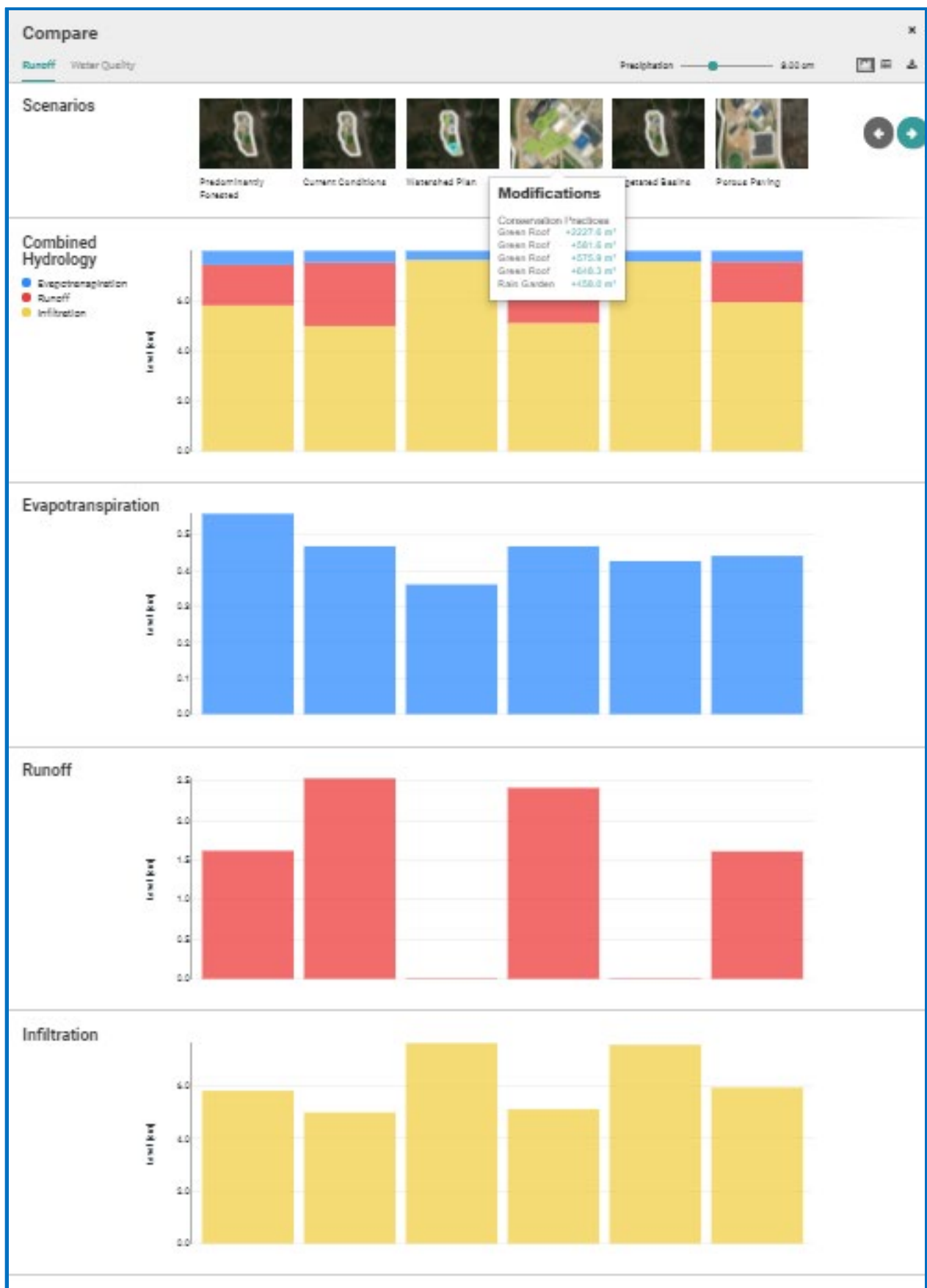
As you add land cover changes or conservation practices, you can see the amount of area changed by clicking on any polygon you added. You can also see a list of all of the modifications you made in the scenario by clicking on the space in the upper right of the map pane where it says "x modifications." This gives a "shopping cart" of modifications grouped by the type of modification. You can delete any modification by clicking the trashcan next to it. If it helps to decide where to make changes, you can still use the "Layers" control box to select which overlays to display on the map.





You can create many possible scenarios of landscape modification by clicking on the "+ New Scenario" next to the drop down list of current conditions and scenarios. This opens up a new scenario with no modifications on it (a copy of "Current Conditions"). Scenarios can be renamed by clicking the three dots "." next to the scenarios in the scenarios drop down list. Select the "Duplicate" option to create a copy of the scenario that you are working on to add or delete more changes while saving your "New Scenario." You can also rename your entire project by clicking the small down arrow (circled in blue above) next to the "Untitled Project" text in the top left corner and, if you are logged in, share your project through the same menu. If you have made your project publicly accessible and given someone the link, they will be able to view all of your scenarios and results. They will not, however, be able to modify it. Any public project can be made private again from the same menu.

Once you have created several scenarios, you can compare all of them by clicking "Compare" (circled in green above) in the upper toolbar. This gives a side-by side comparison of all of the scenarios along with the original conditions before any modifications. It also shows what the partitioning would be if the landscape were 100% forested. This 100% forested condition will give the maximum amount of infiltration for the landscape, given its soils. In the toolbar at the top of the Compare view you can select the type of output you would like to compare (runoff or water quality), change the amount of precipitation in the 24-hour storm event, and toggle between viewing the data as a graph (📊) or a data table (📄). At the top of each scenario is a map showing the original area and modifications. When you hover the cursor over a scenario map, you will see a list of the modifications. To scroll through many scenarios, use the "Navigate Scenarios" arrows on the right side of the Scenario maps. Click the ✕ in the upper right hand corner to close the Compare window and return to the scenarios.



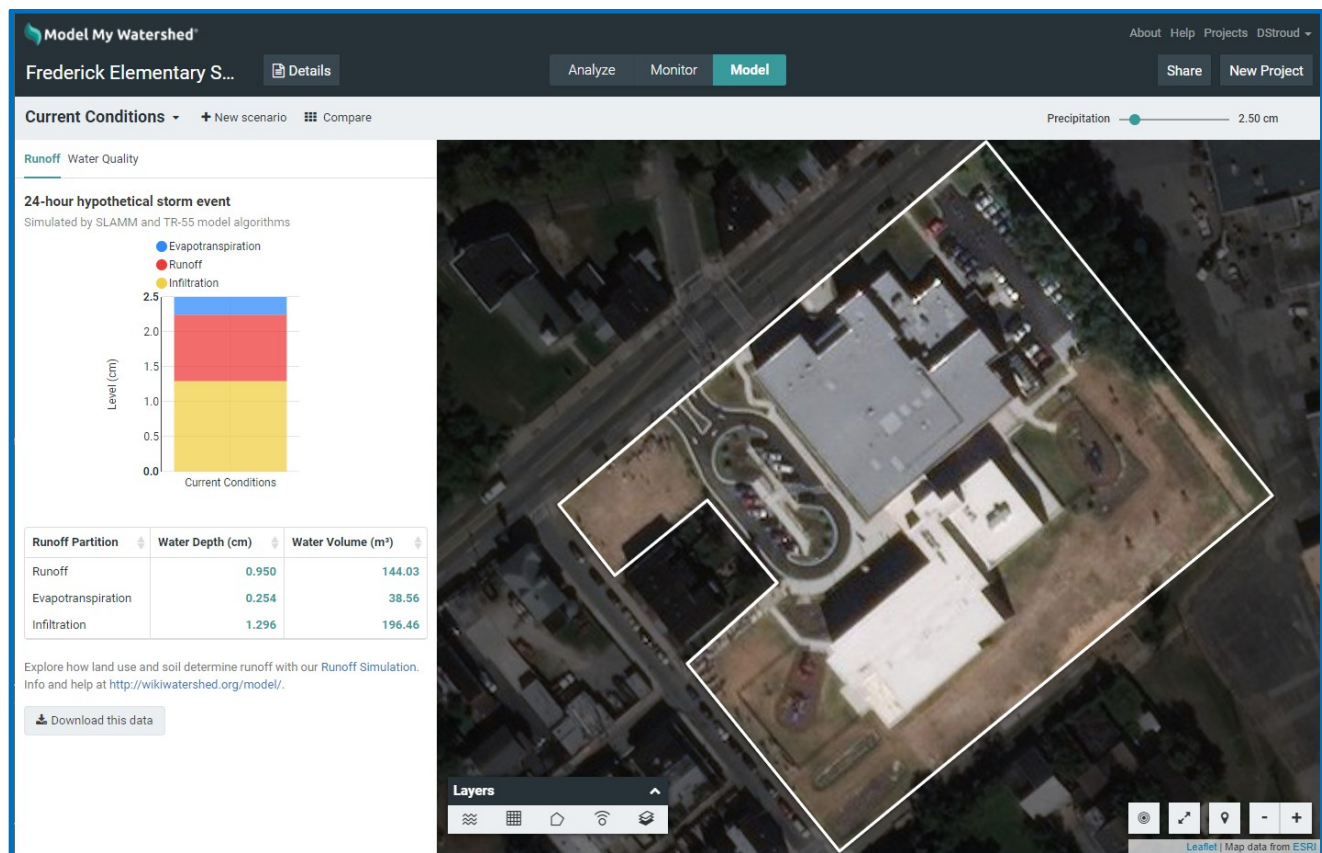
Model My Watershed® Schoolyard BMP Exemplars



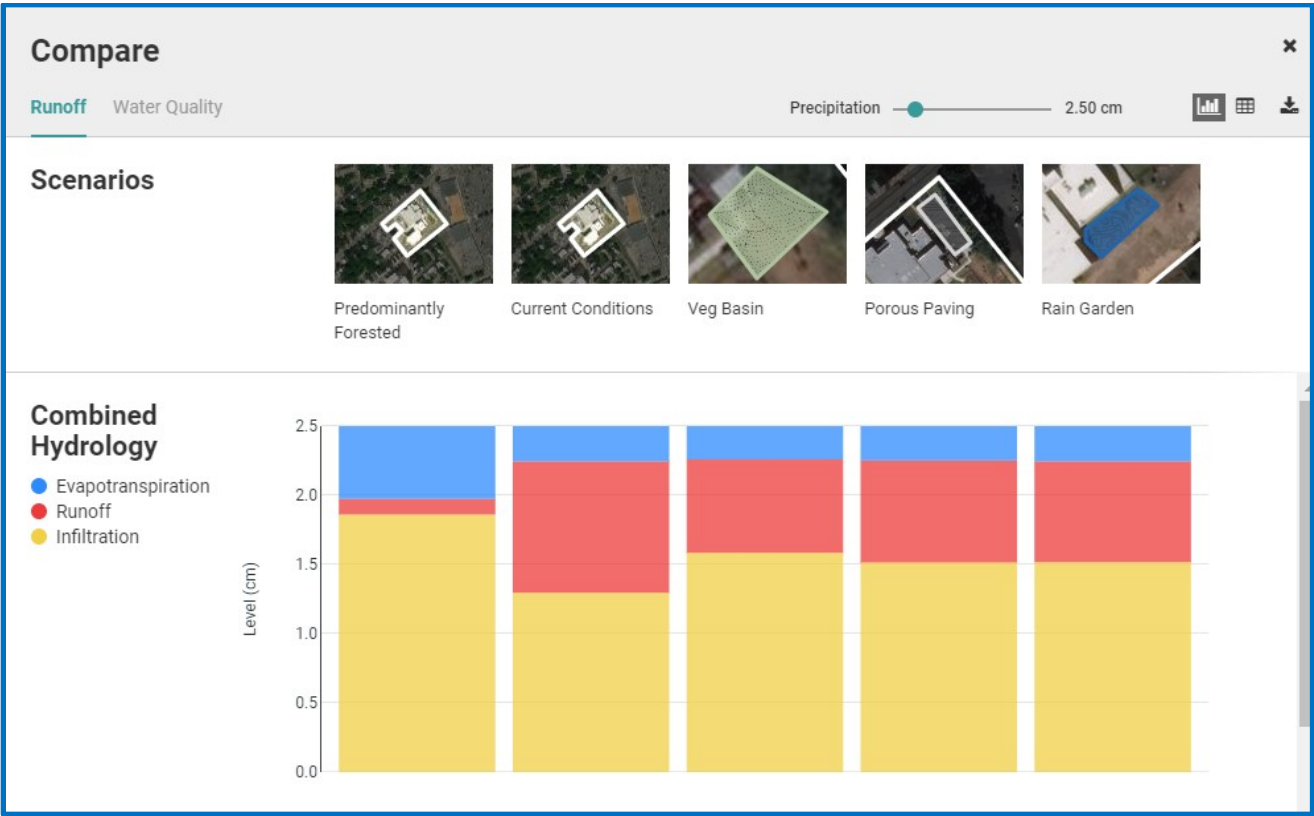
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Urban: Frederick Elementary School, MD

Base Schoolyard Map: **Selected Area** 15,162 m²



Proposed BMP Installation Scenario Comparison Runoff Graph



Proposed BMP Installation Scenario Comparison Runoff Data

Compare					
Runoff		Precipitation		2.50 cm	
Scenarios	Predominantly Forested	Current Conditions	Veg Basin	Porous Paving	Rain Garden
Runoff	0.113 cm	0.95 cm	0.675 cm	0.737 cm	0.729 cm
Evapotranspiration	0.526 cm	0.254 cm	0.241 cm	0.248 cm	0.254 cm
Infiltration	1.862 cm	1.296 cm	1.584 cm	1.514 cm	1.517 cm

Proposed BMP Installation Scenario Comparison Water Quality Data




Compare

Runoff


Water Quality

Precipitation


2.50 cm




Scenarios




Predominantly Forested




Current Conditions



Veg Basin



Porous Paving



Rain Garden

Total Suspended Solids

0.48 kg/ha

11.958 kg/ha

8.498 kg/ha

9.279 kg/ha

9.176 kg/ha

Total Nitrogen

0.011 kg/ha

0.289 kg/ha

0.205 kg/ha

0.224 kg/ha

0.222 kg/ha

Total Phosphorus

0.001 kg/ha

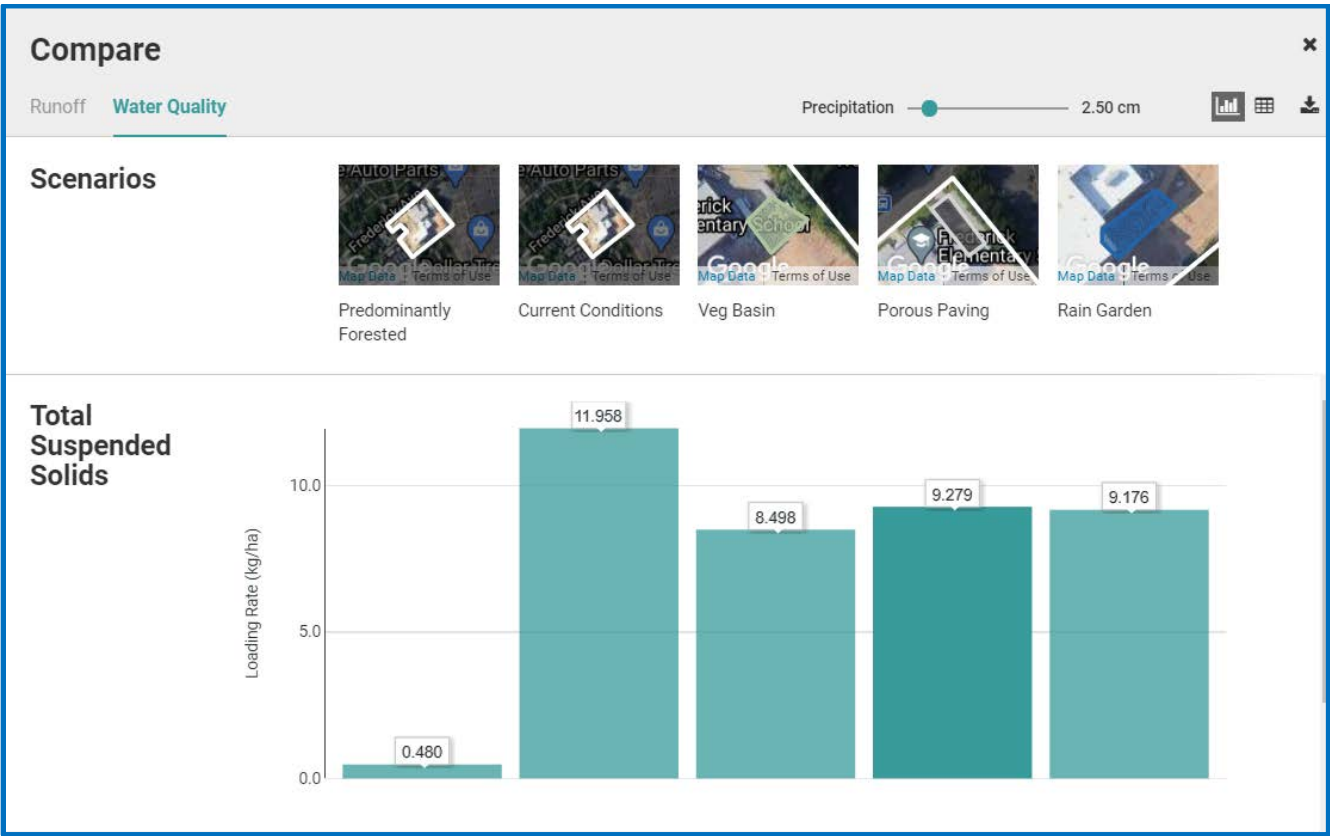
0.032 kg/ha

0.023 kg/ha

0.025 kg/ha

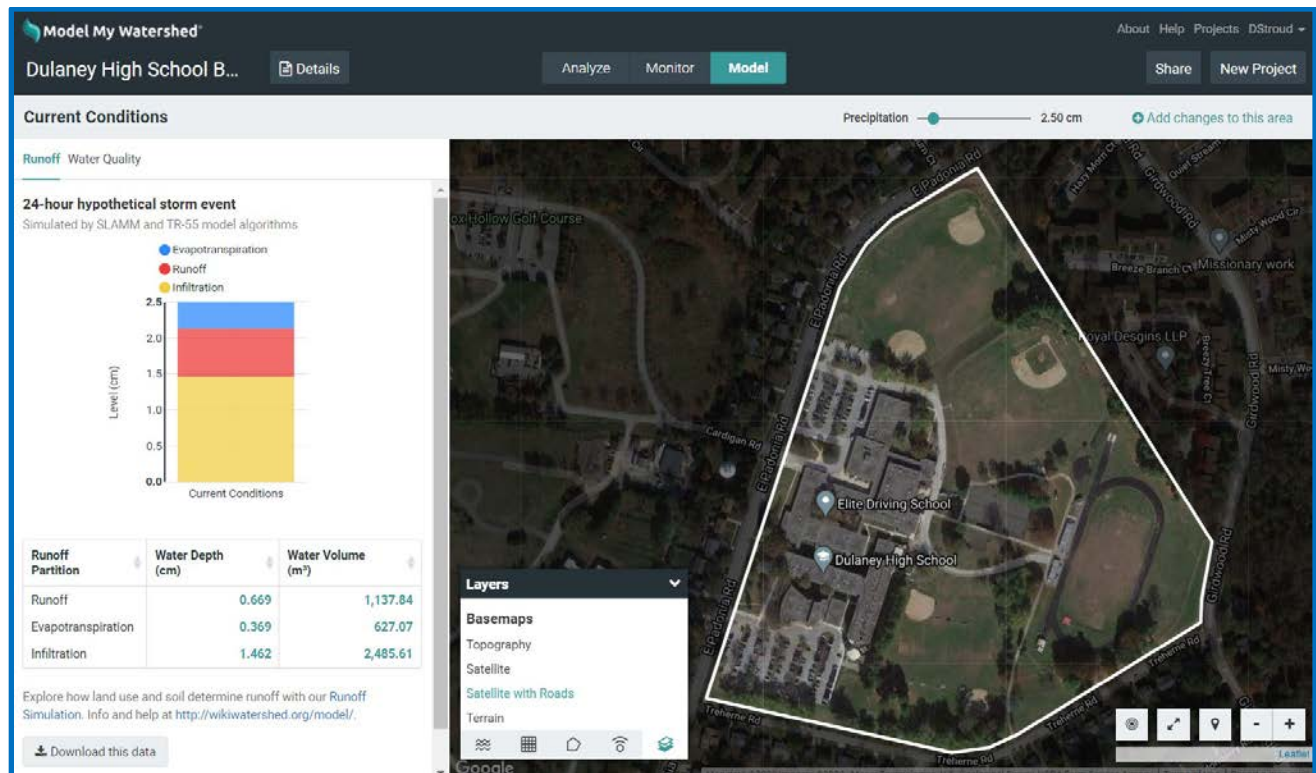
0.025 kg/ha

Proposed BMP Installation Scenario Comparison Water Quality Graph

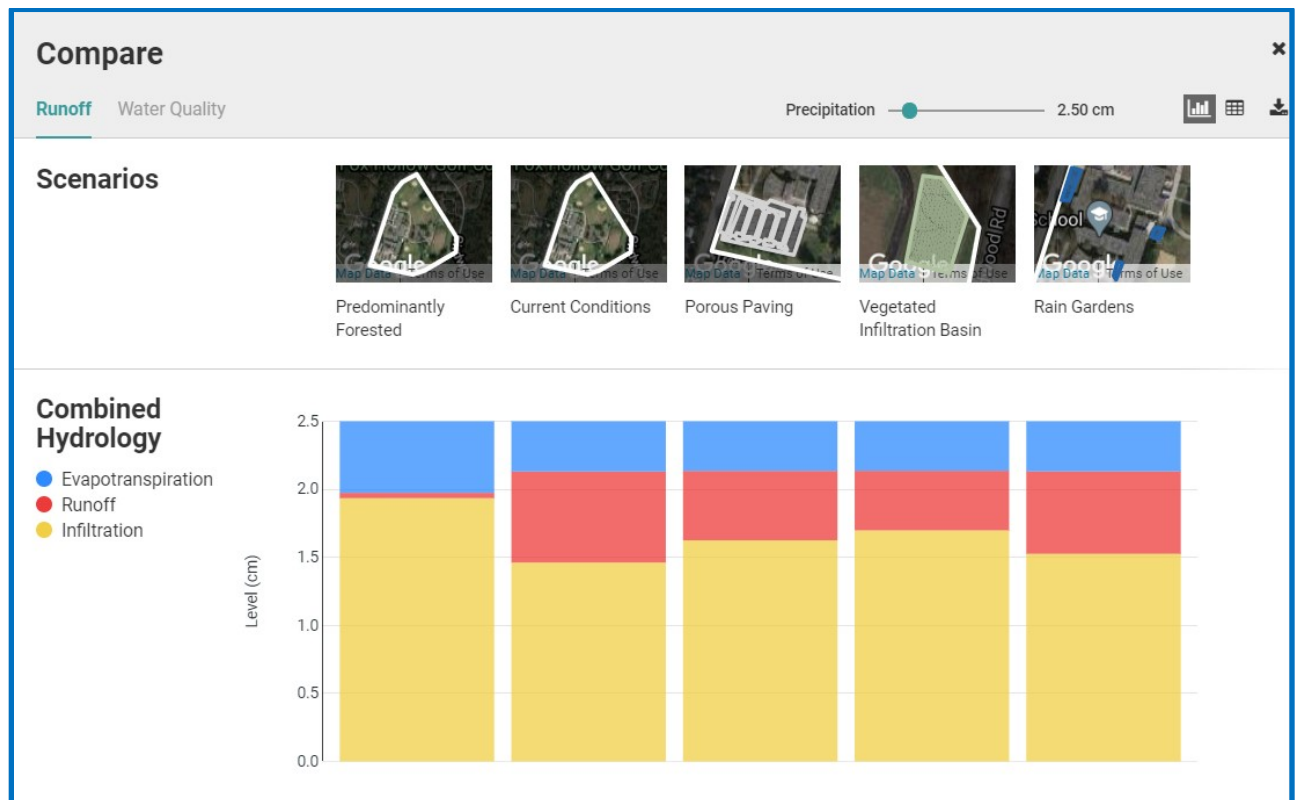


Suburban: Dulaney High School, MD

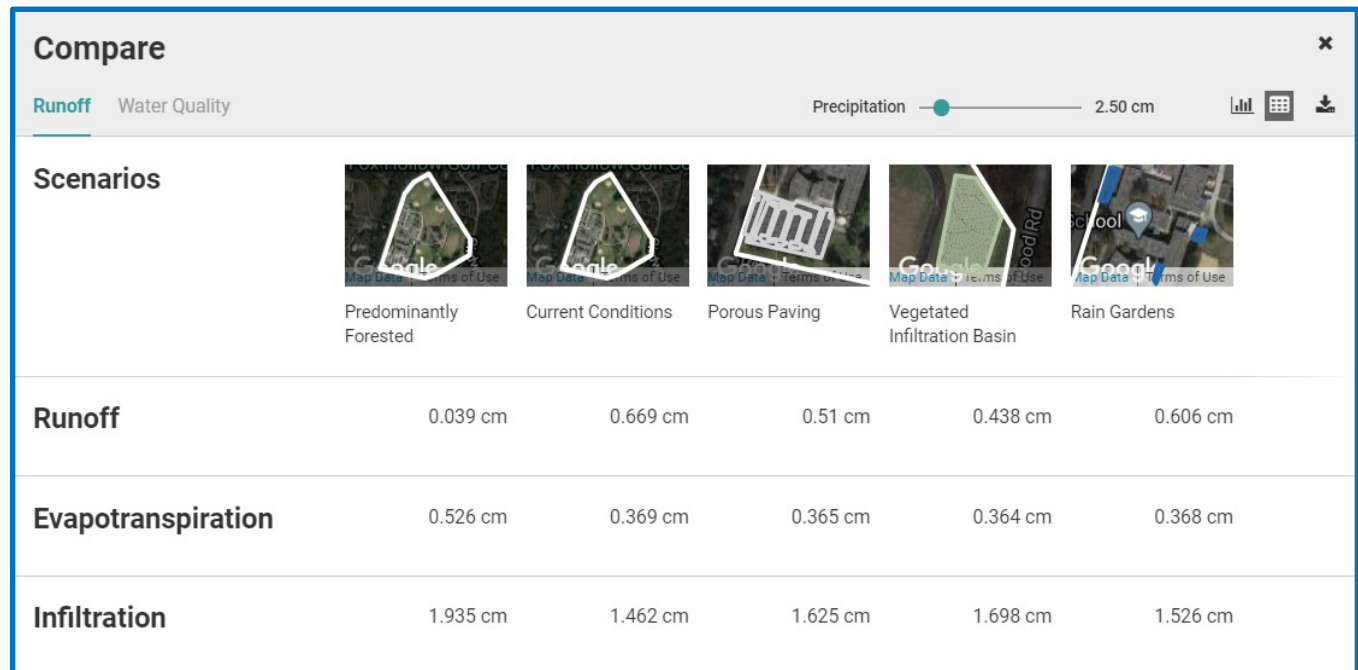
Base Schoolyard Map: **Selected Area** 170,021 m²



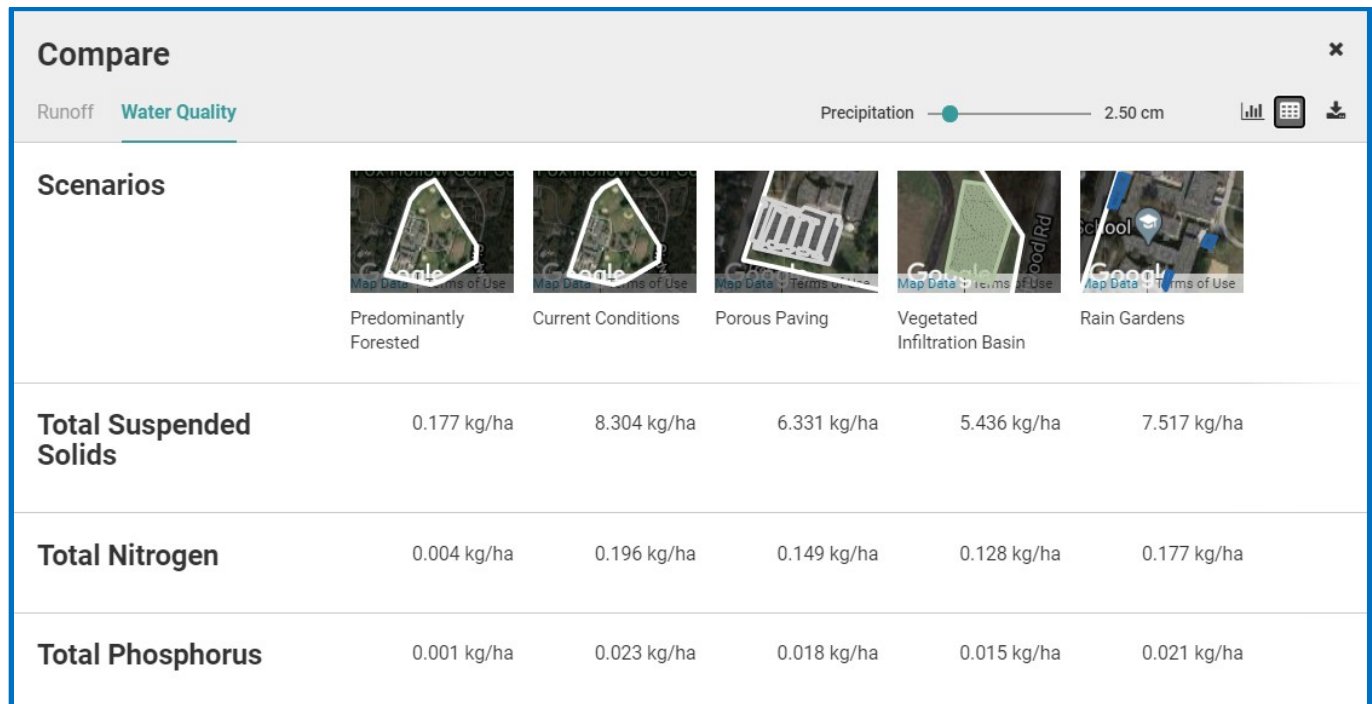
Proposed BMP Installation Scenario Comparison Runoff Graph



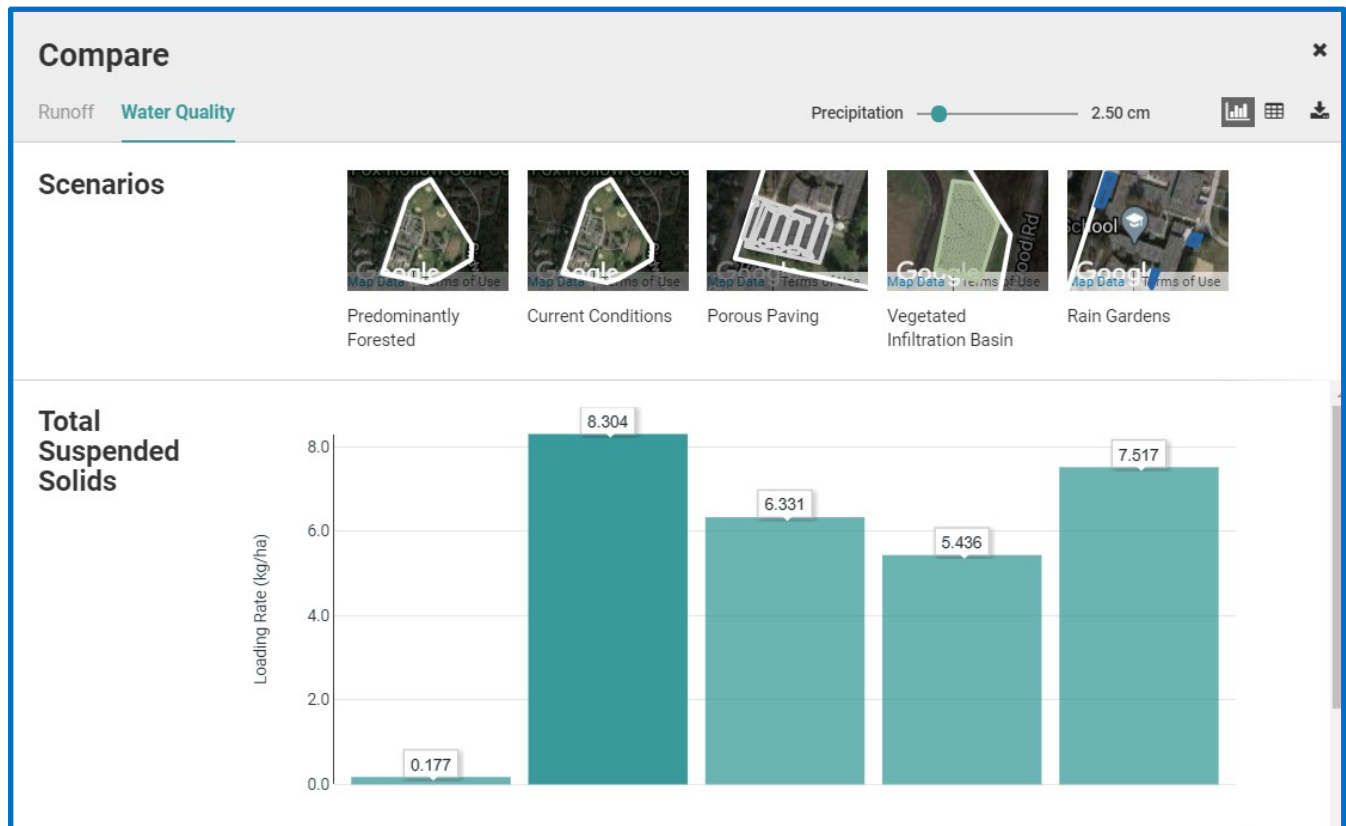
Proposed BMP Installation Scenario Comparison Runoff Data



Proposed BMP Installation Scenario Comparison Water Quality Data

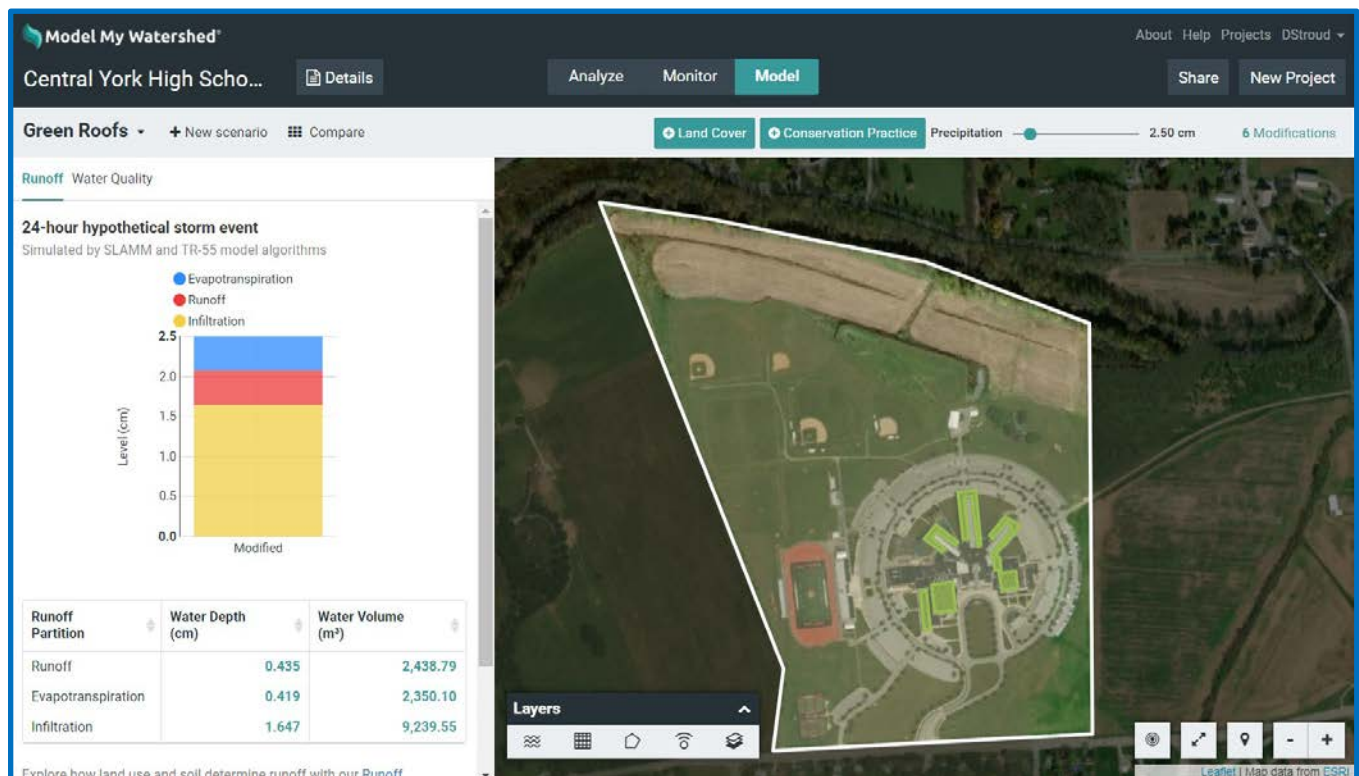


Proposed BMP Installation Scenario Comparison Water Quality Graph

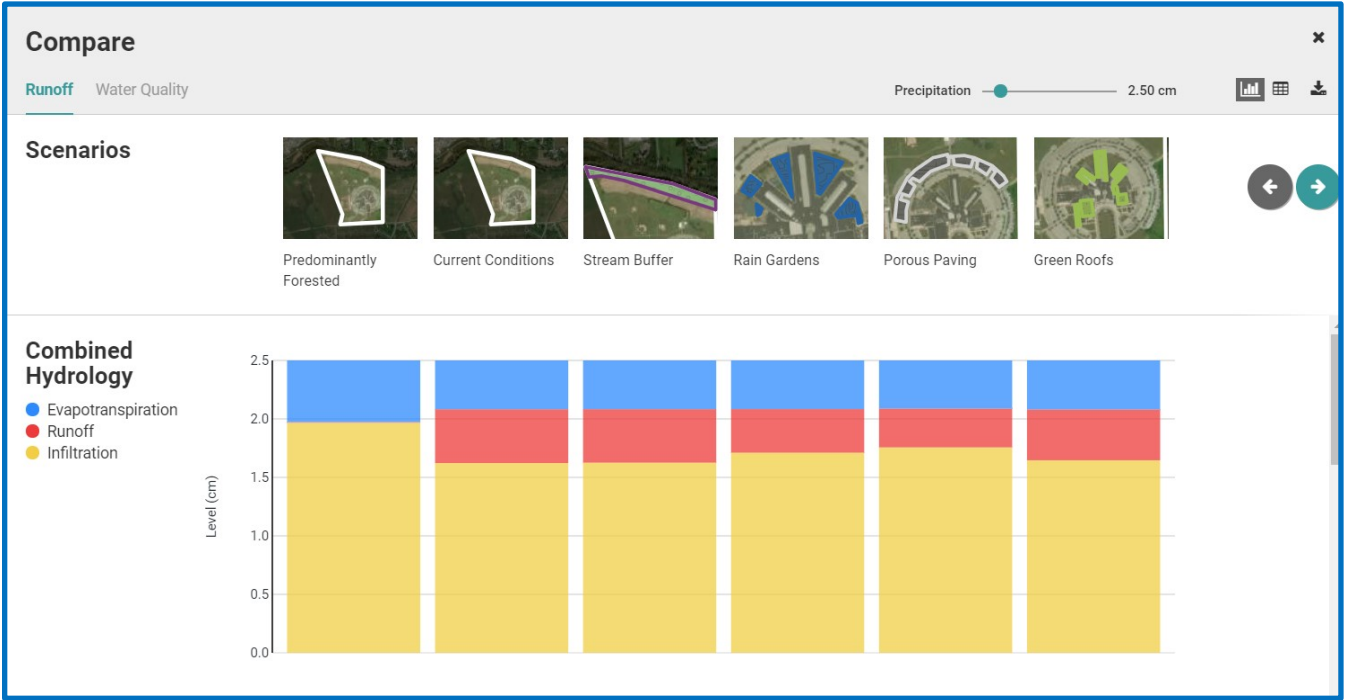


Rural: York Central School, PA




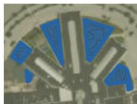


Base Schoolyard Map: **Selected Area** 561,138 m²



Proposed BMP Installation Scenario Comparison Runoff Graph



Proposed BMP Installation Scenario Comparison Runoff Data




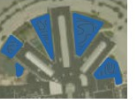


<div><div>Compare</div><div><div>Runoff</div><div>Water Quality</div></div><div>Precipitation 2.50 cm</div></div>						
<div><div>Scenarios</div><div><div></div><div></div><div></div><div></div><div></div><div></div></div><div><div>Predominantly Forested</div><div>Current Conditions</div><div>Stream Buffer</div><div>Rain Gardens</div><div>Porous Paving</div><div>Green Roofs</div></div></div>						
Runoff	0.006 cm	0.46 cm	0.458 cm	0.373 cm	0.332 cm	0.435 cm
Evapotranspiration	0.527 cm	0.417 cm	0.417 cm	0.416 cm	0.411 cm	0.419 cm
Infiltration	1.967 cm	1.622 cm	1.626 cm	1.711 cm	1.757 cm	1.647 cm

Proposed BMP Installation Scenario Comparison Water Quality Data

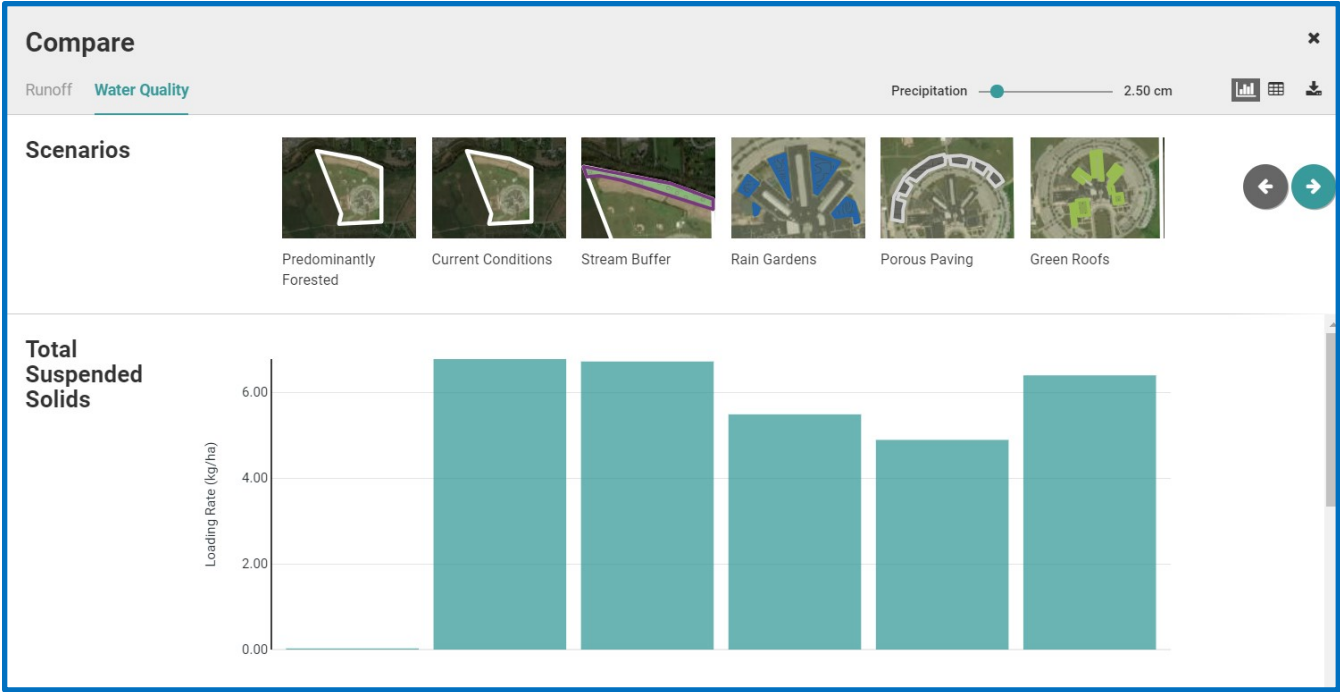
Compare

RunoffWater Quality

Precipitation2.50 cm

Scenarios						
	Predominantly Forested	Current Conditions	Stream Buffer	Rain Gardens	Porous Paving	Green Roofs
Total Suspended Solids	0.026 kg/ha	6.784 kg/ha	6.728 kg/ha	5.493 kg/ha	4.897 kg/ha	6.404 kg/ha
Total Nitrogen	0.001 kg/ha	0.181 kg/ha	0.179 kg/ha	0.146 kg/ha	0.13 kg/ha	0.171 kg/ha
Total Phosphorus	0 kg/ha	0.021 kg/ha	0.021 kg/ha	0.017 kg/ha	0.015 kg/ha	0.02 kg/ha

Proposed BMP Installation Scenario Comparison Water Quality Graph



Cover Letter Text -

As a resource expert, you recognize that protecting local watersheds is a priority. A priority that is articulated in Stormwater regulations associated with the Federal Clean Water Act (CWA) that are administered under the Municipal Separate Storm Sewer (MS4) Program by the Environmental Protection Agency (EPA). Protecting local watersheds requires a community effort. **The purpose of this letter is to highlight the value of partnering with school districts to minimize impacts from stormwater runoff and maximize the educational benefits for students (future voters) and the greater community.** School districts and schools are underutilized and valuable community partners in the important work of substantial sediment reductions in local waterways through the installation and maintenance of effective Best Management Practices (BMPs). BMPs are important because they can provide a dual benefit as meaningful actions that municipalities can take to fulfill some of the required MS4 permit obligations (mitigation and education). Structural and non-structural BMPs help manage stormwater in our municipalities (DEP, 2016).

- Structural BMPs are engineered systems that are designed to mitigate the impacts of stormwater. Structural BMPs are effective tools for stormwater management in both development and retrofit situations.
- Non-Structural BMPs can include physical changes to the grounds or modifications to maintenance practices. These changes focus on the prevention of stormwater generation, therefore effectively reducing runoff volume, and decreasing development costs while increasing property value and marketability.

Partnering with local school districts provides agencies with the opportunity to engage the entire community in minimizing impacts from stormwater runoff and maximizing the educational benefits for and the greater community. One example is via on-the-ground action projects through which stakeholders (and the community) can see the results of community efforts. When agencies partner with a school to install BMPs, these Stormwater BMP action projects help students develop a sense of environmental ethics and stewardship that will be essential to the long-term sustainability of our watersheds and will serve as the foundation of a positive, lifelong relationship with the environment. BMP installations can include signage that provides ongoing educational benefits to the community and the schools.

The enclosed packet provides guidance on how to engage with local school districts:

- ABCs of Working with School Districts on BMP Projects (Benefits, Approach, Steps to Success)
- Method for Selecting BMPs for School Properties (with Appendices: A (Blank Worksheets) and B (Model My Watershed® Users Guide))
- Chesapeake Bay Watershed Resources for BMPs on School Grounds
- Model My Watershed® Overview



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Component 2: 1-2 pages: ABCs of how municipalities (Elected officials & Resource management staff - MS4 coordinator or County Planner) can work with schools to install and promote BMPs on school properties

Forming a Watershed Partnership with Your Local School District

Section 1: Benefits of working with a school district

- Opportunity -
 - School districts are often in control of significant tracts of land where BMPs could be or have been installed to help meet stormwater requirements. Changes to land management practices can reduce maintenance costs and personnel time.
 - School districts are expanding and building new facilities that require BMP installations in their site plans. Older buildings are often renovated and require updated site plans that are subject to new stormwater regulations.
 - Many schools are unaware of the BMPs already installed on their properties and the learning opportunities they present for their students and the community.
- Invested Partners -
 - School districts take on the responsibility to educate their students and the public. They are open to new ways to integrate real-world learning in their curriculum and involve their students in meaningful action plans that benefit the community.
 - School districts are committed to implementing sustainability plans and projects that reduce costs, conserve resources, reduce their environmental footprint, and demonstrate responsible environmental stewardship.
- Limited Expertise -
 - While some large school districts may have sustainability coordinators or civil engineers on staff, most school districts lack facilities staff who are knowledgeable of BMPs and their maintenance or may not have the specialized equipment required to properly maintain BMPs. School district employees would benefit from oversight and training to support the installation and maintenance of BMPs.
 - Many school districts would benefit from BMP and stormwater control expertise and information to integrate BMPs into their curriculum. This includes introducing students to professionals who work for agencies and highlight potential career paths.

Section 2: Approaching a School District

- Motivation -
 - Like most organizations, school districts are motivated by energy/cost savings and the need to meet building code requirements. School districts may be most motivated to partner with others during capital building projects that require the inclusion of BMPs. Consider reviewing school district capital improvement plans or similar documents that outline proposed building construction and/or renovation projects.
 - School districts are continually looking for opportunities to enhance student learning. Identifying existing BMP installations on the school grounds and highlighting how these BMPs can be linked to the curriculum is a low-cost way to fulfill some of the required MS4 permit obligations.

- Challenges -
 - Funding is a persistent challenge for school districts. It is important to consider funding sources for installing and for maintaining BMPs prior to approaching school districts. For example, consider partnering with your county conservation district. Conservation district personnel include a Watershed Specialist and, in some cases, an Education Specialist that has experience working with teachers/students in the implementation of BMPs on school grounds. Cooperating with County Conservation Districts opens up grant funding opportunities. Other funding opportunities include the state Department of Environmental Protection and local non-profits.
- Who to approach -
 - District Office Personnel - It is advisable to contact the district office personnel (not an individual school in the district) if your partnership goals include BMP installations that will require modifications to the grounds and on-going maintenance. Appropriate central office district personnel may include facilities/maintenance manager or the assistant superintendent in charge of buildings and grounds. In smaller school districts this may be the assistant superintendent. Larger school districts may have a construction division with in-house civil engineers or architects. School districts may also have a sustainability coordinator or curriculum specialist who would provide a vital link in connecting BMP installations to the curriculum.

Section 3: Steps to Success

Step 1 - Form your team: Contact school districts to understand their administrative structure and identify the staff from the district that would be important to include in developing BMP plans and projects, many school districts publish their district organization structure online to help identify key personnel and may include contact information. The most important staff member at most school districts is the administrative assistant who answers the phone. It is best to have pre-identified some personnel that you would like to include in the team you are assembling, but always ask the administrative assistant to recommend who else should be included. Include personnel from administration, facilities, curriculum, and ask if they have a sustainability coordinator. Consider adding partners from other county agencies or departments (Soil/Water Conservation Districts, Rivershed Associations, land conservancies)

Step 2 - Identify potential school sites and combined impacts for BMP projects: Use the enclosed [Method for Selecting BMPs for School Properties](#) to identify school districts properties where BMPs and restoration projects would be most beneficial. Access the ArcGIS [CBT Public School Stream BMP Evaluation Tool \(vers 1.0\)](#) and [Model My Watershed®](#) (an online watershed modeling app) to prioritize school properties and compare the effects of different BMPs on stormwater and pollutant runoff. Finally, estimate and compare the costs of those BMPs using the [National Stormwater Calculator](#). For some less technical and less costly BMPs this exercise will be adequate for decision-making and BMP installation. In cases where stormwater infrastructure must be designed and built at significant expense, the exercise described here should be considered a screening level analysis that prepares school personnel and agency staff for a discussion with engineers.

Step 3 - Finalize projects: Plan the roles and supports for the potential BMP project installations including the operation and maintenance of post construction BMPs. School districts may need assistance managing new installations during summer months if students are included in the maintenance plans. Demonstrate to school districts how their involvement can support or help define district-wide sustainability plans. Consider projects that make use of existing structural BMPs or involve changes in maintenance procedures (ex. no-mow zones). Include features that promote educational opportunities for students and the community (interpretive signs, viewing areas, outdoor classroom spaces).

Step 4 - Identify sources of funding: Work with your team to identify potential funding sources for BMP installations, maintenance, and curricular integration. Use the data from the models in step 2 (above) to support grant applications. Consider federal, state, and county grant programs in stormwater and habitat improvement, as well as local and corporate funding opportunities (maintenance tools cost money too!). Consider how students could be involved in the process to increase educational opportunities and enhance funding application narratives.

Step 5 - Promote the success: Include plans to promote and celebrate the success of BMP installations and implementation in student learning that increase the educational outcomes in the community at large. Encourage school districts to apply for state, federal, and national green school recognition programs (Green Ribbon, Eco-schools USA, etc.) and include these projects and partnerships in their applications.

Component 4: Resources (Include a Sample of Resources or include full document:
Chesapeake Bay Watershed Resources for BMPs on School Grounds)

Bay Backpack (<http://baybackpack.com/>)

The Bay Backpack is an online collection of resources that support hands-on environmental learning by providing educators with information about **funding opportunities**, **field studies**, and **curriculum guides and lesson plans** related to the Chesapeake Bay. Bay Backpack helps educators find the tools they need to give their students **Meaningful Watershed Educational Experiences** (MWEEs). MWEEs allow students of all ages to develop a sense of environmental ethics and stewardship that will be essential to the long-term sustainability of the Chesapeake Bay and will serve as the foundation of a lifelong relationship with the environment.

WikiWatershed® (<https://wikiwatershed.org/>)

WikiWatershed® is a web toolkit created to support citizens, conservation practitioners, municipal decision-makers, researchers, educators, and students in collaboratively advancing knowledge and stewardship of fresh water. WikiWatershed® includes a suite of easy to use web tools that offer rapid visualization of watershed data, advanced geospatial analysis capabilities, and assist in watershed monitoring and management. The web toolkit includes: [Model My Watershed®](#), [Monitor My Watershed®](#), [EnviroDIY](#), [Leaf Pack Network®](#), [Macroinvertebrates.org](#), and the [Water Quality Mobile App](#).

Chesapeake Tree Canopy (<http://chesapeaketrees.net/>)

An online resource for projects involving best practices for tree canopy assessments, information, and contacts for urban forestry projects.

NOAA MWEE 101 & 201 Online Professional Development Modules

(<https://cbexapp.noaa.gov/course/index.php?categoryid=3187>)

The NOAA MWEE 101 & 201 Modules provides educators with the resources and training options to learn how to use the MWEE framework to develop Meaningful Watershed Educational Experiences that will educate and empower students to identify and solve problems in their watersheds.

MAEOE Resource Library (<https://maeoe.org/resource-library/clean-water-project-resources>)

The Maryland Association for Environmental & Outdoor Education has many resources within their online library including this page dedicated to Clean Water Project Resources. MAEOE also offers professional development, runs the Green Schools and Green Centers program, and hosts an annual Youth Summit.

Chesapeake Bay Foundation (<https://www.cbf.org/>)

The Chesapeake Bay Foundation website offers many resources to help everyone learn about the Chesapeake Bay, the issues, and ways to save the Bay. One of their resources is a Schoolyard Report Card that educators can use to engage students in assessing how their own schoolyard is impacting the Bay. (https://www.cbf.org/document-library/education-resources/schoolyard_reportcard28aa.pdf)

Exemplar Programs

The following programs and projects have been recognized as exemplary and could be adapted and replicated throughout the Chesapeake Bay Watershed to expand and enhance educational opportunities and civic engagement for all students, schools, and communities.

The Clean Water Partnership Schools Program (<https://thecleanwaterpartnership.com/cwp-schools-program/>)

The Clean Water Partnership (CWP) is a collaborative effort by Prince George County (MD) and Corvias (a consulting company that specializes in developing collaborative partnerships to engage and improve communities) to develop and implement innovative solutions to stormwater regulatory challenges. The CWP partnered with Prince George's County Public Schools (PGCPS) to launch the CWP Schools Program, a pilot program designed to assist PGCPS with treating and managing stormwater runoff from impervious sites by utilizing BMPs. This collaborative effort between PGCPS and the CWP helps the County achieve its stormwater compliance goals while also providing an educational legacy for future generations committed to managing the water quality in Prince George's County communities.

The Watershed Report Card (<https://www.howardnature.org/watershed-report-card-program/>)

Howard County's largest environmental education program – The Watershed Report Card – reaches 5,000 students from all 13 Howard County High Schools. Students study the biological, chemical, and physical aspects of local streams and complete a scientifically rigorous assessment. The final product of this year-long study is a student-developed, published Watershed Report Card. At the Summit, students turn the table and present their grade to county leaders. This is a successful model that demonstrates a collaboration between a non-profit land conservancy and a school district. The Howard County Conservancy, originally founded in 1990 as a private, nonprofit land trust, today has a dual mission of preserving land in Howard County and providing educational programs.

River Tools (<https://www.designgreenllc.com/river-tools>)

River Tools is a green infrastructure maintenance kit developed by Design Green LLC that includes a manual and system to engage students in BMP Maintenance: <https://www.designgreenllc.com/river-tools>
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Chesapeake Bay Watershed Resources for BMPs on School Grounds



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MAEOE Resource Library (<https://maeoe.org/resource-library/clean-water-project-resources>)

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Chesapeake Bay Foundation (<https://www.cbf.org/>)

Resources for Teachers & Students (<https://www.cbf.org/join-us/education-program/resources/>)

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(https://www.cbf.org/document-library/education-resources/schoolyard_reportcard28aa.pdf)

EPA Storm G3 Initiative (<https://www.epa.gov/G3>)

The EPA launched the Green Streets, Green Jobs, Green Towns (G3) Initiative in n October of 2010 to assist small to medium-sized communities in urbanized watersheds in reducing stormwater issues by providing tools and resources to develop a green vision, design-build, and operate and maintain green infrastructure stormwater management practices, and improve the water quality of local watersheds. Two of the outcomes from the EPA's G3 program include reference materials for resource managers and school districts to assist in developing their community's green vision.

[Storm Smart Cities: Integrating GI into Local Hazard Mitigation Plans \(PDF\)](#)(32 pp, 6 MB)

[Storm Smart Schools \(PDF\)](#)(36 pp, 11 MB)

Exemplar Programs

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Sustainable & Green Schools Programs

US Department of Education Green Ribbon Schools

(<https://www2.ed.gov/programs/green-ribbon-schools/index.html>)

The US Department of Education Green Ribbon Schools is a program that recognizes the accomplishments of schools, school districts, and institutions of higher education (IHEs) who apply to and are selected by their state education authorities. Recognition is earned by showing substantial progress in three pillars: Reduced Environmental Impacts and Costs, Improved Health and Wellness, and Effective Environmental and Sustainability Education. Schools, districts, colleges and universities who are interested in earning recognition apply to their state education authorities.

State Education Authorities for the US Department of Education Green Ribbon Schools

D.C.: <https://osse.dc.gov/publication/dc-green-ribbon-school-applications>

Delaware: <https://greenbuildingunited.org/initiatives/green-schools>

Maryland: <http://marylandpublicschools.org/programs/Pages/Environmental-Education/mgrs.aspx>

New York: <http://www.p12.nysed.gov/facplan/GreenRibbonSchools.html>

Pennsylvania:

<https://www.education.pa.gov/Teachers%20-%20Administrators/GreenSchools/Pages/default.aspx>

Virginia:

http://www.doe.virginia.gov/support/facility_construction/healthy_buildings/green_ribbon/index.shtml

West Virginia: <http://wvde.state.wv.us/sustainable-schools/>

Green Strides (<https://www.greenstrides.org/>) The US Department of Education's web portal developed to connect all school communities to the resources, webinars, case studies, and promising practices to facilitate collaborations so that all schools can make progress in each of the three pillars.

Eco-Schools USA (<https://www.nwf.org/eco-schools-usa>) National Wildlife Federation's Eco-Schools USA is a national program that provides a framework for schools to enlist and engage in sustainability programs and projects. Schools can earn levels of recognition by completing various pathways that reduce ecological footprints and educate students, schools, and the community.

Green Ribbon SchoolsSM (<http://www.greenribbonschools.org/>)

Green Schools Alliance (<https://www.greenschoolsalliance.org/home>)

Project Green Schools (<https://projectgreenschools.org/>)

BMP Project Funding Resources

Bay Backpack Funding Opportunities (<http://baybackpack.com/funding/>)

National Municipal Stormwater Alliance MS4 Online Resource Library

(<http://ms4resource.nationalstormwateralliance.org/index.php/funding-source-options/>)

BMP Project Idea Resources

Austin Independent School District (<https://www.austinisd.org/schoolyard-improvements-projects>)

A great example of a school district that is embracing sustainability by engaging in many projects at their schools to connect students with nature in their schoolyards and improve student achievement.

Schoolyard Habitat Project Guide (<https://www.fws.gov/cno/pdf/HabitatGuideColor.pdf>)

A planning guide developed by the US Fish & Wildlife Service for creating schoolyard habitat and outdoor classroom projects.

State Fish and Wildlife Agencies

The US Fish and Wildlife Service works in partnership with many organizations and individuals. Fish and wildlife conservation requires coordinated efforts by the states and the territories, as well as private landowners, tribes, and other countries besides the United States. The list below provides a starting point for finding the state and territory agencies that manage fish and wildlife resources.

Also, the Association of Fish and Wildlife Agencies maintains a list of [natural resources agencies](#) for states, provinces, and territories.

Delaware	Delaware Department of Natural Resources and Environmental Control Delaware Division of Fish and Wildlife US Fish and Wildlife Service Offices in Delaware
District of Columbia	District of Columbia Department of Energy and Environment District of Columbia Fisheries and Wildlife Division US Fish and Wildlife Service Offices in District of Columbia
Maryland	Maryland Department of the Environment Maryland Department of Natural Resources US Fish and Wildlife Service Offices in Maryland
New York	New York Department of Environmental Conservation US Fish and Wildlife Service Offices in New York
Pennsylvania	Pennsylvania Department of Conservation and Natural Resources Pennsylvania Department of Environmental Protection Pennsylvania Fish and Boat Commission Pennsylvania Game Commission US Fish and Wildlife Service Offices in Pennsylvania
Virginia	Virginia Department of Conservation and Recreation's Virginia Department of Environmental Quality Virginia Department of Game and Inland Fisheries Virginia Marine Resources Commission US Fish and Wildlife Service Offices in Virginia
West Virginia	West Virginia Department of Environmental Protection West Virginia Division of Natural Resources US Fish and Wildlife Service Offices in West Virginia

State Native Plant Societies:

Delaware	Delaware Native Plant Society	http://www.delawarenativeplants.org		FB
Delaware	Mt Cuba Center	http://www.mtcubacenter.org/	info@mtcubacenter.org	FB
District of Columbia	Smithsonian National Museum of Natural History, Department of Botany	http://apsdev.org/welcome.html		
District of Columbia	The Botanical Society of Washington	http://www.wvnps.org/		
Maryland	Maryland Native Plant Society	http://www.mdflora.org/	info@MDFlora.org	FB
New York	Native Plant Society of Staten Island	http://www.nativeplantsocietyofstatenisland.org/		FB
New York	New York Flora Association	http://www.nyflora.org/	info@nyflora.org	FB
New York	Torrey Botanical Society	http://www.torreybotanical.org/		FB
New York	The Finger Lakes Native Plant Society of Ithaca	http://flnps.org/	info@flnps.org	
New York	The Native Plant Center at Westchester Community College		wcc.nativeplant@sunywcc.edu	
Pennsylvania	Pennsylvania Native Plant Society	http://www.pawildflower.org/	president@pawildflower.org	FB
Pennsylvania	Botanical Society of Western Pennsylvania	http://www.botsocwpa.org/		
Pennsylvania	Delaware Valley Fern & Wildflower Society	http://www.dvfws.org/		
Virginia	Virginia Native Plant Society	http://vnps.org/	vnps.org@gmail.com info@vnps.org	FB
Virginia	American Chestnut Cooperators' Foundation	http://www.accf-online.org/	allaccf@gmail.com	
West Virginia	West Virginia Native Plant Society	http://www.wvnps.org/		FB

State Resources

District of Columbia

District of Columbia Environmental Education Consortium (<http://dceec.org/>)

Inspector Green App (Design Green LLC) - an online way for students to engage in BMP maintenance in a game setting. (<https://www.designgreenllc.com/inspector-green>)

Delaware

Delaware Association of Environmental Education (<http://daeeonline.org/>)

Delaware Pathways to Green Schools (<https://greenbuildingunited.org/initiatives/green-schools>)

Green Building United is a Non-Profit Organization that administers the Delaware Pathways to Green Schools program. The Pathways program provides grants, resources, and one-on-one support to K-12 schools in Delaware that are committed to becoming healthier, more sustainable, and more energy efficient. This program is funded by the [Delaware Sustainable Energy Utility](#) (also a nonprofit quasi-governmental organization). Delaware is a participant in RGGI, the Regional Greenhouse Gas Initiative and through participation and RGGI Delaware receives funding for energy efficiency and renewable energy projects and the Delaware sustainable energy utility distributes that funding to to actively reduce energy use and carbon emissions from the state. Green Building United also supports the development of sustainable communities in Delaware. (<https://greenbuildingunited.org/communities/delaware>)

Maryland

Maryland Association for Outdoor and Environmental Education (<http://maeoe.org/>)

Watershed Stewards Academy (<https://extension.umd.edu/watershed/watershed-stewards-academy>)

The Watershed Stewards Academy (WSA) is a training program to empower residents to improve the quality of local waterways. By sharing resources, forming partnerships, and coordinating efforts, WSA works with a Consortium of Support Professionals, Master Watershed Stewards and their communities to reduce pollutants, infiltrate stormwater and restore natural systems.

New York

New York State Outdoor Education Association (<https://nysoea.weebly.com/>)

Pennsylvania

Pennsylvania Association of Environmental Educators (<http://www.paee.net/>)

Virginia

Virginia Association for Environmental Education (<https://vaee.wildapricot.org/>)

West Virginia

West Virginia Environmental Education Association

(<https://www.facebook.com/WestVirginiaEnvironmentalEducationAssociation/>)

BMP Maintenance Resources

SUSTAINABLE LANDSCAPE MAINTENANCE MANUAL for the Chesapeake Bay Watershed

<https://cblpro.org/downloads/CBLPMaintenanceManual.pdf>

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The Value of Green School Yards in the face of COVID-19

<https://www.greenschoolyards.org/covid-19-overview-outdoor-learning>

https://static1.squarespace.com/static/57682b81725e25259d8396e3/t/5ec7584383adba6fbbba93aaf/1590122565462/20-05-21_USA-CovidResponse-GSA-2pg.pdf

<https://www.greenschoolyards.org/outdoor-infrastructure>

Component 1: Introduction Letter: Call to action format (1 page max- general cover letter; not to a specific person/entity)

- Overview, brief introduction: ABCs of how schools can work with local municipal leaders and **reasons to implement BMPs on school grounds.**

Cover Letter Text -

Protecting the health of our local watersheds is vital to the sustainability of our community; and it requires a community effort that starts with education. School districts have the ability to lead by example through the use of Best Management Practices (BMPs) on school grounds. School districts are underutilized and valuable community partners in the important work of substantial sediment reductions in local waterways through the installation and maintenance of effective Best Management Practices (BMPs). BMP installations and proper management assist in meeting stormwater regulations associated with the Federal Clean Water Act (CWA) that are administered under the MS4 Program by the Environmental Protection Agency (EPA). BMPs are important because they can provide a dual benefit as meaningful actions that municipalities can take to fulfill some of the required MS4 permit obligations (mitigation and education). Structural and non-structural BMPs help manage stormwater in our municipalities (DEP, 2016).

- Structural BMPs are engineered systems that are designed to mitigate the impacts of stormwater. Structural BMPs are effective tools for stormwater management in both development and retrofit situations.
- Non-Structural BMPs can include physical changes to the grounds or modifications to maintenance practices. These changes focus on the prevention of stormwater generation, therefore effectively reducing runoff volume, and decreasing development costs while increasing property value and marketability.

The purpose of this letter is to highlight the value of partnering with local agencies such as municipal MS4 managers, county conservation districts, local land conservancy organizations, county or state environmental protection departments, state agencies (natural resources, wildlife, fish & boat) **to minimize impacts from stormwater runoff and maximize the educational benefits for students and the greater community.** When agencies and school districts work together to install BMPs, these Stormwater BMP action projects help students develop a sense of environmental ethics and stewardship that will be essential to the long-term sustainability of our watersheds and will serve as the foundation of a positive, lifelong relationship with the environment. BMP installations can also beautify school grounds, increase outdoor learning spaces, and include signage that provides ongoing educational benefits to the community and the schools.

The enclosed packet provides guidance on how to engage with local agencies.

- ABCs of Working with local agencies on BMP Projects (Benefits, Approach, Steps to Success)
- Method for Selecting BMPs for School Properties (with Appendices: A (Blank Worksheets) and B (Model My Watershed® Users Guide))
- Chesapeake Bay Watershed Resources for BMPs on School Grounds
- Model My Watershed® Overview
- CBT - Model My Watershed® Schoolyard BMP Exemplars
- BMP/Conservation Practice Factsheets



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Component 2: 1-2 pages: ABCs of how municipalities (Elected officials & Resource management staff - MS4 coordinator or County Planner) can work with schools to install and promote BMPs on school properties

Forming a Watershed Partnership with Your Local Agencies and Organizations

Section 1: Benefits of Working with Local Agencies and Organizations

- Opportunity -
 - Changes to land management practices can reduce maintenance costs and personnel time.
 - School districts often control significant tracts of land where BMPs could be or have been installed to help meet stormwater requirements. Expanding school districts are building new facilities that require BMP installations in their site plans. Older buildings being renovated often require updated site plans that are subject to new stormwater regulations.
 - MS4 managers and local agencies often have programs to assist with BMP installations on school properties and the integration of BMPs into curriculum.
 - Many schools are unaware of the BMPs already installed on their properties and the learning opportunities they present for their students and the community.
- Investments in Education -
 - School districts take on the responsibility to educate their students and the public. They are leaders of educational innovation and are open to new ways to integrate real-world learning into their curriculum and involve their students in meaningful action plans that benefit the community.
 - BMP projects provide real-world learning opportunities that can engage students and the community in meaningful ways that align to state and national standards.
 - School districts can implement sustainability plans and projects that reduce costs, conserve resources, reduce their environmental footprint, and demonstrate responsible environmental stewardship.
- Expertise and Career Exposure -
 - Many school districts would benefit from BMP and stormwater control expertise and information to integrate BMPs into their curriculum. This includes introducing students to professionals who work for agencies and highlighting potential career paths.
 - Many school districts would benefit from oversight and training to support the installation and maintenance of BMPs, and may not own the specialized equipment required to properly maintain BMPs.

Section 2: Approaching Local Agencies and Organizations

- Motivation -
 - Local resource managers (MS4 managers, conservation districts, county or state environmental protection departments) often have a budget and need to meet specific goals that would benefit from partnerships with schools. Often these same departments are involved with reviewing site plans for new school construction or renovation projects and can help school districts save energy and maintenance costs with the inclusion of BMPs.

- School districts are continually looking for opportunities to enhance student learning. Identifying existing BMP installations on the school grounds and highlighting how these BMPs can be linked to the curriculum is a low-cost way to fulfill some of the required MS4 permit obligations.
- Challenges -
 - Cooperating with County Conservation Districts opens up grant funding opportunities. Other funding opportunities include the state Department of Environmental Protection and local non-profits.
 - Conservation district personnel often include a Watershed Specialist and, in some cases, an Education Specialist that has experience working with teachers/students in the implementation of BMPs on school grounds.
- Who to approach -
 - Local MS4 Managers - Contact your municipality or county to see if all (or parts) of your school district are under MS4 regulations and how you can be involved in MS4 projects and education.
 - Conservation District Managers - Water and/or Soil Conservations are located in each county and may have programs to assist with BMP projects on school grounds.
 - Department of Environmental Protection - county or state level agencies that oversee watershed regulations and programs.
 - State Agencies (natural resources, wildlife, fish & boat) - often have programs to assist in reducing pollution, controlling stormwater, and/or improving wildlife habitat.
 - Local Land Conservation Organizations - Great resources for potential BMP projects and may have educational staff to assist with integrating BMP projects into the curriculum.

Section 3: Steps to Success

Step 1 - Form your team: If your school district has a sustainability team already then you are ahead of the game! If your school district does not have a sustainability team, this is the perfect time to initiate a new collaboration. Include stakeholders from all parts of your school community (administrators, buildings & grounds staff, curriculum supervisors, sustainability coordinators, environmental education specialists, teachers, students, parents). Consider adding partners from county agencies or departments (MS4 managers, Soil/Water Conservation Districts, Watershed Associations, and/or land conservancies). BMP projects are one way to involve your team in improving the water quality in your watersheds, although they could expand to other sustainability projects in your schools including energy conservation, water conservation, developing outdoor classrooms or wildlife habitats. The National Wildlife Federation's Eco-Schools USA program has a great seven step framework that can help guide and organize your efforts (<https://www.nwf.org/Eco-Schools-USA/Framework>).

Step 2 - Identify potential school sites and combined impacts for BMP projects: Use the enclosed Method for Selecting BMPs for School Properties to identify school districts properties where BMPs and restoration projects would be most beneficial. Access the ArcGIS [CBT Public School Stream BMP Evaluation Tool \(vers 1.0\)](#) and [Model My Watershed®](#) (<https://modelmywatershed.org/> - an online watershed modeling app) to prioritize school properties and compare the effects of different BMPs on stormwater and pollutant runoff. Finally, estimate and compare the costs of those BMPs using the [National Stormwater Calculator](#). For some less technical and less costly BMPs this exercise will be adequate for decision-making and BMP installation. In cases where stormwater infrastructure must be designed and built at significant expense, the exercise described here should be considered a screening level analysis that prepares school personnel and agency staff for a discussion with engineers. Engage students in this process by integrating the Watershed Modeling STEM Mini-Unit into school district curriculum (<https://wikiwatershed.org/curricula/>)

Step 3 - Finalize projects: Plan the roles and supports for the potential BMP project installations including the operation and maintenance of post construction BMPs. Review current (and future) construction plans with resource managers (MS4, DEP, Dept. of Natural Resources, or Conservation Districts) to see where BMP projects could be integrated on school properties and if project funding is available. Take advantage of the expertise of these partners in developing or defining BMP maintenance plans or even district-wide sustainability plans. Consider how students can be involved in the projects as this helps with funding opportunities and Green/Sustainable School awards and recognitions. Consider projects that make use of existing structural BMPs or involve changes in maintenance procedures (ex. no-mow zones), and include features that promote educational opportunities for your students and the community (interpretive signs, viewing areas, outdoor classroom spaces).

Step 4 - Identify sources of funding: Work with your team to identify potential funding sources for BMP installations, maintenance, and curricular integration. Use the data from the models in step 2 (above) to support grant applications. Consider federal, state, and county grant programs in stormwater and habitat improvement, as well as local and corporate funding opportunities (maintenance tools cost money too!). Consider how students could be involved in the process to increase educational opportunities and enhance funding application narratives.

Step 5 - Promote the success: Include plans to promote and celebrate the success of BMP installations and implementation in student learning that increase the educational outcomes in the community at large. Contact local media outlets and consider presentations by your sustainability team or even students. Consider applying for state, federal, and national green/sustainability school recognition programs (Green Ribbon, Eco-schools USA, etc.) and include your projects and partnerships in your applications.

Component 4: Resources (Include a Sample of Resources or include full document:
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