

APS Environmental Literacy Plan

APS lists among its core values excellence, innovation, collaboration, and stewardship. These values must be applied to solve future environmental problems that its students will meet after they leave the school system. In order to prepare its students for the challenges they will encounter, APS is working to create a cohesive plan to evaluate how it teaches environmental literacy throughout each student's tenure. The following statement summarizes APS's environmental literacy goals:

"To provide students with multiple opportunities to increase their environmental literacy at each grade level in order to enable students to graduate with the knowledge, skills, and dispositions to solve problems and resolve issues individually and collectively that sustain ecological, economic, and social stability."

The APS Environmental Literacy Plan is based on the [APS Strategic Plan](#), [Virginia Standards of Learning](#), and [Virginia Environmental Literacy Guidelines](#). The purpose of this document is to create an outline of the resources that APS has at its disposal to meet its goal of graduating students with high levels of environmental literacy. By creating a centralized location where resources can be listed and analyzed, APS can structure a more comprehensive view of what is being done to meet its environmental literacy goals. This document is the beginning of the evaluation process. This will be a living document, as programs get added, deleted, modified, or moved.

According to the [National Association for Environmental Education](#), there are four components to environmental literacy. The following is taken from the executive summary for developing an assessment framework for environmental literacy among society:

Competencies	Knowledge
<p>Competencies are clusters of skills and abilities that may be called upon and expressed for a specific purpose. Measurement of competencies is the primary objective in large-scale assessments. They include the capacity to:</p> <ul style="list-style-type: none">● Identify environmental issues,● Ask relevant questions,● Analyze environmental issues,● Investigate environmental issues,● Evaluate and make personal judgments about environmental issues,● Use evidence and knowledge to defend positions and resolve issues,● and create and evaluate plans to resolve environmental issues.	<p>Environmental literacy entails knowledge of:</p> <ul style="list-style-type: none">● physical and ecological systems;● social, cultural and political systems;● environmental issues;● multiple solutions to environmental issues;● and citizen participation and action strategies.

<p>The expression of a competency is influenced by and influences prior knowledge and dispositions.</p>	
<p>Dispositions</p>	<p>Environmentally Responsible Behavior</p>
<p>Dispositions are important determinants of behaviors related to the environment, both positive and negative. Learners' dispositions toward the environment are thought to influence their willingness to recognize and choose among value perspectives, as well as their motivation to participate in public deliberations about environmental issues. They include:</p> <ul style="list-style-type: none"> • Sensitivity; • attitudes, • concern, • and worldview; • personal responsibility; • self-efficacy/locus of control; • and motivation and intentions. 	<p>Competencies, knowledge, and dispositions enable and are expressed as behaviors, and environmentally responsible behavior is the ultimate expression of environmental literacy. It describes the point at which competencies, knowledge, and dispositions are brought to bear within a particular context. Treating behavior as a component of large scale environmental literacy assessments, however, is controversial, in part because it is more difficult to assess than the other components. Measures of behavior tend, for obvious reasons, to rely heavily on self reports, which many researchers view as less reliable than other sorts of measures.</p>

The four components of environmental literacy should also be considered through a social justice lens, as environmental stewardship, decisions, policies, and the effects of them, impact different communities in different ways. In order to provide teachers (and possibly students) with background information on the connections between environmental literacy and social justice, a resource list has been compiled, which can be found [here](#). This is a dynamic list that can be modified as resources are used, vetted, and understanding is expanded.

In order for the goal of environmental literacy to be integrated into an already demanding course load, these four components can be aligned with the Virginia Standards of Learning. Each standard is an opportunity to build in components of environmental literacy. General science principles and environmental literacy components dovetail together to help students achieve a meaningful and socially responsible education. Studies show that when using environmental literacy as a framework, students outperform academically compared to traditional programs.

A large component of providing environmental literacy is the Meaningful Watershed Experience (MWEE) that was part of the [2014 Chesapeake Bay Watershed Agreement](#). As a helpful guide, the [NOAA definition of a MWEE](#) is provided here:

Meaningful Watershed Experience (MWEE): multi-stage activities that include learning both outdoors and in the classroom, and aim to increase the environmental literacy of all participants. Teachers should support students to investigate topics both locally and globally that are of interest to them, learn they have control over the outcome of environmental issues, identify actions available to address these issues, and understand the value of those actions.

All four of these components are required for the experience to qualify as a Meaningful Watershed Educational Experience (MWEE):

Issue Definition: Students identify an environmental question, problem, or issue and explore through background research and investigation.

Outdoor field experiences: Students participate in one or more outdoor field experiences sufficient to collect the data required for answering the research questions and informing student actions.

Action projects: Students participate in an action project during which students take action to address environmental issues at the personal or societal level.

Synthesis and conclusions: Students analyze and evaluate the results of their investigation of the issue and synthesize and communicate results and conclusions.

[Superintendent's Advisory Committee on Sustainability \(SACS\)](#)

APS also demonstrates its dedication to sustainability and environmental literacy through the continued efforts of the Superintendent's Advisory Committee on Sustainability (SACS). The mission of the SACS is to provide recommendations to the Superintendent to achieve APS's sustainability objectives. This committee is also responsible for overseeing the Sustainability Liaison Program, which has a focus on waste reduction (reduce, reuse or recycling efforts), energy conservation, and sustainability projects that are based on the school's needs or are passionate to the students and/or liaisons. This ever-expanding program aims to support teachers at APS by providing a modest stipend in exchange for coordinating and designing sustainability activities that engage students and the APS community. Through the important work of the Sustainability Liaison's, APS increases the frequency of environmental literacy learning. More information on the SACS, including its annual reports and recommendations can be found by clicking on the link above, or by clicking [here](#).

Grade Band Environmental Literacy Targets

Elementary Environmental Literacy Targets

By the end of Grade 5, APS elementary students will engage in experiences that:

- address environmental literacy as outlined in the Virginia SOLs grades K-5,
- occur in their schoolyards or outdoor learning spaces,
- provide the opportunity to participate in local outdoor education opportunities, such as Nature Center class visits in the 1st grade,
- are hands-on, outdoor learning experiences, such as the Outdoor Lab in the 3rd and 5th grade,
- engage them in sustainability education and projects led by their sustainability coordinator or classroom teachers in their schools, and
- fulfill the opportunity to participate in at least one complete MWEE experience.

[K-5 Curricular Connections](#)

Middle School Environmental Literacy Targets

By the end of Grade 8, APS Middle School students will engage in experiences that:

- address environmental literacy as outlined in the Virginia SOLs grades 6-8,
- occur in their schoolyards or outdoor learning spaces,
- are hands-on, outdoor learning experiences, such as the Outdoor Lab in the 7th grade,
- engage them in sustainability education and projects led by their sustainability coordinator or classroom teachers in their schools, and
- fulfill the opportunity to participate in at least one complete MWEE experience.

[6-8 Curricular Connections](#)

High School Environmental Literacy Targets

By the end of grade 12, APS High School students will engage in experiences that:

- address environmental literacy as outlined in the VA SOLs,
- occur in their schoolyards or outdoor learning spaces,
- engage in research, service projects, clubs or internship opportunities that promotes environmental stewardship,
- offer the opportunity to receive the Board of Education Seal for Excellence in Science and the Environment, and
- fulfill the opportunity to participate in at least one complete MWEE experience.

[9-12 Curricular Connections](#)

Additional components to incorporate within curriculum documents:

- Problem-based or project-based learning opportunities that can be connected
- Performance assessments with environmental themes
- Ways to better incorporate outdoor space available at the school
- Social justice components of environmental literacy
- [Arlington Water Quality Overview](#)

External Partnerships and Internal Support	
APS Partnering Organizations	Applied Energy Services Corporation, Arlington County Department of Environmental Services, Arlington County Nature Centers, Arlington Master Naturalists, Arlington Outdoor Education Association, Dominion Energy, Eco-Action Arlington, Friends of the Planetarium, National Oceanic and Atmospheric Administration (NOAA), National Wildlife Federation (NWF)
Internal APS Support	<p>Arlington Public Schools recognizes the vital role the many departments within the school system plays in supporting the Environmental Literacy Plan.</p> <ul style="list-style-type: none">● Facilities and Operations● Food Services● Information Systems● Teaching and Learning● Transportation● School and Community Relations <p>Through the Science Office, the APS Chemical Hygiene Plan provides guidance on environmentally-conscious chemical use and disposal within Arlington Public Schools and is available to teachers at all grade levels within Canvas.</p>

Resources:

Alice Ferguson Foundation. (2020). Bridging the watershed. Retrieved from <https://fergusonfoundation.org/bridging-the-watershed/>

Arlington Public Schools. (2018). 2018-2024 APS strategic plan. Retrieved from <https://www.apsva.us/strategic-plan/>

Arlington Public Schools. (2020). Superintendent's advisory committee on sustainability. Retrieved from <https://www.apsva.us/aps-goes-green/superintendents-advisory-committee-sustainability/>

Board of Education: Commonwealth of Virginia. (2018). Science standards of learning curriculum framework 2018. Retrieved from http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

Caring for Our Watersheds. (2018). Chesapeake Bay. Retrieved from <https://caringforourwatersheds.com/usa/chesapeake-bay/>

Chesapeake Bay Program. (2014). Chesapeake Bay watershed agreement. Retrieved from https://www.chesapeakebay.net/documents/FINAL_Ches_Bay_Watershed_Agreement.withsignatures-HIres.pdf

Chesapeake Bay Program. (2020). Underwater grasses. Retrieved from https://www.chesapeakebay.net/issues/bay_grasses

Department of the Interior. (n.d.). Every kid outdoors. Retrieved from <https://everykidoutdoors.gov/index.htm>

National Oceanic and Atmospheric Association. (2017). NOAA meaningful watershed educational experience. Retrieved from <https://www.noaa.gov/education/explainers/noaa-meaningful-watershed-educational-experience>

National Wildlife Federation. (2020). Eco-Schools USA. Retrieved from <https://www.nwf.org/eco-schools-usa>

North American Association for Environmental Education. (2020). Environmental literacy framework. Retrieved from <https://naaee.org/our-work/programs/environmental-literacy-framework>

The College Board. (2020). AP Biology: About the course. Retrieved from <https://apstudents.collegeboard.org/courses/ap-biology>

The College Board. (2020). AP Environmental Science: About the course. Retrieved from <https://apstudents.collegeboard.org/courses/ap-environmental-science>

Virginia Department of Education (n.d.). Environmental literacy. Retrieved from http://www.doe.virginia.gov/instruction/environmental_literacy/index.shtml

Virginia Department of Education. (n.d.). Environmental science course content and process guidelines. Retrieved from http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml.

Virginia Department of Education. (n.d.). Science outcomes: Ecology. Retrieved from http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml.

(End of literacy plan – The following is already linked within the previous content.)

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Environmental Literacy and Social Justice

Below is a list of resources that can be used to help teachers with the complex social justice issues surrounding environmental literacy. If there are additional resources that you find helpful in your instruction, please share them so that they can be added to the list.

Source	Author/Organization	Grade Level(s)	Notes
The Connection between Social and Environmental Justice	Student Affairs Administrators in Higher Education (NASPA)		A compiled list of resources that address the following: “As the impacts of climate change intensify and disproportionately impact vulnerable and marginalized populations, it has become increasingly harder to ignore just how interconnected issues of social and environmental justice are, and how consequential they have become. Climate change not only impacts the environment but the economic and social realms of human life as well. This blog post highlights a few resources that bring together perspectives from environmental, social, and economic justice lenses, and offer insights that bridge these three critical aspects of sustainability. “
Environmental Justice Factsheet	University of Michigan - Center for Sustainable Systems		“Environmental Justice (EJ) is defined as the equal treatment and involvement of all people in environmental decision making. ¹ Inspired by the Civil Rights movement, EJ became widespread in the 1980’s at the intersection of environmentalism and social justice. ² Environmental injustice is experienced through heightened exposure to pollution and corresponding health risks, limited access to adequate environmental services, and loss of land and resource rights. ³ EJ and sustainability are interdependent and both necessary to create an equitable environment for all. ⁴ ”
Environmental Justice and Eco-Social Justice	University of Colorado, Boulder - Environmental Center		“The environmental justice movement grew in response to the disproportionate environmental burdens communities of color and low-income communities bear including pollution, industrial production and processing facilities, landfills and power plants. Simultaneously these communities often have fewer environmental benefits like parks, gardens and green spaces, while facing inadequate health care, access to healthy food, less political power.”

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Kindergarten - Grade 5

This table identifies where environmental literacy instruction takes place at each grade level. These instances are aligned with the Virginia Standards of Learning (SOLs) and should support the central theme of each grade level. In addition, each grade band has identified environmental literacy targets that can be achieved through the cumulative experiences at each level.

Elementary Environmental Literacy Targets

By the end of Grade 5, APS elementary students will engage in experiences that:

- address environmental literacy as outlined in the Virginia SOLs grades K-5,
- occur in their schoolyards or outdoor learning spaces,
- provide the opportunity to participate in local outdoor education opportunities, such as Nature Center class visits in the 1st grade,
- are hands-on, outdoor learning experiences, such as the Outdoor Lab in the 3rd and 5th grade,
- engage them in sustainability education and projects led by their sustainability coordinator or classroom teachers in their schools, and
- fulfill the opportunity to participate in at least one complete MWEE experience.

Content Areas and Themes	Environmental Literacy Strands (based on 2018 VA SOL Curriculum Frameworks)	APS Sponsored Opportunities Supporting Environmental Literacy	Suggested or Possible Sustainability Liaison Projects	Example Environmental Field Trips and Individual School Sponsored Environmental Literacy Programs/Projects
Kindergarten				
Science Using my senses to understand my world	K.11 a-c Central Idea: Humans can impact the amount of natural resources by reusing, recycling and conserving. Unit: Earth's Resources (Q4)		Recycling projects Waste free lunch Engineering challenges with recyclables	Schoolyard Nature Scavenger hunt Trips to local Nature Centers

Grade 1

Science How I interact with my world	1.4 a, 1.5 a, 1.8 a-c Central idea: Natural resources (clean air, clean water & undeveloped land) are limited and need to be conserved and used responsibly. These resources also provide the basic life needs for survival of plants and animals. Unit: Earth's Resources (Q4) 1.8 a-c	Nature Center first grade class visits. Students learn about the characteristics of animals (SOL 1.5) and their adaptations to the environment. Students also have opportunities to interact with different animals from the Nature Centers.	Recycling projects Waste free lunch Engineering challenges with recyclables Litter prevention	Green Spring Gardens Local Nature Centers Schoolyard Nature Scavenger Hunt
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Grade 2

Science Change occurs all around us	2.5 c, 2.8 a-c Central idea: Habitats of living organisms may change due to human influence. Unit: Interdependence and Environmental Changes (Q4) MWEE Opportunity	APS Planetarium show: The H2O Cycle	Habitat creation in schoolyard Soil erosion reduction	Green Spring Gardens Local Nature Centers
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Grade 3

Science Interactions in our world	3.8 a-c Central Idea: Human behaviors can negatively impact organisms and their habitats. Conservation practices can lessen the effects of human activity on the environment.	Outdoor Lab Trip: 3rd grade students visit the Outdoor Lab and participate in outdoor experiential learning. SOLs covered: 3.3, 3.5, 3.6, 3.7	Soil conservation Schoolyard garden Composting	Outdoor Lab day trip Schoolyard/neighborhood land use survey
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	Units: Ecosystems (Q1), Soil (Q3) MWEE Opportunity			Dominion Energy: Project Plant It!
Grade 4				
Science Our place in the solar system	4.8 a-d Central Idea: Virginia has many natural resources and “we all live downstream”. Unit: Virginia Resources (Q1) MWEE Opportunity	APS Planetarium Show: The Flight of the Butterfly	Litter cleanups, native species planting, stream studies Water quality testing at local streams	Trip to local stream All National Parks free for grade 4 students: Every Kid Outdoors Dominion Energy: Project Plant It!
Grade 5				
Science Transforming matter and energy	5.8 d Central Idea: Erosion and deposition contribute to Earth’s constantly changing geosystem. Unit: Changing Earth (Q4) 5.9 a-c Central Idea: Some resources are renewable and others are not. Unit: Conservation of Energy (Q4) MWEE Opportunity	The Outdoor Lab: students participate in an overnight trip to the Outdoor Lab. They are immersed in outdoor experiential learning activities. SOLs covered: 5.6, 5.8, 5.9 AES: Energy demo and class visit	Soil erosion reduction Reduce energy use (energy audits, no lights Friday etc.)	Outdoor Lab Overnight Trip

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Grades 6 - 8

This table identifies where environmental literacy instruction takes place at each grade level. These instances are aligned with the Virginia Standards of Learning (SOLs) and should support the central theme of each grade level. In addition, each grade band has identified environmental literacy targets that can be achieved through the cumulative experiences at each level.

Middle School Environmental Literacy Targets

By the end of Grade 8, APS Middle School students will engage in experiences that:

- address environmental literacy as outlined in the Virginia SOLs grades 6-8,
- occur in their schoolyards or outdoor learning spaces,
- are hands-on, outdoor learning experiences, such as the Outdoor Lab in the 7th grade,
- engage them in sustainability education and projects led by their sustainability coordinator or classroom teachers in their schools, and
- fulfill the opportunity to participate in at least one complete MWEE experience.

Content Areas and Themes	Environmental Literacy Strands (based on 2018 VA SOL Curriculum Frameworks)	APS Sponsored Opportunities Supporting Environmental Literacy	Suggested or Possible Sustainability Liaison Projects	Example Environmental Field Trips and Individual School Sponsored Environmental Literacy Programs/Projects
Grade 6				
Science Our world, our responsibility	<i>Water is important for agriculture, power, and public health: 6.6 f</i> <i>Watershed systems are dynamic and complex; interactions within these systems may influence the overall health of the watershed: 6.8 a-d</i>	APS Planetarium Show: Oasis in Space	Clear signage toward understanding of recycling procedures Cleanup of local watershed	Smithsonian Environmental Research Center (SERC) Caring for Our Watersheds National Wildlife Federation: Eco-Schools USA

	<p><i>Natural resource management and health and safety issues related to the use of resources should be considered in the development of public policy:</i> 6.9 a-f</p> <p>MWEE Opportunity</p>		Peer to peer education regarding ongoing efforts	
Grade 7				
Life Science	<p><i>Biotic and abiotic factors: Matter in cycles, energy flow in cycles, relationships:</i> LS.5 a-c</p> <p><i>Interaction and interdependence: predator/prey in food webs, competition and cooperation, niche related to survival:</i> LS.6 a,b,d</p> <p><i>Adaptation for survival: biotic and abiotic factors and physical and behavioral characteristics:</i> LS.7 a,b</p> <p><i>Ecosystems and their components are dynamic and affected by small and large scale environmental changes:</i> LS.8 b,c</p> <p><i>Relationship between ecosystem dynamics and human activity:</i> LS.9 a-c</p>	<p>The Outdoor Lab: Students spend the day learning ecological concepts through outdoor experiential education. LS.3 a-c; LS. 4 a, b; LS 5 a-c; LS.6 a-d; LS. 7 a, b; LS.8 a-c; LS.9 a-c; LS.11 c</p>	<p>Removal of invasive plants and planting of native species on school grounds</p> <p>Development and remediation of schoolyard habitats</p> <p>Peer to peer education regarding ongoing efforts</p>	<p>Caring for Our Watersheds</p> <p>National Wildlife Federation: Eco-Schools USA</p>

	<p><i>Populations change over time due to many factors including environmental ones: LS.11 c</i></p> <p>MWEE Opportunity</p>			
Grade 8				
Physical Science	<p><i>Energy storage and transformation within the context of energy conservation: PS.5 b,c</i></p>		<p>Energy Projects which may include:</p> <ul style="list-style-type: none"> -Local power sources and use analysis integrated with speakers from local government - Signs to turn off lights when rooms are not in use. -Public transportation benefits and solutions to/from school -Electronics recycling events -Energy audits at school and home with communication of results and recommendations <p>Peer to peer education regarding ongoing efforts</p>	<p>National Wildlife Federation: Eco-Schools USA</p>

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Grades 9-12

This table identifies where environmental literacy instruction takes place in each content area. These instances are aligned with the Virginia Standards of Learning (SOLs). In addition, each grade band has identified environmental literacy targets that can be achieved through the cumulative experiences at each level.

High School Environmental Literacy Targets

By the end of grade 12, APS High School students will engage in experiences that:

- address environmental literacy as outlined in the VA SOLs,
- occur in their schoolyards or outdoor learning spaces,
- engage in research, service projects, clubs or internship opportunities that promotes environmental stewardship,
- offer the opportunity to receive the Board of Education Seal for Excellence in Science and the Environment, and
- fulfill the opportunity to participate in at least one complete MWEE experience.

Courses	Environmental Literacy Strands (based on 2018 VA SOL Curriculum Frameworks)	APS Sponsored Opportunities Supporting Environmental Literacy	Suggested or Possible Sustainability Liaison Projects	Example Environmental Field Trips and Individual School Sponsored Environmental Literacy Programs/Projects
Science				
Environmental Science	VDOE Guidelines MWEE Opportunity	The Outdoor Lab: Each high school is given one day a month for a trip to the Outdoor Lab. Various science classes will send their students to study biology, earth science,	Implementation and monitoring of school recycling and waste management efforts Focus on peer to peer education regarding ongoing efforts	Chesapeake Bay Foundation field trips Grasses for the Masses project through Chesapeake Bay Foundation

		environmental science, and ecology. SOLs covered: varies	Walk and bike to school campaign to reduce carbon footprint (Safe Routes Partnership).	NOAA B-WET sponsored projects and field experiences Environmental clubs Internship opportunities Water testing at local stream site Trip to water treatment facility National Wildlife Federation: Eco-Schools USA
Biology	<i>Bacteria affect other organisms and the environment, specifically infectious disease: BIO.4 e</i> <i>Synthetic biology has biological implications: BIO.5 e</i> <i>Changes in environmental conditions change populations of species in different ways: BIO.7 b-d</i> <i>Organisms are part of living systems and demonstrate interdependence with other organisms and the environment: BIO.8 a-d</i>		Building and installing bird and/or bat boxes for biodiversity Development, maintenance, and education efforts of composting bins in conjunction with cafeteria waste management Focus on peer to peer education regarding ongoing efforts Monitoring and water testing for local streams	Chesapeake Bay Foundation field trips NOAA B-WET sponsored projects and field experiences Environmental clubs Internship opportunities Observing microinvertebrates and surrounding nature at local stream site Bridging the Watershed (Alice Ferguson Foundation)

	MWEE Opportunity			National Wildlife Federation: Eco-Schools USA
Chemistry	<i>Stoichiometric relationships:</i> CH.4.b <i>Solution concentrations:</i> CH.4.c <i>Titration:</i> CH.4.d CH.6.b			
Physics	<i>Conservation of Energy:</i> PH.4b <i>Optics:</i> PH.6 <i>Circuits, electrical power:</i> PH.8 <i>Modern/quantum, in particular nuclear, and photoelectric effect/solar panels:</i> PH.9a, d <u>AP and DE Physics:</u> <i>Thermal topics including heat engines and laws of thermodynamics</i>			

<p>Earth Science</p>	<p><i>Many factors affect the use and the conservation of natural resources to include availability, renewal rates, and economics. The use and allocation of these resources globally have economic, political, and environmental impacts: ES.6 a-d</i></p> <p><i>Water impacts geology and geological processes. Limited freshwater resources are impacted by several factors including human use: ES.8 a-d</i></p> <p><i>Oceans are dynamic systems that support life and moderate global temperatures. Natural occurrences and human activities can disrupt the equilibrium of the system: ES.10 a-c, e</i></p> <p><i>The atmosphere is a dynamic system that supports life in many ways. Natural occurrences and human activities can disrupt the equilibrium of the system: ES.11 a, c, d</i></p> <p><i>Changes in the atmosphere and oceans due to human activity affect global climate: ES.12 e</i></p>		<p>Stream and/or trash and recycling pickup on school grounds</p> <p>Analysis of water movement and erosion on and around school grounds with development of remediation efforts in combination with school and local agencies</p> <p>Focus on peer to peer education regarding ongoing efforts</p>	<p>Chesapeake Bay Foundation field trips</p> <p>NOAA B-WET sponsored projects and field experiences</p> <p>Environmental clubs</p> <p>Internship opportunities</p> <p>Use school features to observe renewable resources.</p> <p>National Wildlife Federation: Eco-Schools USA</p>
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Ecology	VDOE Guidelines MWEE Opportunity		<p>Development and/or maintenance of outdoor classroom with a focus on environmental education</p> <p>Engaging teachers in the use of the outdoor classroom</p> <p>Watershed cleanup</p>	<p>Chesapeake Bay Foundation field trips</p> <p>NOAA B-WET sponsored projects and field experiences</p> <p>Environmental clubs</p> <p>Internship opportunities</p> <p>Water testing at local stream site</p> <p>Use NoVA Parks to go canoeing/kayaking to observe ecosystems</p> <p>Engage with Four Mile Run Conservatory</p> <p>Bridging the Watershed (Alice Ferguson Foundation)</p> <p>National Wildlife Federation: Eco-Schools USA</p>
Oceanography	<p>Content guidelines are currently under development by VDOE</p>		<p>Aquaponics stream study</p> <p>Growing bay grasses for transplanting</p>	<p>Chesapeake Bay Foundation field trips</p> <p>NOAA B-WET sponsored projects and field experiences</p>

				<p>National Wildlife Federation: Eco-Schools USA</p> <p>Environmental clubs</p> <p>Internship opportunities</p>
AP Biology	<p><u>Ecology Unit</u></p> <ul style="list-style-type: none"> • <i>Communication and responses to environmental changes</i> • <i>Energy flow within and across ecosystems</i> • <i>Factors in the growth, density, and success of populations</i> • <i>Factors in community and ecosystem dynamics</i> • <i>Invasive species, human interaction, and environmental changes</i> 		<p>Local biodiversity analysis with focus on educating teachers and other adults</p> <p>Participate in local citizen science environmental monitoring projects</p> <p>Stormwater management projects to reduce runoffs</p>	<p>Chesapeake Bay Foundation field trips</p> <p>NOAA B-WET sponsored projects and field experiences</p> <p>Environmental clubs</p> <p>Internship opportunities</p> <p>National Wildlife Federation: Eco-Schools USA</p>
AP Environmental Science	<p><u>Biodiversity Unit</u></p> <ul style="list-style-type: none"> • <i>Introduction to biodiversity</i> • <i>Ecosystem services</i> • <i>Island biogeography</i> • <i>Ecological tolerance</i> • <i>Natural disruptions to ecosystems</i> • <i>Ecological succession</i> <p><u>Land and Water Use Unit</u></p> <ul style="list-style-type: none"> • <i>The tragedy of the commons</i> • <i>The Green Revolution</i> 		<p>Waste and recycling projects focus on educating teachers and other adults</p> <p>Participate in local citizen science environmental monitoring projects</p>	<p>Chesapeake Bay Foundation field trips</p> <p>NOAA B-WET sponsored projects and field experiences</p> <p>Environmental clubs</p> <p>Internship opportunities</p>

- *Types and effects of irrigation*
- *Pest-control methods*
- *Meat production methods and overfishing*
- *The impacts of mining*
- *Urbanization and ecological footprints*
- *Introduction to sustainable practices including crop rotation and aquaculture*

Energy Resources and Consumption Unit

- *Energy sources and fuel types, including fossil fuels, ethanol, and nuclear power*
- *Global energy consumption and distribution of natural resources*
- *Natural sources of energy, including solar power, wind, geothermal, and hydroelectric power*
- *Energy conservation methods*

Atmospheric Pollution Unit

- *Introduction to air pollution*
- *Photochemical smog*
- *Indoor air pollution*
- *Methods to reduce air pollutants*
- *Acid rain*
- *Noise pollution*

Water testing at local stream site

Use NoVA Parks to go canoeing/kayaking to observe ecosystems

Trip to water treatment facility

National Wildlife Federation:
[Eco-Schools USA](#)

	<p><u>Aquatic and Terrestrial Pollution Unit</u></p> <ul style="list-style-type: none"> • <i>Sources of pollution</i> • <i>Human impact on ecosystems</i> • <i>Thermal pollution</i> • <i>Solid waste disposal and waste reduction methods</i> • <i>Pollution and human health</i> • <i>Pathogens and infectious diseases</i> <p><u>Global Change Unit</u></p> <ul style="list-style-type: none"> • <i>Ozone depletion</i> • <i>Global climate change</i> • <i>Ocean warming and acidification</i> • <i>Invasive species</i> • <i>Human impacts on diversity</i> 			
Geospatial Tools and Techniques	<p><i>Geospatial technologies, such as geographic information systems (GIS), global positions systems (GPS), and remote sensing to a problem of interest.</i></p> <p><i>Apply technology to solve the problem, analyze the data, and propose and communicate possible solutions related to environmental issues.</i></p>			<p>NOAA B-WET sponsored projects and field experiences</p> <p>Environmental clubs</p> <p>Internship opportunities</p> <p>National Wildlife Federation: Eco-Schools USA</p>

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