Research-Based Best Practices for Environmental Education

STAC Workshop Report
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About the Scientific and Technical Advisory Committee
The Scientific and Technical Advisory Committee (STAC) provides scientific and technical guidance to the Chesapeake Bay Program on measures to restore and protect the Chesapeake Bay. As an advisory committee, STAC reports periodically to the Implementation Committee and annually to the Executive Council. Since its creation in December 1984, STAC has worked to enhance scientific communication and outreach throughout the Chesapeake Bay watershed and beyond. STAC provides scientific and technical advice in various ways, including (1) technical reports and papers, (2) discussion groups, (3) assistance in organizing merit reviews of CBP programs and projects, (4) technical conferences and workshops, and (5) service by STAC members on CBP subcommittees and workgroups. In addition, STAC has the mechanisms in place that will allow STAC to hold meetings, workshops, and reviews in rapid response to CBP subcommittee and workgroup requests for scientific and technical input. This will allow STAC to provide the CBP subcommittees and workgroups with information and support needed as specific issues arise while working towards meeting the goals outlined in the Chesapeake 2000 agreement. STAC also acts proactively to bring the most recent scientific information to the Bay Program and its partners. For additional information about STAC, please visit the STAC website at www.chesapeake.org/stac.

The enclosed material represents the professional recommendations and expert opinion of individuals undertaking a workshop, review, forum, conference, or other activity on a topic or theme that STAC considered an important issue to the goals of the Chesapeake Bay Program. The content therefore reflects the views of the experts convened through the STAC-sponsored or co-sponsored activity.

Steering Committee Members
- Ann Regn, Virginia Department of Environmental Quality, Workgroup Co-chair
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- William McBeth, University of Wisconsin-Platteville
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Executive Summary
The future health of the Chesapeake Bay depends on having a knowledgeable citizenry in years to come; effective environmental education efforts are key to enabling this scenario. To ensure best practices are incorporated in environmental education efforts, the Chesapeake Bay Program's Education Workgroup convened a STAC-supported workshop on August 27-28, 2012 to explore topics critical to establishing standards for environmental education in the watershed.

The Chesapeake Bay Program (CBP) has formally supported environmental education in the region since 1998, when Education Directive 98-1 was signed, forming the Chesapeake Bay Education Workgroup ("Workgroup"). Two years later, the Meaningful Watershed Education Experience ("MWEE")[1] was defined by the Workgroup and adopted by the states of Pennsylvania, Virginia, Maryland, and the District of Columbia as a "Keystone Commitment" of the Chesapeake 2000 Agreement. The MWEE is a pedagogical student experience that includes classroom preparation, outdoor learning, and reflection on the outdoor learning experience. By adopting the MWEE, states agreed to provide one experience per student prior to their high school graduation. States have since expanded that goal to providing three MWEEs throughout a student's academic career.

The Workgroup has tracked progress toward the MWEE goal by gathering information from the state departments of education and resource agencies. The goal is reported as a percentage of public school students receiving a MWEE annually. However, there is currently no uniform tracking mechanism. The methods used by states to gather MWEE numbers vary greatly, which calls into question the validity of the estimates. In addition, it is recognized that not all MWEEs have the same rigor and quality. Therefore, even if it is assumed that the numbers of students participating in MWEEs annually are accurate, there is no certainty that students' environmental literacy and stewardship are increasing as a result of partaking in MWEEs. As states move forward with environmental literacy plans, it is critical that evaluative and/or assessment metrics for tracking environmental literacy be articulated and embedded into these plans. In addition, while the MWEE is a well-defined experience for students, it does not include information about

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[1] Chesapeake Bay Program Education Workgroup. *Stewardship and the Meaningful Watershed Education Experience.* March 8, 2001. http://www.chesapeakebay.net/content/publications/cbp_12136.pdf

teacher professional development or school grounds and maintenance (i.e., "Green Schools")—
two topics that are recognized as essential to high-quality environmental education.

To address these issues, the August 2012 workshop brought together top researchers and
evaluators in the environmental education field to share their research and provide guidance
during working sessions (see Appendix A). Attendees included key staff from federal agencies,
state departments of education, state resource agencies, and non-governmental organizations who
are integral to developing environmental literacy plans and collecting student information (see
Appendix B).

Slides and audio presentations from this workshop can be found at:
http://www.chesapeake.org/stac/workshop_edu.php.

The workshop's goals were to:

- Identify best practices of education programs and practices that lead to increased
  environmental literacy in K-12 students.
- Examine the definition of the Meaningful Watershed Educational Experience in order to
  reflect MWEE's role and importance in broader, more systematic environmental
  education programs.
- Discuss indicators and metrics that will assess progress toward increasing student
  stewardship.

Workshop attendees were divided into three "listening workgroups" under the areas of student,
educator, and Green Schools best practices. Workgroups were asked to identify essential and
recommended best practices based upon the researcher's presentations, question and answer
sessions, and their collective knowledge and experiences. Workgroups were provided with a
framework document to guide their discussion. The framework included potential best practices
from existing sources, such as the current MWEE definition and the North American Association
for Environmental Education's (NAAEE) *Guidelines for Excellence in Environmental
Education.* Each workgroup used the framework and information from the researchers to draft
the "Best Practices in Environmental Literacy" (see Appendix C). This document has been
shared with the broader Workgroup, with a final version expected in summer, 2013.

Attendees also focused on potential mechanisms and metrics for tracking student environmental
literacy in the mid-Atlantic. Presenters were asked to reflect on the Best Practices portion of the
workshop and provide recommendations for tracking and developing metrics. A summary of
this discussion and recommendations are included in the appendices. The researchers pointed
out that this work has the potential to have tremendous effects in the field of environmental
education. The development of metrics and indicators will be difficult but important work.
While the workshop did not result in a draft metric or indicator, it did begin the very important
process of group validation. Indicators must be perceived as legitimate. The process currently
under way by the Workgroup should help gain the legitimacy needed to make these meaningful
and usable.

Workshop Proceedings: Day One

Introduction
Following opening remarks by CBP Director Nick DiPasquale, Shannon Sprague (NOAA Chesapeake Bay Office) provided an in-depth summary of CBP education efforts going back to the 1998 education directive. This summary included a time table for key CBP education-related actions, such as when MWEE began to be tracked and reported. She also discussed the 2011 Mid-Atlantic Environmental Literacy Strategy and how it supports state environmental education efforts. Jamie Baxter (Chesapeake Bay Trust) then discussed the purpose of this workshop and provided an overview of the objectives, format, and follow-up measures that will stem from the workshop.

Additional Resources:
- [Mid-Atlantic Elementary and Secondary Environmental Literacy Strategy](): A strategy developed for administering President Obama's Executive Order 13508 on Chesapeake Bay Protection and Restoration called on the federal government to develop an Elementary and Secondary Environmental Literacy Strategy. The Strategy—outlined in this document—draws on the full strength of the federal government to support state efforts to transform their schools to provide the next generation of citizen stewards with the knowledge and skills they need to make informed environmental decisions.
- [STAC Workshop Presentation](): Slides and audio recording of actual workshop session presentation.

The Framework: NAAEE Guidelines for Excellence in Environmental Education
- *Dr. Bora Simmons, Senior Research Associate, National Project for Excellence in Environmental Education*

The North American Association for Environmental Education (NAAEE) National Project for Excellence in Environmental Education ("Guidelines") started in the mid-1990s and aimed to pull together the collective wisdom of environmental educators through a synthesis of existing research and a public participatory process. Through this project, five different Guidelines for Excellence have been developed. These Guidelines focus on environmental education materials, professional development for environmental educators, non-formal environmental education programs, early childhood environmental education programs, and K-12 environmental education. These Community Environmental Education Guidelines are currently being developed.

In the process of developing the Guidelines, essential underpinnings of environmental education were identified based on the recognition that environmental education builds from a core of key principles that inform its approach to education. Some of these important underpinnings are systems, interdependence, the importance of where one lives, integration and infusion, roots in the real world, and lifelong learning.

Guidelines developers also recognized that environmental education needs to be rooted in a way that is compatible with and supportive of the standards-based school curriculum. To this end, NAAEE has developed crosswalk matrices to show the connections between the Guidelines framework and the Essential Principles for Ocean Literacy, Climate Literacy, and Energy

Literacy. In addition, NAAEE partners in Kentucky have completed a crosswalk aligning the Guidelines with the Common Core Standards for English Language Arts and Mathematics. Guidelines developers will continue to try to provide connections between the Guidelines and curriculum standards as the Next Generation Science Standards and new national social studies standards are developed.

By engaging environmental education professionals in a deep discussion about high-quality environmental education practices, the Guidelines and this workshop can help the environmental education community determine what they want to accomplish and how to accomplish it the best way possible. This workshop builds on the goals that motivated the development of the Guidelines and will help the community focus on: what it knows, what it thinks it knows, and where it wants to go with our goals and existing knowledge.

Additional Resources:
- [STAC Workshop Presentation:](#) Slides and audio recording of actual workshop session presentation.
- [Environmental Education Materials: Guidelines for Excellence:](#) These guidelines provide a set of recommendations for developing and selecting environmental education materials. They aim to help developers of activity guides, lesson plans, and other instructional materials produce high-quality products and to provide educators with a tool to evaluate the wide array of available environmental education materials.
- [Guidelines for the Preparation and Professional Development of Environmental Educators](#): These guidelines offer recommendations about the basic knowledge and abilities educators need to provide high-quality environmental education.
- [Non-formal Environmental Education Programs: Guidelines for Excellence](#): These guidelines comprise a set of recommendations for developing and administering high-quality non-formal environmental education programs.
- [Early Childhood Environmental Education Program: Guidelines for Excellence](#): These guidelines contain a set of recommendations for developing and administering high-quality environmental education programs for young children from birth to age eight, with a focus on ages three to six. To advance the work and partnerships established through the development of this set of guidelines, NAAEE will produce an International Journal of Early Childhood Environmental Education. The first edition of this peer-reviewed journal may be available as early as fall 2013.
- [Excellence in Environmental Education: Guidelines for Learning (K-12)](#): These guidelines provide students, parents, educators, homeschoolers, policy makers, and the public a set of common, voluntary guidelines for environmental literacy achievement. The guidelines support state and local environmental education efforts by setting learner expectations for environmental literacy in fourth, eighth, and twelfth grades.

What We Know: Environmental Education and the Meaningful Watershed Education Experience
- *Dr. Marc Stern, Associate Professor, Virginia Tech*
- *Dr. Michaela Zint, Associate Professor of Environmental Education and Communication, University of Michigan*

The presentations by Dr. Stern and Dr. Zint laid the foundations for the best practices discussion by focusing on research and literature reviews that establish what is known about effective instruction that can lead to increased knowledge, gains in stewardship characteristics, confidence in teaching about watersheds, and more. Dr. Stern's presentation, "Aligning best practices with outcomes," discussed lessons from an empirical literature review and a large sample study in interpretation.

The systematic literature review examined 83 research articles published from 1999 to 2011 that empirically evaluated the outcomes of 106 environmental education programs[2]. The review sought empirical evidence for what works in environmental education programming and to characterize the field of environmental education research and evaluation over the past decade. It also tried to identify lessons regarding promising approaches for future environmental education initiatives and their evaluation.

While the review revealed primarily circumstantial evidence in favor of virtually all of the consensus-based best practices contained in publications such as the NAAEE's guidelines for excellence, Stern and his colleagues focused on instances where specific claims made by authors about program characteristics linked to measured outcomes were empirically supported by data. The review found authors clearly honing in on the several best practices that appear to drive positive results in knowledge, awareness, skills, attitudes, intentions, behavior, and enjoyment. These include:
- Dosage (longer experiences)
- Experiential approaches
- Investigation, issue-based, and project-based approaches
- Reflection and relevance
- Efforts to explicitly provide students with a sense of empowerment
- Incorporating social components, such as involvement with communities facing real environmental problems and active group discussion
- Designing programs with specific goals in mind

Dr. Stern then discussed an empirical study of 376 National Park Service interpretive programs, which collected data from more than 3,600 program attendees. The results were analyzed for relationships among the observed program characteristics and visitor-reported outcomes (program satisfaction, behavior change, and their experience and appreciation). Through examining a variety of programs, the study isolated practices that most consistently related to positive visitor outcomes. The best predictors of positive outcomes included interpreters' confidence (comfort, eloquence, and apparent knowledge), passion, and sincerity and the incorporation of interpretive principles including holistic story-telling, theme development, affective messaging, relevance to the audience, responsiveness, and provocation. The study also found that interpreters whose primary goal was to increase the knowledge of their audiences achieved less positive outcomes than those aiming to enhance audience members' appreciation of the resource.

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[2] Currently in review

While environmental education differs from interpretation on some levels, there are lessons from this interpretation study that clearly translate to best practices in environmental education. Most notably are the critical role of the instructor and the importance of a holistic approach that actively engages learners in a complete experience. Dr. Stern concluded his presentation with these overarching ideas about best practices and corresponding research:

- NAAEE guidelines are on the right track
- Longer experiences with preparation and follow-up were supported by literature
- IEEIA (Investigating and Evaluating Environmental Issues and Actions) and similar holistic experiential approaches that ground education in relevant real-world contexts show promise
- Explicit affective components may further enhance their effectiveness
- Explicit reflection appears to enhance outcomes
- Program design should be aligned with goals
- The role of the educator (their identity, style, and in particular sincerity) has been largely ignored
- Commitment of educators to goals of programs is important

Dr. Michaela Zint delved further into the topic of what is known through research, focusing specifically on watershed education. She began with an overview of the MWEE, discussing both what this pedagogical experience entails for students and how teacher training in MWEEs should be conducted. Dr. Zint also briefly discussed NOAA's Bay-Watershed Education and Training Program (B-WET), which is a grant program that specifically funds MWEEs for students and related professional development for teachers.

Providing examples for other studies and literature reviews, Dr. Zint discussed the need and potential benefit of watershed education, and also presented some instructional practices linked to the benefits of watershed education. Dr. Zint also presented a review of studies that examined the effectiveness of scientific inquiry in fostering student understanding of scientific concepts. Zint provided further support for characteristics of effective student experiences and teacher professional development, including a review of two major studies from the Chesapeake Bay watershed (see "additional resources" below). There was particular attention on the 2007 "Chesapeake Bay MWEE study," which included more than 1,300 students and 500 teachers. This included results for student stewardship outcomes and characteristics of MWEEs linked to those outcomes as well as MWEE characteristics associated with gains in teacher confidence and intentions. Based on this body of work, it can reasonably be said that any MWEE for students and teacher professional development about MWEEs should include at a minimum:

Student MWEE

- Three implementation phases
  - Preparation—question/problem/issue
  - Action—minimum two outdoor experiences or multi-day + action related to environmental change/study
  - Reflection—emphasis on analysis/assessment/communication
- Aligned with standards
- Employing NOAA sciences (e.g., data , personnel)

- Hands on, focused on question/issue/project-oriented

Teacher Professional Development

- Three-day professional development including outdoors experience
- Adequate reflection/follow up/support
- Incentives (stipends, continuing credits)

In summary, MWEE practices are mostly supported by past research/evaluations but can be strengthened further based on environmental education and related research/evaluation findings, including duration and behavior change strategies as well as future insights from B-WET's evaluation system.

Additional Resources:
- STAC Workshop Presentations from Stern and Zint: Slides and audio recording of actual workshop session presentations.
- Identifying best practices for live interpretive programs in the United States National Park Service: A study of live interpretive programs in the National Park Service to examine which interpretive practices are most consistently related to desired outcomes for program attendees.
- Programmatic NOAA Chesapeake B-WET Evaluation: NOAA, the Chesapeake Bay Trust, and the Keith Campbell Foundation commissioned an evaluation to determine whether the Chesapeake Bay-Watershed Education and Training program (B-WET) professional development and meaningful watershed educational experience programs were attaining short-term outcomes as measures of potential for a future citizenry committed to protecting the Bay. The evaluation was published in February 2007.
- Evaluation of the Chesapeake Bay Foundation's Conservation Education Programs: An evaluation of the Chesapeake Bay Foundation's conservation education programs to determine to what extent they promote participants' environmentally responsible behavior and reduce teachers' perceived barriers to teaching about the Bay.

Urban Environmental Education: The North Bay Example
- *Dr. Marc Stern, Associate Professor, Virginia Tech*

North Bay Adventure Center in North East, Maryland, presents a unique case study of the successful use of the IEEIA model for urban environmental education. At North Bay, the goal of implementing the IEEIA model is to use environmental issues as integrating contexts to teach students critical-thinking skills and to have students investigate issues from multiple perspectives, thus arriving at their own conclusions. The academic curriculum reflects the latest science, an emphasis on technology, and a hands-on, outdoor classroom approach. The North Bay program links daily environmental education lessons through metaphor with multi-media presentations in the evenings to relate what the students are learning to their home environments. For example, when invasive species are examined during the day, the evening program focuses on drugs, crime, and other home challenges. Similar metaphors are drawn for biological diversity (cultural diversity) and ecological niche (empowering students to choose their own role in their communities). North Bay's mission is to "challenge middle school students to realize that their attitudes and actions have a lasting impact on their future, the environment, and the

people around them by using approved Maryland Department of Education curriculum and the outdoors as an integrating context."

Baltimore City students are brought to North Bay in sixth grade to provide them with a Meaningful Watershed Educational Experience that students can bring back with them to their home communities. In Dr. Stern's five-year study, pre-experience, post- experience, and three-month follow-up surveys have shown that the North Bay program has achieved uncommonly positive results with urban youth in the areas of environmental responsibility, character development and leadership, and attitudes towards school. Hypothesized factors contributing to these positive results include:

- Appropriately defining the "environment" to make sure environmental education is culturally relevant and strongly connected to the home communities of students
- Intermingling positive youth development with environmental education
- Empowering students to choose their own identity and take ownership over how they interact with their community
- Providing students with strong new role models
- Providing students with a holistic experience
- Enforcing an appropriate disciplinary approach and staff support
- Having experiences take place in a culturally appropriate, yet novel setting: the North Bay Adventure Center is located on the Chesapeake Bay next to a state park. The large facility includes a gym, cabins, a game room, basketball courts, a high ropes course, two rock walls, and a zip line that goes directly into the Bay. The location provides strong connections to the environment but has touchstones that connect urban students with the communities they come from, allowing them to feel safe and comfortable.

Inquiry-Based Learning: Leveraging Students' Natural Curiosity to Learn about Their Environment
- *Dr. Trudi Volk, Emeritus Professor, Southern Illinois University*
- *Dr. William McBeth, Professor of Education, University of Wisconsin-Platteville*

Dr. Volk's presentations focused on "variables involved in environmentally responsible behavior" and followed a schematic of the same title that nests these variables under three elements: Entry Level, Ownership, and Empowerment. Each element contains variables that research shows are critical to developing environmentally-responsible citizen behavior on the part of students. Environmentally-responsible behavior entails direct action, defined here as positive physical actions taken with respect to the environment. It also involves indirect action, i.e., broader citizen action, such as consumer or political action. Following an overview of the three elements and their variables, she discussed educational implications that address each.

The first element - Entry Level - includes two variables: knowledge of ecological concepts and principles, and environmental sensitivity. Dr. Volk elaborated on this second variable and identified factors that research shows contribute to greater environmental sensitivity, such as time spent in the outdoors as a youth. The next two major elements are Ownership (personal ownership of environmental issues) and a feeling of Empowerment (related to attempting to help resolve these issues). Changes in learner (citizenship) behavior occur when learners "own" the issues they are invested in and when they feel "empowered" to do something about those issues.

Dr. Volk presented results of research on the effectiveness of the IEEIA curriculum model in addressing these variables. This model uses environmental issues as integrating contexts to teach students critical thinking skills, and has students investigate issues without bias. In this model, teachers are not to communicate a pre-conceived message regarding the given topic. Rather, students should derive their own conclusions and initiate their own actions.

Additional Resources:
- STAC Workshop Presentation: Slides and audio recording of actual workshop session presentation.
- Introduction of the Investigating and Evaluating Environmental Issues and Actions (IEEIA) Model: A middle- and secondary-school curriculum that promotes environmental citizenship for large numbers of students over long periods of time.

Keeping It Real: Using Schools and Communities as a Context for Environmental Education
- *Dr. Rachel Becker-Klein, Senior Associate, Program Evaluation and Educational Research (PEER) Associates*
- *Robert Hoppin, Place-Based Education Consultant, Boston Public Schools*
- *Julian Dautremont-Smith, Chief Sustainability Officer, Alfred State College*

Dr. Becker-Klein explored the common qualities, promising practices, and benefits of place-based learning through two different studies: (1) a meta-analysis commissioned by the Environmental Protection Agency (EPA) and the National Park Service (NPS) to examine if environmental education can positively affect environmental air quality and (2) a synthesis of evaluation work the Program Evaluation and Educational Research (PEER) project is conducting in collaboration with the Place-based Education Evaluation Collaborative (PEEC).

Within the EPA/NPS meta-analysis, it was determined that educational programs can improve environmental quality, with 46% of all programs that were studied showing a measurable change over the course of their projects. This study revealed that the more place-based learning "promising practices" schools incorporated, the more likely they were to have actually affected the environment. The two strongest predictors of environmental impact were that the place-based learning experiences included a service-learning component and contributed to an authentic community need. This study highlights the importance of bringing measurement and evaluation into programs and the need to focus on specific educational practices that lead to specific environmental outcomes.

The work of the PEER/PEEC partnership emphasized the benefits of place-based education. This study noted that place-based education helps students learn, invites students to become active citizens in their schools and communities, energizes teachers, transforms school cultures, connects schools and communities, and encourages students to become environmental stewards.

In concurrence with the findings of both of these studies, place-based learning was identified as a holistic approach to education that uses the local community as an integrating context for learning at all ages. It fosters vibrant partnerships between schools and communities, includes project-based experiential learning, boosts student achievement, and improves the health and vitality of the local community. It was also noted that local learning should provide an age-

appropriate foundation for understanding regional/global issues, that place-based learning should be initiated and driven by student interests, and that administrative support is critical for programs to be sustained over time.

Mr. Hoppin's presentation provided information on using place-based education in K-12 education, identified factors that are important for high-quality place-based educational experiences, and provided case studies of successful place-based education from Boston (Massachusetts) Public Schools.

One of the main avenues for introducing environmental education into the formal K-12 system is through the improvement of English Language Arts and Math; place-based learning provides a framework through which this can be accomplished. Place-based education is education in and about a location that is culturally relevant to the targeted audience. It offers the opportunity to create a more interesting vision for education that goes beyond test scores and talking about academic achievement as simply a number that needs to be reached. Components of high-quality place-based education for green schools, applied teacher professional development, and student practices are summarized in the table below:

Components of High-Quality Place-Based Education		
Green Schools	Applied Teacher Professional Development	Student Practice
Attachment to place Authentic community need Support by leadership Collaboration with community	Builds local partnerships Support by the local community Project-based Interdisciplinary Structured reflection by students	Experiential and hands-on Driven by the students Independent and group work Service learning Teen employment

Mr. Hoppin's presentation also indicated that support by leadership ranks highly in terms of ability to improve environmental quality. For environmental education efforts in the mid-Atlantic region, this suggests that efforts to provide professional development about environmental and place-based education to educators should be expanded to include school/school system administrators and community leadership. Additionally, it was suggested that the mid-Atlantic environmental education community needs to think critically about how to promote the good works that are going on in the region.

Additional Resources:
- STAC Workshop presentations from Becker-Klein and Hoppin: Slides and audio recording of actual workshop session presentations.
- Getting Out Gets Results: Environmental Education Research from Boston and Beyond: This report from the Boston Youth Environmental Network summarizes findings of environmental education research related to student engagement, academic achievement, environmental stewardship, and connections and collaboration.
- The Benefits of Place-based Education: A Report from the Place-based Education Evaluation Collaborative. This brochure summarizes evaluation data from six place-

based education programs representing more than 100 schools (rural, suburban, and urban) covering 12 states. The findings indicate that place-based education helps students learn to take care of the world by understanding where they live and taking action in their own backyards and communities.

Mr. Dautremont-Smith's presentation examined the strengths and limitations of school sustainability ratings systems. Through a review of the academic literature currently available on the subject and a review of the more extensive academic literature about ratings systems in general, seven best practices for school sustainability ratings systems were identified. These best practices include:

1. Strong accountability mechanisms: Programs administering ratings systems need to ensure that the information reported by a school is accurate. Some programs have a ratings systems administrator or employ a third, independent party to verify the accuracy of reported data.
2. Performance-focused criteria: Criteria used to assess schools should be quantitative, allow for change to be evaluated over time, require more than a "yes" or "no" response, and should measure an intended outcome (i.e., energy consumption per square foot as opposed to number of CFL bulbs used). Performance-focused criteria tend to allow for more innovation because they do not prescribe a particular strategy for achieving an environmental outcome.
3. Comprehensive topical scope: Ratings systems should look at sustainability in a broad context and avoid environmental/health tradeoffs to ensure recognized schools are truly sustainable.
4. Open governance processes: Green school communities should have some control over the governance process so that the program is actually meeting the needs of the community.
5. Multiple levels of achievement: Ratings systems that do not just grant a one-off award promote continued innovation and are more accessible to all schools versus just the top achievers.
6. Public reporting of submissions: The data on which a school's ranking or award are based should be publically accessible so schools can learn from one another.
7. Transparent criteria and methodologies: What a ranking or award actually means, and how a school can go about achieving it should be clearly understood.

These best practices were used to assess the structure and achievements of 32 English-language school sustainability ratings systems. Through this assessment it was determined that strengths of existing school sustainability ratings systems are that they have transparent criteria and that many ratings systems include multiple levels of recognition. Weaknesses of school sustainability ratings systems include weak accountability mechanisms, minimal focus on performance/weak requirements, limited topical scope, fairly closed governance processes, and no public reporting of application submissions.

These weaknesses suggest that while ratings systems can help schools understand and communicate their performance, there is still room for improvement. A suggested method for achieving such improvements is the consolidation of the many school sustainability ratings

systems into fewer, more comprehensive programs. Benefits of consolidating school sustainability ratings systems would include greater brand recognition, improved benchmarking and information sharing, and improved allocation of resources.

Additional Resources:
- [STAC Workshop Presentation](#): Slides and audio recording of actual workshop session presentation.

Workshop Proceedings: Day Two

What Does NELA Mean for Metrics Development?
- *Bill McBeth, Professor of Education, University of Wisconsin-Platteville*

Dr. McBeth provided an overview of the National Environmental Literacy Assessment (NELA) project, including its purpose and some results from the first two phases. His presentation is included on the STAC website. The purpose of this presentation was to provide a foundational understanding of the project to inform later conversations about measuring environmental literacy broadly throughout the region.

The NELA project is an ongoing study targeting middle-school students across the United States. It is funded in part by EPA and NOAA and administered by the North American Association for Environmental Education (NAAEE). Key partners included researchers from the University of Wisconsin–Platteville; the Center for Instruction, Staff Development and Evaluation in Illinois; and the Florida Institute of Technology.

In their focus on environmental literacy assessment, the NELA Research Team developed a multiphase study, with the first phase designed to identify baseline levels of environmental literacy among sixth- and eighth-grade students in randomly selected U.S. schools with middle grades. That research used a probability proportional sample of 48 middle schools identified by GfK Roper. With Phase One accomplished, these sixth- and eighth-grade baselines can serve as comparative measures for future NELA research efforts, as well as for other assessment efforts that may be undertaken by scholars and practitioners in environmental education.

Phase Two research sought to answer two research topics. The first was to determine the level of environmental literacy of sixth-, seventh-, and eighth-grade students across the United States who participate in exemplary environmental education programs at their schools, on each of the following variables: ecological knowledge; verbal commitment; actual commitment; environmental sensitivity; general environmental feelings; environmental issues; and action skills. The second was to determine how the level of environmental literacy of students in these programs compared to the Phase One baseline level of environmental literacy of sixth- and eighth-grade students across the United States.

Both Phase One and Phase Two provided the foundation for the future work of NELA, which will explore more extensively related variables that might affect environmental literacy.

Phase Three will include the secondary analyses of data on variables collected through supplemental instruments (i.e., teacher, program, and school surveys). This research could

provide important insights into the development of a number of environmental literacy variables. Also, the earlier two phases have allowed the team to identify "schools of interest"—schools with environmental literacy composite scores in the top quartile. The in-depth study of these schools could provide valuable information into the educational conditions inherent in high-performing schools (e.g., staffing, pedagogical, curricular, and cultural).

Ultimately, this multiphase study was designed to provide environmental education professionals with guidance on the use of extant environmental education instructional materials or the development of new environmental education materials, delivery of instruction, and environmental conditions that may enhance the probability of further developing environmental literacy among middle-school learners in the United States. This final report describes the work that built on the baseline assessment and lays the foundation toward "best" educational practices in the development of environmental literacy.

Additional Resources:
- [STAC Workshop Presentation](): Slides and audio recording of actual workshop session presentation.
- [NELA Year One Final Report](): Phase One of the NELA study, a national baseline study of middle-grades students.
- [NELA Phase Two Final Report](): Measuring the effectiveness of North American environmental education programs with respect to the parameters of environmental literacy.

Panel: Education Priorities and Their Connection to Environmental Education Best Practices
- *Laurie Jenkins, Supervisor, PK-12 Outdoor Environmental Education Programs, Montgomery County Public Schools*
- *Jennifer Tabola, Senior Director of Education, National Environmental Education Foundation*
- *Moderator: Jamie Baxter, Program Director, Chesapeake Bay Trust*

Ms. Jenkins noted that the Next Generation Science Standards are very well aligned with the goals and best practices of environmental literacy/education. The Next Generation Science Standards are written as performance expectations; they integrate science and engineering practices with disciplinary core ideas and cross-cutting concepts. Each standard has at least one practice, one cross-cutting concept, and one core idea; frequently all can be taught using environmental topics. "Hot topic" terms in the environmental education community may not be directly incorporated into the framework, but it does include a new section for "Earth and Human Activity" under the "Earth and Space Sciences." This new section provides a direct link for the integration of environmental science content.

Ms. Tabola noted that science, technology, engineering, and math (STEM) learning is a hot topic issue throughout the education community and described how environmental education can serve as an excellent portal for embedded STEM content throughout classroom curricula. Environmental education gives students the opportunity to apply STEM skills and provides a context in which they can become interested. For young girls especially, making stronger connections to the influence STEM careers have on positively affecting communities is very

important. Teaching STEM content through the lens of environmental issues is an excellent way to accomplish this. By taking the innate and documented interest that students have in the environment and foster and develop it early on, it is increasingly likely that they may develop an interest in STEM fields and careers.

The National Environmental Education Foundation (NEEF), which was chartered by Congress in 1990, seeks to further lifelong environmental education and bring resources to the effort through public-private partnership. Through its work in developing such partnerships, NEEF has found that providing a strong connection between environmental education and STEM is essential to generating funding and support for environmental education initiatives. Developing an educated workforce is a big component of what interests the private sector in supporting STEM and environmental education. As the private sector establishes foundations and structures for corporate giving, sustainability and education are frequently featured. Linking sustainability with STEM raises the priority of these issues; therefore, strengthening and promoting those connections is a priority for the environmental education community.

Additional Resources:
- STAC Workshop Presentation: Slides and audio recording of actual workshop session presentation from Laurie Jenkins.
- Generation STEM—What Girls Say about Science, Technology, Engineering, and Math: A national research report from the Girl Scout Research Institute investigating girls' perceptions, attitudes, and interests in the subjects and general field of STEM.
- EE Week STEM Infographic: Poster developed by the National Environmental Education Foundation illustrating how the environmental offers a compelling context to teach STEM subjects.

Panel: Reflections on the Implications for Metrics Development

The researchers who attended the workshop pointed out that this work has the potential to have tremendous impact on the field of environmental education. The development of metrics and indicators will be difficult, but important work. While the workshop did not result in a draft metric or indicator, it did begin the very important process of group validation. Indicators must be perceived as legitimate. The process currently underway by the Workgroup should help gain the legitimacy needed to make these meaningful and usable.

Michaela Zint and Trudi Volk indicated that any metric that is used for this type of assessment needs to have associated validity and reliability. This workshop began to help the group establish validity by re-examining the framework of a MWEE, specifically: What is a MWEE, and what does a MWEE look like? This is important to be able to define what is to be measured and to break it down into measurable pieces/component parts. Specifically, this work was supported by the student breakout group, which was designed to dissect a MWEE and get the consensus of the Workgroup. This process continued at the November 2012 Mid-Atlantic Environmental Literacy Workshop and will be completed in the Spring of 2013.

Specific to the development of metrics, the group was reminded that there are many levels of policies and programs that need to be in place for a successful environmental education structure

and to fully understand the system the characteristics of each of these need to be understood. These are: policies, networks, schools, and individuals (students and educators).

At the network level, John Baek introduced the following construct of collective impact, which has great applicability for the regional environmental literacy work under way. The construct supports the current structure as follows:

"The Five Conditions of Collective Impact"
(Stanford Social Innovation Review, winter 2011; Copyright © 2011 by Leland Stanford Jr. University)

Condition		Mid-Atlantic Region
Common Agenda	All participants have a shared vision for change, a common understanding of the problem, and a joint approach to solving it through agreed upon actions	*Mid-Atlantic Elementary and Secondary Environmental Literacy Strategy*
Shared Measurement	Collecting data and measuring results consistently across all participants ensures efforts remain aligned and participants hold each other accountable	Chesapeake Bay Program indicator/metrics
Mutually Reinforcing Activities	Participant activities must be differentiated while still being coordinated through a mutually reinforcing plan of action	State working groups and state environmental literacy plans
Continuous Communication	Consistent and open communication is needed across the many players to build trust, assure mutual objectives, and appreciate common motivation	Chesapeake Bay Program Education Workgroup
Backbone Support	Creating and managing collective impact requires a separate organization with staff and a specific set of skills to serve as the backbone for the entire initiative and coordinate participating organizations and agencies	Chesapeake Bay Program staff, NOAA, Chesapeake Research Consortium, EPA

Michaela Zint suggested that any indicator needs to be:
- Measurable
- Relevant (valid + reliable): Use more than one indicator because all indicators have strengths and shortcomings
- Manageable (data available, not too many)
- Easily understood
- Not binary (to document progress)
- Achievable/reachable
- Meaningful/important—sufficiently ambitious
- Timely
- Have targets in mind (can be adjusted as more information is collected)

Zint also suggests the group must consider:
- Who is going to run the evaluation?
- Who is the target audience for the assessment?
- What are you going to do with your results? Evaluations are political in nature and can be used against the assessors. If things do not turn out as expected, report what was found and look for implications of the unexpected findings.

There was also a discussion of whether existing state databases could be used to track the indicators/metrics developed by the group. The following are the databases discussed by the group; however, at this time it does not appear that any exist that could easily support the desired data. Also, the data-collection instruments are not consistent across states. Therefore, once the indicators/metrics are developed, states may choose to implement through an existing state database or structure, but likely there will not be consistency across the states.
- Pennsylvania: Database of schools in Pennsylvania related to Green Schools
- West Virginia: Database of teacher professional development by topic (maybe hours too). Does not have the specificity that would be needed; it was not obvious that WV would be open to modification.
- Virginia: Working on a comprehensive student database. May have the opportunity to add a few questions to it sometime in the future. There is a formal process for submitting questions to the state student databases. There should be certainty about what is being loaded into the database. Once developed it is more or less static.

Additional Resources:
- STAC Workshop Presentations from Baek and Zint: Slides and audio recordings of actual workshop session presentations.

Next Steps
Moving forward, the group should answer these questions *(from Bill McBeth)*:
- What are MWEEs? The discussion group (student) that McBeth attended spent some time on this.
- What are the purposes of assessing MWEEs?
  - Is it to improve MWEEs?
  - Is it to identify where there is exceptional MWEE work?
  - Is it to produce MWEE case studies?
  - Is it to generate external funds for MWEEs?
  - Is it to determine how many students and teachers participate in local restoration and protection projects?
  - Others?
- What are the broad goals of a MWEE? Improve the Bay? Help to establish an adult population that will be supportive of environmental protection?
- How do effective MWEEs differ by development level? A table with goals and developmental levels would help teachers at different developmental levels to be more successful.
- How effective are MWEEs in formal and informal educational settings?
- Who is the population for the assessment? This is primarily driven by the purpose for the assessment.

Following the workshop, John Baek provided draft metrics for the group to consider:
- Number of states in the Chesapeake Bay region with MWEEs in their educational policy
- Number of school divisions that have taken action on implementing their state's environmental literacy plan
- Number of public schools and school divisions that have strong organizational support for MWEEs
- Number of students receiving a MWEE in the past year (estimated range with lower and upper bound)
- Percentage of students that show changes in knowledge or stewardship as part of MWEE

In the near term, members of the education workgroup will develop draft indicators and a tracking framework for discussion at the November 2012 Mid-Atlantic Environmental Literacy Workshop in Shepherdstown, West Virginia. The workgroup also plans to create a best practices document for teacher professional development in environmental education that will be similar to the definition of the Meaningful Watershed Education Experience. This document would be endorsed by the education workgroup members and informed by data from this workshop as well as other bodies of research and similar guides for teacher professional development.

Appendices

Appendix A. Workshop Agenda

Workshop Schedule
Research-Based Best Practices for Environmental Education
O'CALLAGHANS HOTEL-ANNAPOLIS, MARYLAND
Galway Room A, 4th Floor
Webinar Available (see information below)

Monday, August 27
8:30-9:00am   REGISTRATION AND COFFEE

9:00-10:00   WELCOME AND INTRODUCTION
Welcome by **Nicholas DiPasquale**, *Director*, U.S. EPA Chesapeake Bay Program
Shannon Sprague, *Chair*, Mid Atlantic Education Workgroup (NOAA)
Jamie Baxter, *Program Director,* Chesapeake Bay Trust

10:00-10:30   THE FRAMEWORK: The NAAEE Guidelines for Excellence in Environmental Education
Dr. Bora Simmons, *Senior Research Associate*, National Project for Excellence in Environmental Education

10:30-NOON   WHAT WE KNOW: Environmental Education and the MWEE
Dr. Marc Stern, *Associate Professor*, Virginia Tech
Dr. Michaela Zint, *Associate Professor of Environmental Education and Communication*, University of Michigan

NOON-12:15
Urban Environmental Education: The North Bay Example
Dr. Marc Stern, *Associate Professor*, Virginia Tech

12:15-1:00   LUNCH

DIGGING A LITTLE DEEPER:
The afternoon will explore two major components of the MWEE, inquiry and place-based education.

1:00-2:30   INQUIRY BASED LEARNING: Leveraging student's natural curiosity to learn about their environment
Dr. Trudi Volk, *Emeritus Professor*, Southern Illinois University
Dr. William McBeth, *Professor of Education*, University of Wisconsin-Platteville

2:30-2:45   BREAK

2:45-4:45   KEEPING IT REAL: Using schools and communities as a context for environmental education
Dr. Rachel Becker-Klein, *Senior Associate,* Program Evaluation and Educational Research (PEER) Associates

Robert Hoppin, *Place-Based Education Consultant*, Boston Public Schools
Julian Dautremont-Smith, *Chief Sustainability Officer*, Alfred State College

4:45-5:15   GROUP REPORTS

5:30-7:30pm   SOCIAL HOUR
Metropolitan Rooftop

Tuesday, August 28
8:30-9:00am
REGISTRATION AND COFFEE

9:00-9:15
INTRODUCTION TO WORKING SESSION
Peyton Robertson, Director, NOAA Chesapeake Bay Office
Jamie Baxter, Chesapeake Bay Trust

9:15-10:00
Dr. William McBeth, *Professor of Education*, University of Wisconsin-Platteville
What does NELA mean for metrics development?

10:00-10:30   PANEL: EDUCATION PRIORITIES AND THEIR CONNECTION TO EE BEST PRACTICES
Moderator: **Jamie Baxter**
Next Generation Science Standards – **Laurie Jenkins,** *Supervisor, PK-12 Outdoor Environmental Education Programs*, Montgomery County Public Schools
Green Ribbon Schools – **Andrea Falken**, *Director,* US Department of Education Green Ribbon Schools
STEM –**Jennifer Tabola**, *Senior Director of Education*, National Environmental Education Foundation

10:30-12:00   WORKING SESSION: BEST PRACTICES DEVELOPMENT
Generate draft EE best practices most essential and recommended for student experiences and teacher PD to achieve stewardship outcomes. Report out, group discussion, Response research community

12:00-1:00   LUNCH

1:00-1:30   REFLECTIONS ON THE IMPLICATIONS FOR METRICS DEVELOPMENT
Moderator: **Shannon Sprague**, NOAA Chesapeake Bay Office
John Baek , *Education Evaluator*, NOAA Office of Education
William McBeth, *Professor of Education*, University of Wisconsin-Platteville
Michaela Zint, *Associate Professor of Environmental Education and Communication*, University of Michigan

1:30 – 3:30   WORKING SESSION: METRICS DEVELOPMENT
Develop draft metrics that could be used to track implementation of best practices across the region
Report and Group Discussion, response from education officials

3:30-4:00   WRAP UP

Webinar Information

We encourage anyone interested in this workshop to join the live webinar that will be available both days. Given the working nature of this event, there will be multiple prolonged periods of small-group work where interaction with in-person attendees may not be possible. This is particularly the case on Tuesday.

Monday Webinar Details:
https://chesapeakeresearch.webex.com/chesapeakeresearch/j.php?ED=197207402&UID=1106868557&PW=NMTg zYjA2MzA3&RT=MiMxMQ%3D%3D
Password: literacy
Toll-Free Number: 1-877-668-4493 Access Number: 736 171 020

Tuesday Webinar Details:
https://chesapeakeresearch.webex.com/chesapeakeresearch/j.php?ED=197217302&UID=1106913112&PW=NOW QwZGQzY2E2&RT=MiMxMQ%3D%3D
Password: literacy
Toll-Free Number: 1-877-668-4493 Access Number: 730 640 109

ADDITIONAL DETAILS FOR ATTENDEES

At the workshop, attendees will be placed into one of three working groups focusing on the topic of student practices, professional development, or sustainable ("green") schools. You will remain in these groups for the entire workshop. Each presentation on the first day will be followed by a question & answer period and group working session.

ABOUT THE MID ATLANTIC EDUCATION WORKGROUP

First convened in 1998 under the Chesapeake Bay Program, the role of the Mid Atlantic Education Workgroup (formerly Chesapeake Bay Education Workgroup) is to support efforts to ensure that elementary and secondary students in region graduate with the knowledge and skills to make informed environmental decisions. The Workgroup supports federal, state, and regional environmental literacy planning, including providing an ongoing forum to collaborate on the goals and objectives of the federal Executive Order and the Regional Roundtable.

Appendix B. Workshop Participants

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Appendix C. Draft Best Practices Documents

DRAFT BEST PRACTICES IN ENVIRONMENTAL LITERACY

INTRODUCTION

The Education workgroup of the Chesapeake Bay Program, in partnership with Chesapeake Bay Trust and NOAA Chesapeake Bay Office, convened a STAC-sponsored workshop August 27-28, 2012 in Annapolis. The workshop's primary goal was to examine the definition of the "Meaningful Watershed Educational Experience" (MWEE) in order to reflect MWEE's role and importance in broader, more systemic environmental education programs. A secondary and interrelated goal of the workshop was to discuss indicators and metrics that will assess progress toward increasing student stewardship. Some of the top researches and evaluators in the environmental education field were in attendance to share their research and provide guidance during working sessions. Attendees included key staff from state departments of education, state resource agencies, and NGOs who are integral to developing environmental literacy plans and collecting student information.

Workshop attendees were divided into three "listening workgroups" under the areas of student, educator, and Green Schools best practices. These workgroups were tasked with identifying essential and recommended best practices based upon the researchers' presentations, question and answer sessions, and their collective knowledge and experiences. Workgroups were provided with a framework document to guide their discussion. The framework included potential best practices from existing sources, such as the current MWEE definition, and the North American Association for Environmental Education's (NAAEE) *Guidelines for Excellence in Environmental Education.* Each workgroup used the framework and information for the researches to draft the best practices. Staff from Chesapeake Bay Trust and NOAA compiled and summarized the recommendations of those working groups and included them below under the headings "Students," " Educators," and "Green Schools".

The final afternoon of the workshop focused on potential mechanisms and metrics for tracking student environmental literacy in the Mid-Atlantic. Presenters during this session were asked to reflect on the best practices portion of the workshop and provide recommendations for tracking and developing metrics. A summary of this discussion and recommendations is included in this document as well.

STUDENTS

The student group discussed best practices in environmental education specifically as it related to the existing definition of the Meaningful Watershed Education Experience. Beyond the current definition of the MWEE, additional best practices for student experiences were recommended. Key suggestions and best practices are as follows:

Essential: The student group affirmed that all elements of the current definition of the MWEE are essential to the student environmental education experiences. Therefore, environmental education for students must:

- include *outdoor experiences*
- include *preparation, action/outdoor experience, and reflection*
- be an integral part of *classroom instruction*
- consider the watershed (or local environment) as part of a system
- be *multi-disciplinary*
- involve students in *external sharing and communication*
- be enhanced by *natural resource personnel*
- *occur at each level of instruction*
- be *investigative* and/or *project-based*

While the group agreed these elements are core to environmental education for students, specific suggestions for edits to elements of the definition were made.

Recommended: A key suggestion made by the student group was that MWEEs should include analysis and evaluation periods throughout each stage of the MWEE (during preparation, action, and reflection stages). The current version of the MWEE encourages summative evaluation only. Another recommendation for the MWEE was an expansion of the definition to include sustainability, energy, and land-use, with an explicit connection to human communities/human interaction piece; this suggestion specifically related to the language that all MWEEs should consider the watershed (or local environment) as part of a system. It was noted that the Next Generation Science Standards (Earth Systems and Human Activity) support this expansion. While MWEEs are currently encouraged at minimum within each level of instruction (elementary, middle, high school), the student group also noted that it would be prudent to recommend MWEEs occur each K-12 year as possible.

There was a less developed recommendation that the MWEE seek to further encourage student-led issue investigations and activities, with guidance as to what is developmentally appropriate given the grade level. Another more specific recommendation was made that the MWEE seek to incorporate civic engagement as a best practice (this is strand 4 in B. Simmons' research, p. 6). The group recommended that civic engagement be incorporated into the student-led action project and follow-up phases where appropriate. Finally the group discussed the concept of choice among learning activities and recommended that MWEEs seek to incorporate issues relevant to the students' lives.

Challenges and Information Gaps: The group struggled to articulate what portion of a MWEE should be relevant to the students' lives, as it seems there is a clear gap in research on this topic.

EDUCATORS

Teachers

This is a draft description of the skills, knowledge, and practices that when possessed and delivered effectively are more likely to result in high quality environmental education (EE).

- Teachers have the content knowledge and pedagogical strategies for teaching EE as appropriate by grade level and discipline

- o Community and issue investigations
- o Interdisciplinary development
- o Service learning
- o <u>Field</u> investigations (science in the field)
- o Citizen engagement/action projects
- o Action skills

- Teachers should view themselves as role models to their students and demonstrate environmentally-responsible behaviors and attitudes to their students.

- Teachers have the ability to make environmental education relevant to specific learners at particular developmental levels.

- Teachers present information fairly and accurately and should incorporate differing perspectives and points of view.

- Teachers implement strategies that enhance the ability of students to think critically about environmental issues.

- Teachers implement instruction guided by learners' interests and building on their prior knowledge.

- Teachers are able to use EE in order to address existing curriculum standards and state department of education initiatives (STEM, Common Core, NGSS, Service Learning, Reading, etc.).

Environmental Education Professional Development Best Practices
This is a draft description of the best practices in environmental professional development that are critical to helping educators develop and master the practices outlined above.

- Teacher Professional Development (PD) workshops include at least 30 hours of instructional time in Environmental Education.

- Teacher PD should model Environmental Education Pedagogy in its delivery as much as possible, including use of the field and/or communities for instruction.

- A goal of all teacher PD in environmental education should be to increase the environmental literacy of the participating teachers, encouraging them to be environmental role models for their students.

- Teachers receive sustained support for EE throughout the school year
  - o Mentors and/or role models exist
  - o Support from administration for EE exists
  - o Exposure to natural resource personnel
  - o Participate in learning communities
  - o Access to continuing professional development opportunities

Important Note: This list attempts to focus on practices that are specific to environmental education; however, there was a broad base of support for best practices germane to all forms of teacher professional development. Links to guidance and recommendations from each of the State Education Agencies on general teacher professional development best practices are included below.

GREEN SCHOOLS

Essential Best Practices for Green Schools
The workgroup agreed that several Green Ribbon School elements should be considered essential best practices that all green schools should strive to achieve. These include:

- School buildings, grounds, and operations should make continual progress towards *net-zero environmental impacts;* and

- The school environment has a *positive effect on the health* of students, staff, and the surrounding community.

In addition to these overarching environmental outcomes for schools, more specific best practices regarding how a school can best function as "green" were identified. Some of these were deemed essential, while others were only recommended. Essential practices are:

- Students are engaged and knowledgeable about school environmental outcomes and practices that are implemented to achieve those outcomes

- School administrators are aware of and support any green initiative taking place in the school

- Grounds and maintenance staff must be involved in the Green School initiatives throughout planning and implementation

- Teachers and students should have access to school energy use, water consumption, and waste production data so these can be used in teaching

Recommended Best Practices for Green Schools

With the above essential best practices at the core of any green school, the workgroup recommends several other best practices that a school can incorporate to achieve sustainability. While not essential, schools striving for "green" status are encouraged to review these recommendations and use them as often as possible.

- Outdoor classrooms and learning spaces should be activity utilized for instruction, and schools that do not have such spaces should include them in any renovation plans

- To the extent possible, students should be actively involved in the planning, design, construction, and maintenance of outdoor classrooms, schoolyard habitats, and other outdoor features such as rain barrels

- Schools should select green practices that have a local context that is culturally relevant, with school grounds a venue for investigating local environmental issues and taking environmental action

- Schools should participate in a program that rates schools based on their sustainability and green practices

- Schools should designate a standing "green team" to ensure sustainable practices and appropriate teachings remain in place. Green teams should be an interdisciplinary group of teachers and when possible also include administration and grounds and maintenance staff.

- School systems should develop facility management plans for schools that include short- and long-term environmental metrics that inform decision making, or include such metrics in existing management plans

Best Practices for Sustainable School ("Green School") Rating Programs
This second category of best practices under the Green School heading pertains to practices for programs that rate schools on some level of sustainability (a list of some of the programs operating in the region is included in Appendix D). Julian Dautremont-Smith, Chief Sustainability Officer at Alfred State College, presented his findings from a review of the School Sustainability Rating Systems, and suggested rating systems should have seven characteristics to increase effectiveness. This was generally a new topic for workshop participants, and the presentation generated a number of questions and discussion. It was agreed that the seven characteristics suggested by Mr. Dautremont-Smith should be goals for any program that rates schools and should be classified as **recommended best practices**. These seven characteristics should:

- use *accountability mechanisms* to provide assurance that the data used to determine a rating are accurate

- use *performance-focused criteria* to quantitatively measure aspects of a school's sustainability performance

- include a *range of sustainability topics in curriculum and community engagement and service* (e.g., energy, waste, water, wildlife, transportation, etc.)

- *offer more than one level of recognition* (e.g., Bronze, Silver, Gold), to encourage continuous improvements

- *allow for the involvement of a variety of stakeholders* in creating and refining the system

- ensure that *schools' ratings are made available publicly*

- include *transparent criteria* that are publicly available

Appendix D. Examples of Sustainable School Rating, Recognition, or Certification Programs

- U.S. Department of Education Green Ribbon Schools: www.greenribbonschools.org/
- Virginia Naturally School Recognition Program: www.dgif.virginia.gov/education/school-recognition/
- Pennsylvania Pathways to Green Schools: www.pathwaystogreenschools.org/
- Maryland Green School Award Program: www.maeoe.org/greenschools/
- National Wildlife Federal Eco Schools: www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA.aspx