



# **Chesapeake Bay National Estuarine Research Reserve in Maryland Estuarine & Environmental Education Needs Assessment**

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Prepared for:

**Chesapeake Bay National Estuarine Research Reserve in Maryland & Maryland Department of  
Natural Resources**

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## Executive Summary

This report summarizes the results of an estuarine and environmental education needs assessment conducted by the Chesapeake Bay National Estuarine Reserve in Maryland (CBNERR-MD) in collaboration with the Institute for Learning Innovation (ILI). This CBNERR-MD needs assessment follows a market analysis conducted with environmental education providers in Maryland in 2011. Having both market and needs data will allow the CBNERR-MD staff to assess the strengths and gaps in environmental education services that the reserve and other organizations currently provide and to make decisions regarding how best to use resources to serve Maryland's teachers and students.

### Methods

The online questionnaire designed for this study included 49 questions, of which 20 were required by the National Estuarine Research Reserve System. The remaining questions were designed by CBNERR-MD staff, in cooperation with ILI, and with guidance from staff of the Maryland Department of Natural Resources, Maryland State Department of Education (MSDE), Maryland Association of Environmental and Outdoor Education, and National Oceanic and Atmospheric Administration. CBNERR-MD and ILI selected a non-random sampling strategy known as "stratified purposeful" sampling. The sample was stratified by two factors: (1) grade band (elementary, middle, and high) and (2) whether teachers had past experience using environmental education. MSDE environmental education liaisons in 19 of Maryland's 24 school districts identified 12 teachers to include in the survey: 6 teachers who had used EE (2 in each grade band) and 6 teachers who had not (2 in each grade band). The overall response rate was 46%. The final sample consisted of 34 elementary school teachers, 40 middle school teachers, 29 high school teachers, and one teacher who taught in all three grade bands. Given the small, non-random response group, there are some limitations to generalizing the results to the population of Maryland's public school teachers. However, given that the MSDE environmental education liaisons were successful in recruiting teachers who fit the strata, and based on the assumption that using these strata helped sample teachers with the desired distribution of backgrounds, the data support several findings.

### Findings

#### ***Estuarine and environmental education (EE) practices currently used by Maryland teachers***

The majority of teacher respondents (85%) had taught environmental, estuary, watershed, and/or ocean topics (EE) in their curriculum in the last three years. Of those teachers, all had taught about watersheds, and almost all had taught about estuaries or oceans. When asked about the emphasis they placed on certain instructional techniques, the most heavily emphasized technique was "scientific inquiry skills. The least emphasized technique was "stewardship projects or activities." The majority of teachers (86%) had used outdoor exploration in their curriculum in the past three years. Over half of the teachers reported using real-time or archived data sets on topics such as water temperature, pH, nutrients, or dissolved oxygen.

#### ***Teachers' prior EE professional development***

Nearly two thirds (63%) of the teachers who responded to questions about professional development (PD) said they had participated in environmental (including estuary, watershed, and/or ocean) education professional development in the last three years. More than half of those teachers had received fewer than 16 hours of watershed or estuary training, and about three quarters of the teachers had received less than eight hours of ocean training, including the 22 who had received none. The PD programs teachers most frequently reported having participated in were Project WET, Project Learning Tree, Project WILD, and Project WILD Aquatic.



### ***Teachers' needs for materials and support for classroom and outdoor EE instruction***

Almost all of the teachers (94%) indicated they were at least somewhat likely to incorporate environmental topics (including estuaries, watersheds, and/or oceans) into their instruction in the next three years, with over half (54%) reporting that they would definitely teach those topics. The most commonly reported barriers to incorporating EE into classroom instruction were lack of funds and time. Field trips and school yard activities were the most often mentioned outdoor learning opportunities desired by teachers, along with funding (e.g., for transportation) and instructional materials (e.g., field equipment) to support these activities. All of the teachers said they were able to use real-time internet resources in their classrooms at least some of the time and about half said they needed additional real-time/archived data sets, such as climate change data. Students' access to computers appeared to be sufficient for these teachers with 90% of the teachers reporting that their students had access to computers at least once per week. Almost half of the teachers said they would like estuary, ocean, or watershed related educational materials to be available in Spanish. Teachers also expressed that several tools would be most helpful in their efforts to incorporate climate change into their curriculum, including lesson plans and student field trips.

### ***Teachers' needs for EE professional development***

Teachers reported needing training in "using real-time or archived data from monitoring sites" and in "incorporating new lab activities" more frequently than other training topics. The teachers had a preference for field-based PD and for attending PD during school hours rather than on their own time. They were less willing to attend after-school or weekend training, but they did indicate that they would be willing to attend summer workshops. A third of the teachers considered stipends and travel expense reimbursements essential to enabling them to participate in professional development.

### **Recommendations**

The following recommendations arose from the teachers' responses to the questionnaire items. CBNERR-MD, along with other EE providers in Maryland, can consider taking these actions:

- Assist teachers with identifying and attaining funding sources to pay for EE instructional materials and resources (classroom and outdoor) and for professional development.
- Offer no- or low-cost field experiences, including in school yards.
- Explicitly describe and model methods teachers can use to integrate EE standards and instruction into their existing standards and instruction in a variety of disciplines.
- Explicitly describe and model strategies teachers can use to integrate outdoor learning experiences into their instruction.
- Explore and address the factors limiting teachers' use of stewardship projects and activities.
- Advertise more broadly the MSDE environmental literacy standards, the state-mandated environmental literacy graduation requirement, and CBNERR-MD's resources.

### **Conclusion**

This needs assessment brought to light some ways in which CBNERR-MD and other EE providers in Maryland can collaborate to increase students' environmental literacy. Teachers indicated several resources and opportunities that would enable them to more easily involve students in environmental and outdoor education, and to increase the teachers' attendance in EE professional development. Teachers may increasingly seek out EE resources as they strive to prepare students to meet the new environmental literacy graduation requirement. This needs assessment provides information to CBNERR-MD and other EE providers so they can proactively work to meet teachers' future needs.

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## Introduction

This report summarizes the results of an estuarine and environmental education needs assessment conducted by the Chesapeake Bay National Estuarine Reserve in Maryland (CBNERR-MD) in collaboration with the Institute for Learning Innovation (ILI).

CBNERR-MD is one of 28 reserves in the National Estuarine Research Reserve System (NERRS), which is funded by the National Oceanic and Atmospheric Administration (NOAA) and conducted in partnership with state agencies. In Maryland, NOAA partners with the Maryland Department of Natural Resources (MDNR) to manage CBNERR-MD's three reserve areas: Otter Point Creek (located in Harford County), Jug Bay Wetlands Sanctuary (located between Anne Arundel and Prince George's County), and Monie Bay (located in Somerset County).

CBNERR-MD's goals are outlined on its website (<http://www.dnr.state.md.us/bay/cbnerr/index.asp>):

*CBNERR-MD promotes educational opportunities and scientific study of these estuarine systems so that we can better manage and successfully restore these important habitats, as well as enjoy a healthy and productive Bay. The goals of the CBNERR-MD are to:*

- *Strengthen the protection and management of the Reserve Components to advance Bay conservation, research and education.*
- *Increase the use of science and Reserve sites to address management issues.*
- *Enhance peoples' ability and willingness to make informed decisions and take responsible actions that preserves Maryland's coastal communities and ecosystems.*

CBNERR-MD conducted this needs assessment to better understand Maryland public school teachers' needs for implementing estuarine and environmental education with their students. This needs assessment is a part of the NERRS national effort to collect information to improve outreach and services to the formal education community across the country. NERRS required that the CBNERR-MD data collection include a set of questions, standardized across all 28 reserves' data collections, to allow for national compilation of teachers' input on most needed resources for incorporating estuarine and environmental education into school-based curricula.

This CBNERR-MD needs assessment follows a market analysis conducted with environmental education providers in Maryland. Having both market and needs data will allow the CBNERR-MD staff to assess the strengths and gaps in environmental education services that the reserve and other organizations currently provide and to make decisions regarding how to best use resources to serve Maryland's teachers and students. These results will be shared and discussed with other environmental education providers, including the Maryland Association of Environmental and Outdoor Education (MAEOE), the Chesapeake Bay Trust (CBT), and the National Oceanic and Atmospheric Administration (NOAA).

Working with the CBNERR-MD advisory group, the CBNERR-MD staff focused the needs assessment on the following questions:

- What estuarine and environmental education (EE) practices are teachers currently using in Maryland?
- What EE professional development have these teachers received?
- What are teachers' needs for materials and support to use EE instruction with students (in the classroom and outdoors)?
- What are teachers' EE professional development needs?

## Methods

### Instrument

After considering several methods for collecting data to answer the needs assessment questions, CBNERR-MD and ILI determined that an online questionnaire was the best tool for collecting data from Maryland public school teachers (Appendix A). CBNERR-MD and ILI decided not to use other methods, such as focus groups



and telephone interviews, because of financial and time constraints. Ultimately, the questionnaire included 49 questions, of which 20 were required by NERRS (8 with exact wording provided by NERRS). The remaining questions were designed by CBNERR-MD staff in cooperation with ILI, and with guidance from MDNR, MSDE, MAEOE, and NOAA.

## Sampling

Given that Maryland is a small state geographically and that the reserves have the potential of serving all 24 of Maryland's school districts, CB-NERR decided to sample the population of all Maryland public school teachers, estimated to be about 57,600 teachers in 2011 (Maryland State Department of Education 2012).

The CBNERR-MD staff, in consultation with ILI, decided to use a non-random rather than a random sampling approach for data collection. Given several concerns about the timing of the survey, it was predicted that distributing the survey to a randomly-selected sample group would result in a very low response from teachers. The timing concerns included: (1) several other environmental education online questionnaires had been disseminated over the last few months, (2) the distribution of this questionnaire was at the end of a school year, a time that is particularly busy for many teachers, and (3) the questionnaire needed to be completed in a short period of time, before the school year ended in June. Other concerns about low response were based on ILI's past experience with similar surveys, and the low response rates reported by other NERRS sites (e.g., the Wells Reserve reported an 11% response rate).

CBNERR-MD and ILI selected a non-random sampling strategy known as "stratified purposeful" sampling. The sample was stratified by two factors: (1) grade band (elementary, middle, and high) and (2) teachers' past experience using environmental education (EE) (yes or no, determined by school district liaison). Each school district's environmental education liaison to the Maryland State Department of Education (MSDE) was asked to identify 12 teachers to include in the survey: 6 teachers who had used EE (2 in each grade band) and 6 teachers who had not (2 in each grade band). This stratified purposeful sampling strategy was selected assuming it would result in a higher response rate than if the sampling was done randomly. However, given the small, hand-selected response group, there are some limitations to generalizing the results to the population of Maryland's public school teachers. However, given that the MSDE environmental education liaisons were successful in recruiting teachers who fit the strata, and based on the assumption that using these strata helped sample teachers with the desired distribution of backgrounds, the data support several findings.

## Request and Response

The school district liaisons were asked by MSDE on May 21, 2012 to forward a survey link to the 12 hand-selected teachers. The deadline for completion of the survey was June 8, 2012, allowing the teachers 3 weeks to complete the survey (estimated to take about 15 minutes to complete). A reminder from MSDE was sent out to the school district liaisons on May 30, 2012. Phone calls were made to the liaisons by the CBNERR-MD staff. In addition to the MSDE and CBNERR-MD personal contact with the school district liaisons and the liaisons' personal contact with the teachers, all teachers were offered an incentive to be included in a raffle for a \$200 VISA gift card (provided by Friends of Jug Bay) if they completed the questionnaire.

Nineteen of the 24 school districts sent the survey request to teachers. The total number of teachers in the sample was 228 (19 districts x 12 teachers per district). One hundred and four teachers completed the survey (Table 1). The overall response rate was 46%. For the "are using EE" teacher sample, 77% responded to the survey (88 respondents). For the "are not using EE" teachers, only 14% responded to the survey (16 respondents). Given that the EE teachers were likely familiar with the school district liaison in the school district and they had prior experience teaching EE, this difference in response rate is not surprising. (Though relevant, a nonresponse analysis is beyond the scope of this project.)

The final sample consisted of 34 elementary school teachers, 40 middle school teachers, 29 high school teachers, and one teacher who taught in all three grade bands.



**Table 1: Sample composition by school district**

School District (County)	Grade Band	Yes, taught EE	No, did not teach EE
Allegany	Elementary	3	
	Middle	1	
	High	2	
Anne Arundel*			
Baltimore City*			
Baltimore	Elementary	2	1
	Middle	3	
	High	2	
Calvert*			
Caroline	Elementary		
	Middle		
	High	2	
Carroll	Elementary	2	
	Middle	5	
	High		
Cecil	Elementary		
	Middle		
	High	6	
Charles	Elementary	2	
	Middle		2
	High	3	1
Dorchester	Elementary		1
	Middle	3	
	High	1	
Frederick	Elementary	2	
	Middle	1	
	High	2	
Garrett	Elementary	3	
	Middle		
	High		
Harford	Elementary	2	1
	Middle	1	2
	High	2	
Howard*			
Kent	Elementary	1	2
	Middle	1	1
	High	1	
Montgomery	Elementary		1
	Middle		
	High	1	
Prince George's	Elementary		1
	Middle		
	High	1	
Queen Anne's	Elementary		
	Middle		
	High	2	
St. Mary's	Elementary	2	
	Middle	2	
	High	2	2
Somerset	Elementary	4	
	Middle	1	
	High	1	
Talbot	Elementary	2	
	Middle	2	
	High	3	1
Washington	Elementary	1	
	Middle	1	
	High	1	
	All levels	1	
Wicomico	Elementary	2	
	Middle	2	
	High	4	
Worcester*			
<b>Total</b>		<b>88</b>	<b>16</b>
<b>Response Rate</b>		<b>77%</b>	<b>14%</b>

\*Questionnaire was not distributed to teachers.



## Respondents

### Subjects Taught

The large majority of public school teacher respondents (90%) taught science (Table 2).

**Table 2: Subjects taught by respondents**

	Bar	Responses	% <sup>2</sup>
Science		93	90%
Math		24	23%
Language Arts		23	22%
Social Studies		23	22%
English		15	14%
Technology/computer science		4	4%
Other (please specify)		4	4%
Physical education/health		1	1%
Fine arts		0	0%
<b>Total</b>		<b>187<sup>1</sup></b>	<b>100%</b>

<sup>1</sup>Total is greater than 104 due to some teachers teaching multiple subjects.

<sup>2</sup>Percent is number of responses per the total number of teacher respondents (104).

Of the 93 teachers who reported teaching science, many of them taught multiple science disciplines, with the most teachers teaching environmental science (Table 3).

**Table 3: Science subjects taught by respondents**

	Bar	Responses	%
Environmental Science		59	64%
Biology		47	51%
General Science		42	46%
Earth Science		33	36%
Physical Science		27	29%
Chemistry		24	26%
Physics		18	20%
Other (please specify):		9	10%
Marine Science		6	7%
<b>Total</b>		<b>265</b>	<b>100%</b>

\*Total is greater than 93 due to some teachers teaching multiple science subjects.

### Green School Status

Over a third of the teachers taught at schools certified as Maryland Green Schools (Table 4).

**Table 4: Teach at an existing Maryland Green School**

	Bar	Responses	%
Yes, it's currently a Green School		39	38%
No, but we are working on certification		13	12%
No		52	50%
<b>Total</b>		<b>104</b>	<b>100%</b>



### School Ethnic Makeup

On average, the ethnic/racial makeup of the teachers' schools was majority White/Caucasian (Table 5).

**Table 5: Teachers' estimate of schools' students' race/ethnicity (in percent)**

	Average Percent
White/Caucasian	61.9%
Black or African American	22.3%
Hispanic, Latino, or Spanish origin	4.9%
American Indian or Alaska Native	0.2%
Native Hawaiian or other Pacific Islander	0.4%
Other	1.8%

## Findings

### Teachers' Current Use of EE Instruction and Professional Development

The great majority (85%, 88 respondents) of teacher respondents had taught environmental, estuary, watershed, and/or ocean topics (EE) in their curriculum in the last three years, with only 15% (16 respondents) not having taught EE during that period of time. All of the teachers who had taught EE had taught about watersheds (Table 6). The teachers had similar years of experience teaching about watersheds, estuaries, and the ocean (Table 6).

**Table 6: Years teachers taught about environmental topics**

	None 1	Less than 2 years 2	2-3 years 3	3-5 years 4	5-7 years 5	7-10 years 6	10-15 years 7	More than 15 years 8	Responses	Mean
Watershed	-	6	6	19	9	8	16	19	83	5.58
Estuaries	2	6	7	18	7	11	16	19	86	5.49
Ocean	2	8	5	18	9	9	15	18	84	5.39

### Estuary Education Requirements

The majority of respondents (81%) indicated that estuary (such as Chesapeake Bay) or estuary-related topics were a required part of their school's science teaching requirements (Table 7). Almost three quarters of the teachers (71%) were somewhat or very familiar with Maryland's environmental literacy (EL) standards, but 29% were not at all familiar with the EL standards (Table 8). Teachers' familiarity with Maryland's new environmental literacy graduation requirement was similar (Table 9). Although one might suspect that those teachers who were unfamiliar with the EL standards and EL graduation requirement would be those who had *not* taught environmental topics in the past, two thirds of the "not at all familiar" teachers were those who *had* taught estuary topics in the past.

Of the teachers who were at least somewhat familiar with the environmental literacy graduation requirement (73 respondents), more than three quarters (76%) believed the requirement would change their future instruction to some degree (Table 10).

**Table 7: Estuary topics required part of school's science teaching requirements**

	Bar	Responses	%
Yes		81	79%
No		15	15%
I don't know		6	6%
<b>Total</b>		<b>102</b>	<b>100%</b>



**Table 8: Familiarity with Maryland’s environmental literacy standards**

	Bar	Responses	%
Not at all familiar		30	29%
Somewhat familiar		55	53%
Very familiar		19	18%
<b>Total</b>		<b>104</b>	<b>100%</b>

**Table 9: Familiarity with Maryland’s environmental literacy graduation requirement**

	Bar	Responses	%
Not at all familiar		30	29%
Somewhat familiar		57	55%
Very familiar		16	16%
<b>Total</b>		<b>103</b>	<b>100%</b>

**Table 10: Environmental literacy graduation requirement will change future instruction**

	Bar	Responses	%
Not at all		18	24%
Somewhat		47	64%
A great deal		9	12%
<b>Total</b>		<b>74</b>	<b>100%</b>

### ***EE Professional Development***

Nearly two thirds (62 respondents, 63%) of the teachers who responded to questions about professional development (99 respondents) said they had participated in environmental (including estuary, watershed, and/or ocean) education professional development (such as workshops, courses, online training, conferences) in the last three years (Table 11). Of those who said they had had EE professional development, more than half had received fewer than 16 hours of watershed or estuary training (38 and 44 respondents respectively), and about three quarters of the teachers (47 respondents) had received less than eight hours of ocean training, including the 22 who had had none.

**Table 11: Hours of EE professional development**

	None	Less than 8 hours	8-16 hours (1-2 days)	16-24 hours (2-3 days)	24-32 hours (3-4 days)	32-40 hours (4-5 days)	More than 40 hours	Responses	Mean
	1	2	3	4	5	6	7		
Watershed	4	21	13	6	4	8	10	66	3.74
Estuaries	7	25	12	7	4	4	8	67	3.30
Ocean	22	25	6	2	1	2	6	64	2.45

The EE teachers were asked what specific professional development programs had they participated in to supplement their estuary/watershed/ocean education. Several teachers (18%) said they did not participate in any of these programs (Table 12). Many teachers indicated they had participated in Project WET, Project Learning Tree, Project WILD, or Project WILD Aquatic.



**Table 12: Specific professional development programs**

	Bar	Responses	%
None of these		12	18%
Project WET		30	45%
Project Learning Tree		24	36%
Project WILD		22	33%
Project WILD Aquatic		18	27%
Green Eggs and Sand Workshop		8	12%
NOAA/NERRS Teachers on the Estuary Training		7	10%
The Jason Project Professional Development		5	7%
Project WILD Flying WILD		4	6%
Growing Up WILD		1	2%
Other (see below)		28	42%
<b>Total</b>		<b>159</b>	<b>100%</b>

Below is a list of “other” professional development opportunities, as provided by 28 of the EE teachers:

- AP Environmental Science Institute, Goucher College
- Bridging the Watershed
- CBF outdoor classroom and the MAEOE conference
- CBF Teachers on the Bay
- COSEE workshops
- county pd for new curriculum
- Data & the Estuary, CLEAN & other Climate change workshops & webinars
- elementary Science Academy BCPS Professional Dev
- Environmental Literacy Academy
- Garrett County Workshops
- Hard Bargain Farm Environmental Institute
- IEEIA
- iGIS and mapping our parks
- MAEOE conference
- MAEOE conference workshops
- Mapping and Monitoring Maryland Streams
- Maryland Math and Science Partnership Grants for Chemistry Distilled, Earth Science Excavated, Life Science and Environmental Science Academies
- POW, WOW, PolarEDUCATORS wkshp, Bering Sea workshop, Gulf of Alaska EARTH workshop
- Science Alive Academy
- Trout In The Classroom, Sturgeon In the Classroom
- WCBOE program
- WET
- wetlands training
- Wonders of Wetlands

***Instructional Strategies***

The 88 teachers who indicated that they had taught about environmental, estuary, watershed, and/or ocean topics (EE teachers) were asked several questions about *how* they had taught about those topics. When asked about the emphasis they placed on certain instructional techniques, the most heavily emphasized technique was “scientific inquiry skills” and the least emphasized was “stewardship projects or activities” (Table 13).



**Table 13: Instructional emphasis**

	Little or no emphasis 1	Moderate emphasis 2	Heavy emphasis 3	N/A	Responses	Mean
Scientific inquiry skills	2	26	60	-	88	2.66
Lab or field work/data collection	12	37	38	1	88	2.32
Data analysis, statistics, and probability	13	46	29	-	88	2.18
Outdoor experiential activities	17	39	31	-	87	2.16
Stewardship projects or activities	20	41	26	-	87	2.07

**Instructional Topics and Data**

Of the topic choices offered in the survey question, teachers reported that students spent more time learning about watersheds than they did about estuaries and oceans (Table 14). Over half of the teachers reported using real-time or archived data sets on each of these topics: water temperature, pH, nutrients, and dissolved oxygen (Table 15).

**Table 14: Class or activity periods of estuary, watershed, and/or ocean instruction received by students in typical year**

	None 1	A portion of 1 class 2	1-2 classes per year 3	3-5 classes per year 4	6-15 classes per year 5	More than 15 classes per year 6	Responses	Mean
Watershed	5	5	12	21	28	14	85	4.22
Estuaries	7	8	12	20	28	11	86	4.01
Ocean	3	7	27	27	17	4	85	3.71

**Table 15: Real-time/archived data used in teaching environmental topics**

	Bar	Responses	%
Temperature: water		46	55%
Ph		45	54%
Nutrients		43	52%
Dissolved oxygen (DO)		42	51%
Algal blooms		38	46%
Salinity		37	45%
Temperature: air		37	45%
Water turbidity (clarity/cloudiness)		32	39%
Fish species and abundance		31	37%
Water contaminants		29	35%
Atmospheric carbon dioxide		24	29%
Sea level rise		19	23%
Zooplankton species		19	23%
Currents		15	18%
Water depth		13	16%
Animal tags/tracking		12	14%
Waves		11	13%
None of the above		7	8%
Bathymetry/topography		6	7%
Ocean color		5	6%
Other (please specify):		4	5%
<b>Total</b>		<b>515</b>	<b>100%</b>



### Web Resources

Of the 84% of the EE teachers who use web resources to obtain information for their classrooms on estuaries, watershed, and oceans, the most popular websites were: the National Oceanic and Atmospheric Administration's Education website, the Chesapeake Bay National Estuarine Research Reserve in Maryland's website, the Environmental Protection Agency Education website, and the Maryland State government website (Table 16).

**Table 16: Web resources used to obtain estuary, watershed, and ocean information for use in classroom**

	Bar	Responses	%
I do not use web resources		14	16%
National Oceanic and Atmospheric Administration's Education website: <a href="http://www.education.noaa.gov">www.education.noaa.gov</a>		59	69%
Maryland's Chesapeake Bay National Estuarine Research Reserve's website: <a href="http://www.dnr.state.md.us/bay/cbnerr">www.dnr.state.md.us/bay/cbnerr</a>		49	57%
Environmental Protection Agency Education website: <a href="http://www.epa.gov/enviroed">www.epa.gov/enviroed</a>		49	57%
Maryland State government website: <a href="http://www.maryland.gov">www.maryland.gov</a>		38	44%
National Science Teachers Association Estuaries Science Guide: <a href="http://www.sciguides.nsta.org">www.sciguides.nsta.org</a>		18	21%
National Estuarine Research Reserve System's Education website: <a href="http://www.estuaries.gov">www.estuaries.gov</a>		18	21%
National Estuarine Research Reserve System's website: <a href="http://www.nerrs.noaa.gov">www.nerrs.noaa.gov</a>		17	20%
Local Non-profit (please specify):		16	19%
Other (please specify):		13	15%
Wikipedia: <a href="http://www.wikipedia.org">www.wikipedia.org</a>		10	12%
National Non-profit (please specify):		6	7%
<b>Total</b>		<b>307</b>	<b>100%</b>

### Outdoor Instruction

Of the 86 teachers who said they taught EE topics and also answered this question, the great majority (86%) had used outdoor exploration in their curriculum in the past three years (Table 17). For those who had not used outdoor exploration (12 respondents), all but one said he or she would use that instructional strategy if he or she received training (Table 18).

**Table 17: Incorporated outdoor exploration activities into curriculum in past three years**

	Bar	Responses	%
Yes		74	86%
No		12	14%
<b>Total</b>		<b>86</b>	<b>100%</b>

**Table 18: Likelihood that teacher would incorporate outdoor exploration if trained**

	Bar	Responses	%
Not at all likely		1	8%
Somewhat likely		4	33%
Very likely		1	8%
Extremely likely		6	50%
<b>Total</b>		<b>12</b>	<b>100%</b>

### CBNERR-MD

The majority of the EE teachers (58%) were not familiar with Maryland's Chesapeake Bay National Estuarine Research Reserve. Of those who were familiar with the reserve, about a third (31%) had used the reserve's educational services or products. Those 11 teachers reported using: the web site, staff for planning a field day, printed resources, lessons (e.g., ChesSIE), online data, and other online resources (e.g., the Bridge). For the 24



teachers who were familiar with the reserve but had not used the resources, they reported this was due to: lack of training, lack of time, availability of other resources, reserve too distant from their school, and lack of advanced level resources for AP classes.

### **Environmental Education Impact**

The EE teachers were asked, “As compared to traditional classroom teaching, have you observed an increase in the environmental awareness or stewardship of your students after participating in an outdoor activity?” An overwhelming majority (90%) said “yes.” When asked what evidence they had for making this claims, 72 teachers responded. Most of them (74%) had heard students’ comments, many had observed changes in students’ behaviors (60%), some had witnessed increased student engagement or interest (24%) and increased student test scores (14%), and one teacher heard about changes from a parent (1%).

**Table 19: Evidence for student increase in environmental awareness or behavior**

	Responses	%
Student comments	53	74%
Student behaviors	43	60%
Student engagement/interest	17	24%
Student test scores	10	14%
Parent comments	1	1%
<b>Total</b>	<b>124</b>	<b>100%</b>

### **Teachers’ Needs for EE Instruction and Professional Development**

Based on CBNERR-MD staff experience and the results of other NERRS needs assessments (e.g., Wells Reserve), it was hypothesized that elementary, middle, and high school teachers might have different needs. The sample size was very low for making those comparisons, but the Kruskal-Wallis Test, a nonparametric test of independent samples used on several of the questions in this section, indicated no differences between the three groups. Therefore, all results are reported for the combined sample of teachers.

### **EE Incorporation into Curriculum**

Almost all of the teachers (94%) indicated they were at least somewhat likely to incorporate environmental topics (including estuaries, watershed, and/or ocean) into their instruction in the next three years, with over half (54%) reporting that they would definitely teach those topics (Table 20). The reasons given by the 6 teachers who were not at all likely to teach environmental topics were: (1) teacher is retiring, (2) only teach math, (3) don’t know how to fit into Physics or AP chemistry courses, (4) lack of resources to apply to Algebra 2 or Pre-Calculus, (5) does not fit with 8<sup>th</sup> grade language arts curriculum, and (6) environmental topics not part of science curriculum. All of the teachers were asked their perceptions of barriers to incorporating more EE in their classroom instruction. In addition to lack of time and money, the teachers reported a wide variety of barriers, mostly those beyond their immediate control, such as the constraints of their curriculum or administration (Table 21 and Table 22).

**Table 20: Intention to Teach EE**

	Bar	Responses	%
Not at all likely		6	6%
Somewhat likely		19	19%
Very likely		21	21%
Definite		55	54%
<b>Total</b>		<b>101</b>	<b>100%</b>



**Table 21: Barriers to incorporating more EE in classroom instruction**

	Bar	Responses	%
Other (see Table 22 )		48	54%
Insufficient curriculum materials		35	39%
Lack of administrative support		24	27%
Lack of alignment with the curriculum I teach		24	27%
My need for environmental education training		20	22%
<b>Total</b>		<b>151</b>	<b>100%</b>

**Table 22: Other barriers to incorporating more EE in classroom instruction**

	Responses
Lack of funds (not specified)	13
Lack of funds for field trips (including transportation)	9
Lack of funds for projects	1
Insufficient time	13
Administrators not supportive of outdoor learning	2
Lack of on-campus outdoor access	1
Restricted number of field trips	1
Not a science teacher	1
Lack of supplies	1
Lack of support from other teachers	1
<b>Total</b>	<b>43</b>

### ***Outdoor Learning Opportunities***

Teachers who expressed an intention to teach EE in the future (95 respondents) were asked what kinds of outdoor experiential learning opportunities they would want to do in the next three years. Field trips were most frequently mentioned, followed by data collection, schoolyard-based activities, hiking/walking, and restoration activities (Table 23). The teachers were asked which factors most commonly prevented them from taking class field trips. By far the greatest barriers reported were transportation and field trips costs (Table 24). Other factors mentioned included limited capacity of field trip destinations to handle class size, limited number of field trips permitted by administration, and lack of student interest. Almost all of the teachers (95%) said that it was at least somewhat important for field trip providers to also provide pre- and post-trip materials for use in the classroom (Table 25).

**Table 23: Outdoor experiential learning opportunities wanted by teachers**

	Bar	Responses	%
Field trips focused on habitats and ecosystems		78	81%
Field trips focused on human impacts and environmental stewardship		78	81%
Data collection		72	75%
Schoolyard-based activities		72	75%
Field trips focused on animals and plants		61	64%
Hiking/walking		59	61%
Restoration activities		57	59%
Writing/nature journaling		35	36%
Geocaching/letterboxing		24	25%
Birdwatching		22	23%
Sketching/art		18	19%
Phenology studies		9	9%
None		0	0%
<b>Total</b>		<b>585</b>	<b>100%</b>



**Table 24: Factors that prevent field trips**

	Bar	Responses	%
Transportation costs		74	78%
Other costs associated with field trips		46	48%
Can't find enough time during the school year		43	45%
Fees charged by field trip destination		41	43%
School buses aren't available for field trips		23	24%
Administrative procedures or paperwork		23	24%
Lack of alignment with curriculum I teach		15	16%
Lack of administration support		12	13%
My own lack of knowledge of teaching outdoors		7	7%
Concern for student safety		6	6%
Lack of chaperones		5	5%
Other		6	6%
<b>Total</b>		<b>301</b>	<b>100%</b>

**Table 25: Important of pre- and post-field trip classroom materials**

	Bar	Responses	%
Not at all important		5	5%
Somewhat important		37	39%
Very important		54	56%
<b>Total</b>		<b>96</b>	<b>100%</b>

### **Computer and Internet Resources**

All of the teachers said they are able to use real-time internet resources, such as Google Earth, in their classrooms at least some of the time (Table 26). The most commonly reported limitation on real-time internet resource access was district level restrictions (Table 27). The vast majority of the teachers (90%) reported that their classes could access computers at least once per week (Table 28). Almost two thirds of the teachers (63%) reported that their students share computers when they use them in class (Table 29).

**Table 26: Real-time internet resource use**

	Bar	Responses	%
Yes		67	71%
Sometimes		28	29%
No		0	0%
<b>Total</b>		<b>95</b>	<b>100%</b>

**Table 27: Limitations for access to real-time internet resources**

	Bar	Responses	%
District level restrictions		15	54%
Internet access		11	39%
Computer software		10	36%
Computer hardware		9	32%
Need for professional development on technology use		7	25%
Technical support		7	25%
Other (please specify)		2	7%
<b>Total</b>		<b>61</b>	<b>100%</b>



**Table 28: Frequency of student access to computers**

	Bar	Responses	%
Daily		48	50%
A few times per month		17	18%
2-4 days per week		12	13%
Once per week		9	9%
Occasionally during the year		9	9%
No access to computers		1	1%
<b>Total</b>		<b>96</b>	<b>100%</b>

**Table 29: Students per computer**

	Bar	Responses	%
1 student per computer		35	37%
2-3 students per computer		38	41%
4 or more students per computer		21	22%
<b>Total</b>		<b>94</b>	<b>100%</b>

### ***EE Services and Opportunities***

When teachers were asked to indicate their level of need for environmental education services and opportunities, their greatest needs were consistent with what they indicated as their greatest barriers to environmental education: need for funds and for field trips (Table 30). School visits from providers was also a highly-rated need. Highlighted in gray in Table 30 are items for which more than 25% of the teachers reported the highest level of need (“great need” = 10). Those 8 items can be grouped into 4 categories: funding, field trips, curriculum supplements (school visits, resources, activity kits or trunks, service learning opportunities), and access to outdoor learning spaces (schoolyard or outdoor school site).

At least half of the teachers said they need real-time/archived data sets synthesized into age-appropriate learning materials and visualizations for their teaching on these topics: Algal blooms, Dissolved oxygen (DO), Water contaminants, Nutrients, pH, Fish species and abundance, and Temperature: water (Table 31).

When considering several broad topics that could be the focus of new educational materials, teachers’ ranked highest “Human impacts and stewardship actions” and ranked lowest “Cultural heritage” (Table 32).

### ***Climate Change Resources***

About half of the teachers expressed a high level of interest in climate change materials (Table 32). Teachers expressed that several tools would be most helpful in their efforts to incorporate climate change into their curriculum, including lesson plans, student field trips, data sets, kits/backpacks to rent for use in the classroom, and teacher workshops (Table 33).



**Table 30: Teachers' level of need for environmental education services and opportunities**

	No need 1	2	3	4	5	6	7	8	9	Great Need 10	Responses	Mean
Funding for activities and resources	-	-	1	-	4	1	4	10	6	65	91	9.24
Outreach - "field trips" that come to schools (School visits from providers)	-	1	2	4	9	4	9	4	13	44	90	8.28
Field trip opportunities	1	1	1	3	11	5	4	21	13	31	91	7.98
Curriculum resources	3	2	2	3	12	8	14	13	8	27	92	7.36
Environmental service learning opportunities	1	1	3	4	18	10	5	15	9	25	91	7.30
Speakers	3	3	1	5	7	11	10	16	13	20	89	7.28
Education products (field guides, etc.)	2	3	2	3	13	9	10	15	13	21	91	7.27
Professional development and environmental education training	3	-	5	5	12	11	7	14	13	22	92	7.120
Lessons	3	3	1	4	11	10	15	16	10	18	91	7.10
Schoolyard outdoor learning space or "classroom"	9	5	3	-	11	5	7	11	8	32	91	7.05
Activity kits or trunks	6	3	5	5	15	3	14	11	3	28	93	6.81
Development of teacher networks	5	3	4	4	15	10	8	18	5	20	92	6.73
County-run outdoor school site	15	3	5	3	3	8	9	7	5	31	89	6.57
Internet resources	4	2	2	5	19	11	20	8	3	17	91	6.55
Maps	3	9	3	5	10	10	13	16	6	16	91	6.52
Videos/DVDs	7	7	4	6	10	13	14	10	6	13	90	6.08
Self-guided tours	11	3	6	3	18	12	11	8	2	16	90	5.87
TV, radio and/or podcast programs	10	4	8	8	13	14	10	10	3	10	90	5.56
Brochures	16	16	7	9	14	5	8	4	1	10	90	4.47

**Table 31: Real-time/archived data sets needed to be synthesized into age-appropriate learning materials and visualizations**

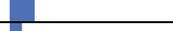
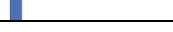
	Bar	Responses	%
Algal blooms		53	60%
Dissolved oxygen (DO)		53	60%
Water contaminants		53	60%
Nutrients		51	57%
pH		51	57%
Fish species and abundance		50	56%
Temperature: water		45	51%
Water turbidity (clarity/cloudiness)		43	48%
Salinity		41	46%
Atmospheric carbon dioxide		37	42%
Animal tags/tracking		36	40%
Temperature: air		36	40%
Sea level rise		35	39%
Zooplankton species		32	36%
Currents		22	25%
Water depth		20	22%
Waves		17	19%
Ocean color		12	13%
Bathymetry/topography		9	10%
None of the above		5	6%
Other (please specify):		2	2%
<b>Total</b>		<b>703</b>	<b>100%</b>



**Table 32: Teachers’ level of interest in educational materials for these topics**

	No interest 1	Some interest 2	High interest 3	Responses	Mean
Human impacts and stewardship actions	3	17	72	92	2.75
Ecology	2	24	66	92	2.70
Use of data in the classroom	3	27	60	90	2.63
Scientific research	4	33	53	90	2.54
Climate change and sea level rise	10	31	49	90	2.43
Cultural heritage	14	51	25	90	2.12
Other	15	7	3	25	1.52

**Table 33: Help needed to incorporate climate change into curriculum**

	Bar	Responses	%
Climate change lesson plans		52	57%
Student field trips about climate change		44	48%
Climate change data sets		41	45%
Climate change kits/backpacks to rent for use in the classroom		39	42%
Teacher workshops about climate change		37	40%
Online webinars about climate change		15	16%
None: I do not plan to incorporate this topic		8	9%
None: I plan to incorporate this topic, but do not require help		8	9%
Other		4	4%
<b>Total</b>		<b>248</b>	<b>100%</b>

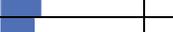
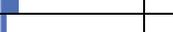
### **Resources in Spanish**

When asked if they foresaw a need for new estuary, ocean, or watershed related educational materials in languages other than English, almost half of the teachers (47%) said yes. All of those teachers (44 respondents) said there was a need for materials in Spanish. Additionally, either one or two teachers mentioned each of these languages used by their students: French, Japanese, Korean, Vietnamese, Chinese, and Burmese.

### **Professional Development**

Teachers were asked to indicate their 3 most needed types of professional development (PD). The two highest ranked needs were training in “using real-time or archived data from monitoring sites” and in “incorporating new lab activities” (Table 34).

**Table 34: Types of professional development needed**

	Bar	Responses	%
Using real-time or archived data from monitoring sites		40	44%
Incorporating new lab activities		38	42%
Facilitating inquiry-based activities		35	38%
Conducting stewardship projects		34	37%
Facilitating field work/data collection		32	35%
Using computer-generated visualizations of data		25	27%
Using the outdoors for instruction		25	27%
Conducting hands-on activities		24	26%
Integrating environmental education into the K-12 curriculum		19	21%
Science content		13	14%
Using new websites		11	12%
Social or cultural content		6	7%
Other		2	2%
<b>Total</b>		<b>304</b>	<b>100%</b>



Teachers were asked about their preferences for PD format (Table 35), length (Table 36), and time during the year (Table 37). There was a strong preference expressed for field-based PD. Teachers had diverse opinions about preferred length of PD, but the one-day model was the most highly ranked. Teachers strongly preferred to have their PD on a school day designated for in-service training or during a summer workshop.

**Table 35: Preferred professional development format**

	Bar	Responses	%
Field experience		79	86%
Train the trainer workshops		35	38%
Classroom and/or lecture experience		34	37%
Internet-based		30	33%
Online webinars (completed individually)		20	22%
Online webinars (taken with others)		17	18%
Networking fair		16	17%
Video/DVD		10	11%
Other		1	1%
<b>Total</b>		<b>242</b>	<b>100%</b>

**Table 36: Preferred professional development length**

	Bar	Responses	%
Full-day educator training		50	54%
Single day symposium with professional experts		47	51%
Multiple-day educator training		42	45%
University courses for credit		37	40%
Half-day educator training		31	33%
Multiple-day conference		31	33%
Other		4	4%
<b>Total</b>		<b>242</b>	<b>100%</b>

**Table 37: Preferred professional development time of year**

	Bar	Responses	%
Teacher in-service during school day		77	83%
Summer workshops		62	67%
Teacher in-service after school		25	27%
Weekend workshops		19	20%
Other		1	1%
<b>Total</b>		<b>184</b>	<b>100%</b>

Stipends and travel expense reimbursements were considered to be essential incentives to attend professional development by a third of the teachers (Table 38). When asked what factors prevented them from attending professional development, teachers' top two barriers paralleled their top two needs for incentives: high registration fees and travel/transportation constraints (Table 39). Teachers reported that their busy lives also got in the way of their PD attendance.



**Table 38: Importance of incentives for professional development**

	Not at all important 1	Somewhat important 2	Very important 3	Essential 4	Responses	Mean
Stipend	2	17	38	34	91	3.14
Travel expense reimbursement	4	22	34	31	91	3.01
Maryland State Department of Education Credit	8	31	32	15	86	2.63
Graduate credit	11	24	38	13	86	2.62
Continuing Education Units	10	35	32	12	89	2.52
Other	2	1	1	2	6	2.50

**Table 39: Factors that prevent teachers from attending professional development**

	Bar	Responses	%
High registration fees		44	48%
Travel/transportation constraints		44	48%
No time/too busy		40	44%
Can't get time off		35	38%
Food/lodging constraints		28	31%
Child care constraints		26	29%
Training is not relevant to my needs		17	19%
No educational credits offered		14	15%
Lack of administration support		12	13%
None		8	9%
Other		2	2%
Total		270	100%

### **Outdoor Instruction Needs**

Teachers expressed that these resources would be most helpful for incorporating more outdoor education into their curriculum: backpacks with field guides, binoculars, magnifying glasses and activity guides, facilitating field work/data collection, facilitating inquiry-based activities, conducting hands-on activities, and a clear connection between outdoor education and standards (Table 40).

**Table 40: Help needed to incorporate more outdoor education into curriculum**

	Bar	Responses	%
Backpacks with field guides, binoculars, magnifying glasses and activity guides, etc.		44	48%
Facilitating field work/data collection		43	47%
Facilitating inquiry-based activities		37	40%
Conducting hands-on activities		37	40%
Clear connection between outdoor education and standards		35	38%
Guidance on monitoring activities		21	23%
Unstructured outdoor experiential activities		17	18%
None: I plan to incorporate outdoor education, but do not require help		13	14%
Other		5	5%
None: I do not plan to incorporate outdoor education		2	2%
<b>Total</b>		<b>254</b>	<b>100%</b>



## Communication Preferences

The vast majority of teachers (91%) prefer to hear about field trip opportunities, educational programs, and teacher workshops via email (Table 41).

**Table 41: Preferred communication vehicle**

	Bar	Responses	%
Email		85	91%
School department heads/coordinators		39	42%
Website of the organization that provides the opportunity		31	33%
School principal		21	23%
Postal mail		19	20%
Newsletter of the organization that provides the opportunity		18	19 %
Facebook		9	10%
Posters		8	9%
Other websites		7	8%
Listservs		5	5%
Twitter		0	0%
<b>Total</b>		<b>242</b>	<b>100%</b>

## Discussion

### Advertising

Many of the teachers were not aware of the presence of environmental literacy in school districts' curriculum standards, namely, the existence of Maryland State Department of Education (MSDE) environmental literacy standards and a state-mandated environmental literacy graduation requirement. The existence of these two influential pieces could be more broadly advertised by MSDE.

Many of the teachers were not familiar with Maryland's Chesapeake Bay National Estuarine Research Reserve (CBNERR-MD). If CBNERR-MD has the capacity to accommodate more traffic from school groups, or at least provide instructional resources to be used in the classroom, it could increase its outreach efforts to reach more teachers and students. Teachers indicated a preference for receiving information via email, so a strategic email outreach effort could be launched.

### Integrating EE with Curriculum

Several sources of data provided by the teachers pointed towards both a need and an opportunity to demonstrate how environmental education (EE) can be integrated into existing curriculum. First, many teachers reported the perception that the new environmental literacy graduation requirement will change their future instruction. Second, several teachers reported not using environmental education because it does not align with their existing curriculum. For example, they teach physics or math or language arts and they do not perceive EE as a means for teaching those subjects. Third, the teachers had a strong preference for student field experiences that included pre- and post-lessons for the classroom. These responses, and others requesting supplemental curriculum materials, indicate a strong need for explicitly described means for integrating EE standards and instruction with existing standards and instruction in a variety of disciplines.

The eighth MSDE environmental literacy standard reads, "The student will make decisions that demonstrate understanding of natural communities and the ecological, economic, political, and social systems of human communities, and examine how their personal and collective actions affect the sustainability of these interrelated systems." The teachers who responded to this needs assessment survey believed that students' outdoor experiences contributed towards students' attaining such environmental awareness and stewardship.



Given the environmental education community's inclusion of outdoor learning experiences as integral components of environmental lessons, the means for integrating outdoor experiences must also be explicitly conveyed to teachers. In addition, although most of the teachers who responded to this survey were comfortable with teaching outdoors, training for those who were not would likely increase the amount of time those teachers spend teaching their students outdoors.

### **Money**

Funding was the chief obstacle reported by the teachers when asked what prevented them from using environmental education strategies and programs. The primary need for funds was to pay for transportation to off-site locations. Money was also needed for field equipment, EE provider fees, and restoration project materials. Helping teachers identify and attain funding sources is critical to increasing their access to outdoor experiences for their students. An outdoor experience many teachers said they would like for their students was on-school-site programs, which would eliminate the transportation cost.

### **Professional Development**

Money was also an issue with professional development (PD); teachers relied on stipends and travel expense reimbursement to participate in professional development. The teachers had a strong preference for attending PD during school hours rather than on their own time. However, they also indicated that they would be willing to attend summer workshops. They were less willing to attend after-school or weekend trainings.

### **Classroom Resources**

Teachers were very interested in additional access to real-time or archived data sets. They would like more training on how to best use those data sets in their instruction. Given that most students have some access to computers at school, computer and internet resources do not seem to be a constraint for the use of the real-time or archived data sets. CBNERR-MD could find ways to increase teachers' access to data sets on the topics most closely in line with their curriculum needs.

Teachers expressed interest in teaching about climate change, but they indicated a need for climate change lesson plans, field trips, and data sets.

Finally, teachers indicated a need for environmental education materials translated into Spanish. Some of their students speak other languages, but Spanish language materials were reported to be most needed.

## **Recommendations**

The following recommendations arose from the teachers' responses to the questionnaire items. CBNERR-MD, along with other EE providers in Maryland, can consider taking these actions:

- Assist teachers with identifying and attaining funding sources to pay for EE instructional materials and resources (classroom and outdoor) and for professional development.
- Offer no- or low-cost field experiences, including in school yards.
- Explicitly describe and model methods teachers can use to integrate EE standards and instruction into their existing standards and instruction in a variety of disciplines.
- Explicitly describe and model strategies teachers can use to integrate outdoor learning experiences into their instruction.
- Explore and address the factors limiting teachers' use of stewardship projects and activities.
- Advertise more broadly the MSDE environmental literacy standards, the state-mandated environmental literacy graduation requirement, and CBNERR-MD's resources.



## Conclusion

This needs assessment brought to light some ways in which CBNERR-MD and other EE providers in Maryland can collaborate to increase students' environmental literacy. Teachers indicated several resources and opportunities that would enable them to more easily involve students in environmental and outdoor education, and to increase the teachers' attendance in EE professional development. Teachers may increasingly seek out EE resources as they strive to prepare students to meet the new environmental literacy graduation requirement. This needs assessment provides information to CBNERR-MD and other EE providers so they can proactively work to meet teachers' future needs.

## References

Maryland State Department of Education. 2010. *Maryland Environmental Literacy Standards*.

[http://marylandpublicschools.org/NR/rdonlyres/EC79EC27-40BF-4017-894B-63A12A89A3D1/31625/MD\\_ELIT\\_STANDARDS.pdf](http://marylandpublicschools.org/NR/rdonlyres/EC79EC27-40BF-4017-894B-63A12A89A3D1/31625/MD_ELIT_STANDARDS.pdf)

Maryland State Department of Education. 2012. *Staff Employed at School and Central Office Levels, Maryland Public Schools, October 2011*. <http://www.marylandpublicschools.org/NR/rdonlyres/F5B571DF-A470-47BE-9516-05DC870DEEBA/31309/stfemp13.pdf>



## Appendix A: Survey Questions

### Maryland CB-NERR Needs Assessment

Maryland's Chesapeake Bay National Estuarine Research Reserve would like to know what it can do for teachers who teach about nature and the environment, or may do so in the future. Maryland has become a leader in the nation in environmental literacy efforts. We would like to understand what resources and services we can provide to make your job easier in order to meet Maryland's new preK-12 environmental literacy requirements and standards, and to achieve the goal of providing a meaningful outdoor environmental experience for every student every year. The questionnaire responses will be kept confidential, so please be perfectly frank in your answers. It may take between 20-30 minutes to complete. We recognize that is a lot to ask, so if you complete the questionnaire and provide your email address, we will include you in a raffle for a chance to win a \$200 VISA gift card (courtesy of the Friends of Jug Bay). Thank you very much for completing the questionnaire. If you have questions, please contact Coreen Weilminster at [cweilminster@dnr.state.md.us](mailto:cweilminster@dnr.state.md.us) or 410.260.8744.

In what educational setting(s) do you teach? Check all that apply.

- I am not a teacher
- Public School
- Private School
- Other (please specify): \_\_\_\_\_

If I am not a teacher Is Selected, Then Skip To End of Survey

If Other (please specify): Is Selected, Then Skip To End of Survey

In which school district or county/city do you teach?

- Allegany County
- Anne Arundel County
- Baltimore City
- Baltimore County
- Calvert County
- Caroline County
- Carroll County
- Cecil County
- Charles County
- Dorchester County
- Frederick County
- Garrett County
- Harford County
- Howard County
- Kent County
- Montgomery County
- Prince George's County
- Queen Anne's County
- Saint Mary's County
- Somerset County
- Talbot County
- Washington County
- Wicomico County
- Worcester County



What grade level(s) do you teach? Check all that apply.

- K
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Which of the following subject(s) do you teach? Check all that apply.

- Science
- English
- Language Arts
- Math
- Social Studies
- Fine arts
- Physical education/health
- Technology/computer science
- Other (please specify) \_\_\_\_\_

Answer If Which of the following subject(s) do you teach? Check all... Science Is Selected

Which of the following science subjects do you teach? Please check all that apply.

- General Science
- Chemistry
- Physical Science
- Environmental Science
- Biology
- Physics
- Earth Science
- Marine Science
- Other (please specify): \_\_\_\_\_

Are estuary (for example, Chesapeake Bay) and estuary-related topics a required part of your school's science teaching requirements?

- Yes
- No
- I don't know

How familiar are you with the new Maryland environmental literacy graduation requirement (COMAR Regulation 13A.03.02), which requires all students (beginning with those entering high school in 2011—2012) to complete a locally designed high school program of environmental literacy?

- Not at all familiar
- Somewhat familiar
- Very familiar



**Answer If How familiar are you with the new Maryland environmental ... Not at all familiar Is Not Selected**

To what degree will the new requirement change your instruction in the future?

- Not at all
- Somewhat
- A great deal

How familiar are you with the Maryland environmental literacy standards?

(marylandpublicschools.org/msde/programs/environment)

- Not at all familiar
- Somewhat familiar
- Very familiar

Is your school a Maryland Green School?

- Yes, it's currently a Green School
- No, but we are working on certification
- No

Approximately what percentage of students in your school or program identify with the following racial/ethnic groups?

(total should be 100%)

- \_\_\_\_\_ White/Caucasian
- \_\_\_\_\_ Black or African American
- \_\_\_\_\_ Hispanic, Latino, or Spanish origin
- \_\_\_\_\_ American Indian or Alaska Native
- \_\_\_\_\_ Native Hawaiian or other Pacific Islander
- \_\_\_\_\_ Other

**BRANCHING QUESTION 1:**

Have you taught environmental, estuary, watershed, and/or ocean topics in your curriculum in the last three years?

- Yes
- No

**If No Is Selected, Then Skip To End of Block**

Think about your plans for your class for the entire year. How much emphasis did you or will you give each of the following?

	Little or no emphasis	Moderate emphasis	Heavy emphasis	N/A
Outdoor experiential activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lab or field work/data collection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stewardship projects or activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data analysis, statistics, and probability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scientific inquiry skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



How many class or activity periods of estuary, watershed, and/or ocean instruction do your students receive in a typical school year?

	None	A portion of 1 class	1-2 classes per year	3-5 classes per year	6-15 classes per year	More than 15 classes per year
Estuaries	<input type="radio"/>					
Watershed	<input type="radio"/>					
Ocean	<input type="radio"/>					

How many years have you been teaching estuary, watershed, and/or ocean related topics?

	None	Less than 2 years	2-3 years	3-5 years	5-7 years	7-10 years	10-15 years	More than 15 years
Estuaries	<input type="radio"/>							
Watershed	<input type="radio"/>							
Ocean	<input type="radio"/>							

From which web resources do you currently obtain estuary, watershed, and ocean information for use in your classroom? Check all that apply.

- I do not use web resources
- National Oceanic and Atmospheric Administration's Education website: [www.education.noaa.gov](http://www.education.noaa.gov)
- National Estuarine Research Reserve System's website: [www.nerrs.noaa.gov](http://www.nerrs.noaa.gov)
- National Estuarine Research Reserve System's Education website: [www.estuaries.gov](http://www.estuaries.gov)
- Maryland's Chesapeake Bay National Estuarine Research Reserve's website: [www.dnr.state.md.us/bay/cbnerr](http://www.dnr.state.md.us/bay/cbnerr)
- Maryland State government website: [www.maryland.gov](http://www.maryland.gov)
- National Science Teachers Association Estuaries Science Guide: [www.sciguides.nsta.org](http://www.sciguides.nsta.org)
- Environmental Protection Agency Education website: [www.epa.gov/enviroed](http://www.epa.gov/enviroed)
- Wikipedia: [www.wikipedia.org](http://www.wikipedia.org)
- National Non-profit (please specify):
- Local Non-profit (please specify):
- Other (please specify):



Which real-time/archived data sets have you used in your teaching related to the following topics? Check all that apply.

- Algal blooms
- Animal tags/tracking
- Atmospheric carbon dioxide
- Bathymetry/topography
- Currents
- Dissolved oxygen (DO)
- Fish species and abundance
- Nutrients
- Ocean color
- pH
- Salinity
- Sea level rise
- Temperature: air
- Temperature: water
- Water depth
- Water contaminants
- Water turbidity (clarity/cloudiness)
- Waves
- Zooplankton species
- None of the above
- Other (please specify): \_\_\_\_\_

Have you incorporated outdoor exploration activities into your curriculum in the past three years?

- Yes
- No

Answer If Have you incorporated outdoor exploration activities into... No Is Selected

How likely is it that you would incorporate outdoor exploration activities if you had training?

- Not at all likely
- Somewhat likely
- Very likely
- Extremely likely

There is a National Estuarine Research Reserve located in Maryland called the Chesapeake Bay Reserve National Estuarine Research Reserve, which is one of 28 Reserves around the country protected for the purposes of education, research, water-quality monitoring and coastal stewardship. Were you aware that your state has a National Estuarine Research Reserve?

- Yes
- No

Answer If There is a National Estuarine Research Reserve (Reserve) ... Yes Is Selected

Have you used their educational services or products?

- Yes
- No

Answer If Have you used their educational services or products? Yes Is Selected

Which services or products?

Answer If Have you used their educational services or products? No Is Selected

Why not?



Would you like more information about the Chesapeake Bay National Estuarine Research Reserve student and teacher programs?

- Yes (Please enter email address): \_\_\_\_\_
- No

As compared to traditional classroom teaching, have you observed an increase in the environmental awareness or stewardship of your students after participating in an outdoor activity?

- Yes
- No

Answer If As compared to traditional classroom teaching, have you o... Yes Is Selected

On what evidence were your observations based (e.g., test scores, student behaviors, student comments, etc.)?

**BRANCHING QUESTION 2:**

Have you participated in environmental (including estuary, watershed, and ocean) education professional development (such as workshops, courses, online training, conferences) in the last three years?

- Yes
- No

If No Is Selected, Then Skip To End of Block

In the last three years, how many hours of professional development training in science have you obtained related to estuaries, watersheds, and the ocean?

	None	Less than 8 hours	8-16 hours  (1-2 days)	16-24 hours  (2-3 days)	24-32 hours  (3-4 days)	32-40 hours  (4-5 days)	More than 40 hours
Estuaries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watershed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ocean	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which professional development trainings have you taken to supplement your estuary/watershed/ocean education?

Check all that apply.

- NOAA/NERRS Teachers on the Estuary Training
- Project WET
- Project WILD Aquatic
- Project WILD Flying WILD
- Project WILD
- Growing Up WILD
- Project Learning Tree
- Green Eggs and Sand Workshop
- The Jason Project Professional Development
- None of the above
- Other (please specify): \_\_\_\_\_

**BRANCHING QUESTION 3:**

How likely is it that you will incorporate environmental topics (including estuaries, watershed, and/or ocean) in your instruction in the next three years?

- Not at all likely
- Somewhat likely
- Very likely
- Definite

If Not at all likely Is Not Selected, Then Skip To What kinds of outdoor experiential le...



Answer If How likely is it that you will incorporate environmental ... Not at all likely Is Selected

If you will not be teaching environmental topics, please give a brief explanation.

If If you will not be teaching... Is Displayed, Then Skip To End of Block

What kinds of outdoor experiential learning opportunities do you want to do in the next three years? Please check all that apply.

- None
- Data collection
- Field trips focused on habitats and ecosystems
- Writing/nature journaling
- Hiking/walking
- Field trips focused on animals and plants
- Field trips focused on human impacts and environmental stewardship
- Sketching/art
- Restoration activities
- Birdwatching
- Geocaching/letterboxing
- Phenology studies
- Schoolyard-based activities

Which of the following are barriers to incorporating more environmental education in your classroom instruction? Please check all that apply.

- Lack of administrative support
- Lack of alignment with the curriculum I teach
- Insufficient curriculum materials
- My need for environmental education training
- Other (please describe): \_\_\_\_\_

What factors most commonly prevent you from taking class field trips? Please select the 3 highest priority factors.

- School buses aren't available for field trips
- Can't find enough time during the school year
- Fees charged by field trip destination
- Lack of chaperones
- Concern for student safety
- Transportation costs
- Other costs associated with field trips
- Administrative procedures or paperwork
- Lack of alignment with curriculum I teach
- Lack of administration support
- My own lack of knowledge of teaching outdoors
- Other (please specify): \_\_\_\_\_

How important is it that field trip providers also provide pre- and/or post-trip materials for the classroom?

- Not at all important
- Somewhat important
- Very important

Currently are you able to use real-time Internet resources (such as Google Earth) in your classroom?

- Yes
- Sometimes
- No



Answer If Currently are you able to use real-time Internet resource... Yes Is Not Selected

What limits your access to real-time Internet resources? (check all that apply)

- Need for professional development on technology use
- Computer hardware
- Computer software
- Internet access
- Technical support
- District level restrictions
- Other (please specify) \_\_\_\_\_

How often do your classes have access to computers?

- No access to computers
- Daily
- 2-4 days per week
- Once per week
- A few times per month
- Occasionally during the year

Answer If Do your classes have access to computers? If so, how ofte... No access to computers Is Not Selected

How many students are there per computer on average?

- 1 student per computer
- 2-3 students per computer
- 4 or more students per computer



Please rate your level of need for the following environmental education services and opportunities on the scale below, where 1 is no need and 10 is great need.

	No need 1	2	3	4	5	6	7	8	9	Great Need 10
Activity kits or trunks	<input type="radio"/>									
Brochures	<input type="radio"/>									
Curriculum resources	<input type="radio"/>									
Development of teacher networks	<input type="radio"/>									
Environmental service learning opportunities	<input type="radio"/>									
Field trip opportunities	<input type="radio"/>									
Funding for activities and resources	<input type="radio"/>									
Internet resources	<input type="radio"/>									
Lessons	<input type="radio"/>									
Maps	<input type="radio"/>									
County-run outdoor school site	<input type="radio"/>									
Outreach - "field trips" that come to schools (School visits from providers)	<input type="radio"/>									
Professional development and environmental education training	<input type="radio"/>									
Schoolyard outdoor learning space or "classroom"	<input type="radio"/>									
Self-guided tours	<input type="radio"/>									
Education products (field guides, etc.)	<input type="radio"/>									
Speakers	<input type="radio"/>									
TV, radio and/or podcast programs	<input type="radio"/>									
Videos/DVDs	<input type="radio"/>									



Which of the following real-time/archived data sets would you need synthesized into age-appropriate learning materials and visualizations for your teaching? Check all that apply. [Note: We’re defining real-time data streams as data that you can access as the data are being collected by scientific instruments, or shortly thereafter, to study current conditions or events. Archived data are defined as older data that are still important and necessary for future reference, but are stored and indexed so that they can be easily located and retrieved.]

- Algal blooms
- Animal tags/tracking
- Atmospheric carbon dioxide
- Bathymetry/topography
- Currents
- Dissolved oxygen (DO)
- Fish species and abundance
- Nutrients
- Ocean color
- pH
- Salinity
- Sea level rise
- Temperature: air
- Temperature: water
- Water depth
- Water contaminants
- Water turbidity (clarity/cloudiness)
- Waves
- Zooplankton species
- None of the above
- Other (please specify):

What is your level of interest in the development of educational materials for these topics?

	No interest	Some interest	High interest
Ecology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use of data in the classroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change and sea level rise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Human impacts and stewardship actions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scientific research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cultural heritage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please describe)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do you foresee a need for new estuary, ocean, or watershed related educational materials in languages other than English?

- Yes
- No



Answer If Do you foresee a need for estuary, watershed or ocean rel... Yes Is Selected

Which languages?

How do you like to hear about field trip opportunities, educational programs, and teacher workshops of interest? Select the top three.

- Email
- Postal mail
- Posters
- Website of the organization that provides the opportunity
- Other websites
- Listservs
- Facebook
- Newsletter of the organization that provides the opportunity
- Twitter
- School principal
- School department heads/coordinators

What type of professional development training do you need? Please check the 3 most needed types.

- Science content
- Social or cultural content
- Conducting hands-on activities
- Facilitating inquiry-based activities
- Facilitating field work/data collection
- Incorporating new lab activities
- Conducting stewardship projects
- Using computer-generated visualizations of data
- Using new websites
- Using real-time or archived data from monitoring sites
- Integrating environmental education into the K-12 curriculum
- Using the outdoors for instruction
- Other (please specify): \_\_\_\_\_

What professional development format would you like to see offered? (check all that apply)

- Classroom and/or lecture experience
- Field experience
- Internet-based
- Networking fair
- Online webinars (completed individually)
- Online webinars (taken with others)
- Video/DVD
- Train the trainer workshops
- Other (please specify) \_\_\_\_\_

What length of professional development would you like to see offered? (check all that apply)

- Single day symposium with professional experts
- Full-day educator training
- Half-day educator training
- Multiple-day educator training
- Multiple-day conference
- University courses for credit
- Other (please specify) \_\_\_\_\_



When during the year would you like to see professional development offered? (check all that apply)

- Summer workshops
- Teacher in-service after school
- Teacher in-service during school day
- Weekend workshops
- Other (please specify) \_\_\_\_\_

How important are these incentives for attending professional development?

	Not at all important	Somewhat important	Very important	Essential
Continuing Education Units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maryland State Department of Education Credit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Graduate credit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stipend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Travel expense reimbursement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please describe):	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What factors prevent you from attending professional teacher development? Check all that apply.

- High registration fees
- Travel/transportation constraints
- Food/lodging constraints
- Child care constraints
- Can't get time off
- No time/too busy
- Lack of administration support
- Training is not relevant to my needs
- No educational credits offered
- None
- Other (please specify): \_\_\_\_\_

What help do you need to incorporate more discussion about the effects of climate change on coastal areas in your curriculum? Please check all that apply.

- None: I do not plan to incorporate this topic
- None: I plan to incorporate this topic, but do not require help
- Climate change lesson plans
- Teacher workshops about climate change
- Online webinars about climate change
- Climate change kits/backpacks to rent for use in the classroom
- Climate change data sets
- Student field trips about climate change
- Other (please specify): \_\_\_\_\_



What help do you need to incorporate more outdoor education in your classroom? Please check all that apply.

- None: I do not plan to incorporate outdoor education
- None: I plan to incorporate outdoor education, but do not require help
- Unstructured outdoor experiential activities
- Backpacks with field guides, binoculars, magnifying glasses and activity guides, etc.
- Facilitating inquiry-based activities
- Conducting hands-on activities
- Guidance on monitoring activities
- Facilitating field work/data collection
- Clear connection between outdoor education and standards
- Other (please specify): \_\_\_\_\_

If you would like to be entered into the raffle for the \$200 gift card, please provide your name and email address here.

You have reached the end of the questionnaire! Thank you for your responses. Please click on Submit below.