District of Columbia Healthy Schools Act of 2010 Environmental Literacy Report

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State of Environmental Education
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As required by Section 502 of the Healthy Schools Act (HSA), as amended by the Sustainable DC Omnibus Amendment Act, effective December 17, 2014 (D.C. Law 20-142), the Office of the State Superintendent of Education (OSSE) is pleased to provide a report about the state of environmental education in the District and plans for expansion of the program.

I. BACKGROUND

Across the nation,[1] jurisdictions are incorporating environmental education throughout the school day in order to ensure that students graduate with an understanding of how their lives impact the environment and the skills to reduce their impact on the environment through personal choices. In the District, this effort is being driven by a mandate from the Council of the District of Columbia (DC Council) through the Healthy Schools Act.

In 2010, the DC Council passed the DC Healthy Schools Act, which prioritizes the health and wellness of students throughout the District. The HSA acknowledged that creating and sustaining an environmentally friendly school environment and integrating environmental education into schools' curricula are essential to the health and wellness of students, as well as the health of the local environment and community. The HSA initially called for the District Department of the Environment to lead, in conjunction with other agencies, the development of an environmental literacy plan, which would serve as a road map for the implementation and integration of environmental education in the K-12 curriculum. Beginning in 2010, DDOE oversaw the process of developing this plan in coordination with DC Public Schools (DCPS), the Office of the State Superintendent of Education, the Public Charter School Board (PCSB), the State Board of Education (SBOE), the Department of Parks and Recreation (DPR), and the University of the District of Columbia (UDC). Substantial input was also received from the

[1] National environmental efforts include, among others, the Department of Interior's "America's Great Outdoors Initiative" – a program to engage youth in outdoor pursuits and learning opportunities aimed at creating a life-long interest in conservation and stewardship, and the U.S. Department of Education's "Green Ribbon Schools" recognition program – the first comprehensive green schools program at the federal level. Regional environmental literacy efforts are driven by the Chesapeake Bay Executive Order 13508: Strategy for Protecting and Restoring the Chesapeake Bay Watershed (issued on May 12, 2009). The purpose of Chesapeake Bay Executive Order 13508 (2009) is "to protect and restore the health, heritage, natural resources, and social and economic value of the nation's largest estuarine ecosystem and the natural sustainability of its watershed." One of the objectives is to foster a dramatic increase in the number of citizen stewards of every age who support and carry out local conservation and restoration. In 2012, the National Oceanic and Atmospheric Administration (NOAA) released the Mid-Atlantic Elementary and Secondary Environmental Literacy Strategy, which details how the federal government can support state efforts in environmental literacy planning and implementation. Included in this strategy is a provision that states in the mid-Atlantic region establish and implement a robust plan for ensuring that all students graduate environmentally literate. The Chesapeake Bay Watershed Agreement (2014) builds upon previous commitments to restore the health of the Chesapeake Bay. The governors of all six states in the Chesapeake Bay region plus the mayor of the District signed the new CBA. The agreement establishes 10 goals and 31 outcomes to restore the Bay, its tributaries, and the lands that surround them. One of the goals addresses environmental literacy and will enable students in the region to graduate with the knowledge and skills to act responsibly to protect and restore their local watershed through three outcomes: student meaningful watershed educational experiences, sustainable schools, and environmental literacy planning. Staff at NOAA are tasked with forwarding the implementation of the CBA, and both DDOE and OSSE have been participating in regional working groups responsible for developing implementation strategies for the outcomes above.

DC Environmental Education Consortium (DCEEC) and environmental non-profit organizations. The resulting Environmental Literacy Plan (ELP) provides a framework to ensure that students will be prepared to make informed decisions concerning the environmental opportunities and challenges of the 21st century. On July 2, 2012, Mayor Vincent C. Gray submitted the final draft of the ELP to DC Council. The ELP creates the groundwork for the development of academic standards and the measurement of student achievement with regards to environmental literacy. The 2012 ELP is available here: http://green.dc.gov/service/dc-environmental-literacy-plan.

The 2012 Environmental Literacy Plan defined environmental literacy as the development of the knowledge, attitudes, and skills necessary to make informed decisions concerning the relationships among natural and urban systems, and identified an environmentally literate person as one who: discusses and describes ecological and environmental systems and human impacts on these systems; engages in hands-on, outdoor learning experiences that involve discovery, inquiry, and problem solving; formulates questions and analyzes information pertaining to his or her surrounding environment; and understands how to take actions that respect, restore, protect, and sustain the health and well-being of human communities and environmental systems.

In 2013, the District released its first Sustainable DC Plan, a strategy that lays out a path forward to make the District the healthiest, greenest, and most livable city in the nation over the next 20 years. During the development of the Sustainable DC Plan, many stakeholders called for the development and implementation of an associated education curriculum for District schools that would include sustainability concepts. The Sustainable DC Plan recognizes that the Environmental Literacy Plan is the appropriate platform on which to build environmental and sustainability education into District schools. In the Sustainable DC Plan, implementation of the ELP is a component of the Equity and Diversity Goal 1 (to ensure that all school-age children in the District are educated in sustainability and prepared for a changing green economy) and includes the following:

- **Target:** By 2032, teach at least 50% of children in the District about sustainability concepts; and
- **Action 1.3:** Launch the implementation of the Environmental Literacy Plan (ELP) in school curriculum.

In response to the Sustainable DC Plan, the Council passed the Sustainable DC Omnibus Amendment Act of 2014, effective December 17, 2014 (D.C. Law 20-142), which identified various areas where legislative changes were needed to achieve Sustainable DC goals, including an amendment to the HSA. The Sustainable DC Omnibus Amendment Act of 2014 amended the HSA to formalize support for the Environmental Literacy Plan by creating an Environmental Literacy Program in OSSE. The purpose of the Environmental Literacy Program is to provide "necessary oversight, subject matter expertise and training resources to ensure that the Environmental Literacy Plan is integrated into District school curricula."[2]

Finally, the Budget Support Act of 2015 for Fiscal Year 2016 requires OSSE to establish a one year pilot program to provide funds to employ environmental literacy specialists at DCPS and public charter elementary schools to implement the 2012 Environmental Literacy Plan. Eight schools shall be selected

[2] Committee of Transportation and the Environment, *Committee Report: Bill 20-573, the "Sustainable DC Omnibus Act of 2014"*, June 16, 2014. Available at: http://lims.dccouncil.us/Download/30722/B20-0573-CommitteeReport2.pdf

to participate in the pilot from those schools that have an existing school garden or a plan to establish a garden with the assistance of an environmental literacy specialist.

These local initiatives have the potential to empower future generations to make effective environmental decisions and become caretakers of our natural resources. The following section discusses the development of the Environmental Literacy Program in its first year.

II. STATE OF ENVIRONMENTAL EDUCATION: ENVIRONMENTAL LITERACY PROGRAM

Specifically, the Sustainable DC Omnibus Amendment Act of 2014 called for an Environmental Literacy Program to:

- Coordinate the efforts of the District Department of the Environment, the District of Columbia Public Schools, the Public Charter School Board, the Office of the State Superintendent of Education, the State Board of Education, the University of the District of Columbia, the Department of Parks and Recreation, the Department of General Services, and the Department of Employment Services to triennially develop an environmental literacy plan for public schools, public charter schools, and participating private schools;
- Establish and convene an Environmental Literacy Committee, composed of community organizations, District government agencies, and other interested persons;
- Collect data on the location and types of environmental education programs in public schools, public charter schools, and participating private schools;
- Provide environmental education guidance and technical assistance to public schools, public charter schools, and participating private schools; and
- Provide training, support, and assistance for environmental literacy programs in public schools, public charter schools, and participating private schools.

Since the enactment of the Sustainable DC Omnibus Amendment Act of 2014, OSSE has worked to meet the subtitle's requirements accordingly:

Coordinate the efforts of District agencies to triennially develop an environmental literacy plan for public schools, public charter schools, and participating private schools.
As per this subtitle, OSSE hired an Environmental Literacy Coordinator in May 2015.
OSSE plans to collaborate with District agencies and stakeholders to draft an updated Environmental Literacy Plan by July 2016 and subsequently share updated progress with the DC Council by July 2017.

Establish and Convene an Environmental Literacy Advisory Committee
During the summer of 2015, OSSE will identify and recruit qualified representatives from schools, community organizations, stakeholders, and District agencies to serve on the Environmental Literacy Advisory Committee, and establish a quarterly meeting schedule.

Collect data on the location and types of environmental education programs in District schools
Data on environmental education programs in District schools for the 2014-15 school year were collected using multiple methods including: 1) HSA School Health Profiles[3], 2) data from OSSE's School

[3] Each public school, public charter school, and participating private school within the District of Columbia is required to complete the School Health Profile Questionnaire (SHP) and submit to OSSE pursuant to Section 602 of

Gardens and Farm-to-School Programs, 3) DCPS Office of Planning and Post-Secondary Readiness, and 4) self-reported data from select environmental education providers.

High School Environmental Science Course Enrollment: Based upon data from the DCPS Office of Planning and Post-Secondary Readiness, since the 2012-13 school year, the availability of District high school environmental science courses (AP and standard) has grown in DCPS, however enrollment in standard environmental science courses has declined (Table 1).

According to school health profile data, out of 20 charter high schools, only nine offered an environmental science course in the 2013-14 school year (with 626 enrolled students), while in the 2014-15 school year, 12 schools offered the course (849 enrolled students).

Table 1. Number of DCPS High Schools Offering AP Environmental Science and Environmental Science and Enrollment in those Courses, in the 2012-13 and 2014-15 school years.

	SY 2012-13	SY 2014-15
# of DCPS High Schools Offering AP Environmental Science Course	3/25 (12%)	5/21 (24%)
Enrollment in DCPS AP Environmental Science	150	173
# of DCPS High Schools Offering Standard Environmental Science Course	19/25 (76%)	18/21 (86%)
Enrollment in DCPS Environmental Science Courses	2150	1430

Environmental Literacy Taught in Schools: According to the 2014-15 SHP data, 51 schools reported teaching at least one of the following environmental topics during the school year:

- Air (quality, climate change)
- Water (stormwater, rivers, aquatic wildlife)
- Land (plants, soil, urban planning, terrestrial wildlife)
- Resource Conservation (energy, waste, recycling)
- Health (nutrition, gardens, food)

However, grant program data from the OSSE School Garden and Farm Field Trip grants and DDOE's Overnight Meaningful Watershed Educational Experience and Sustainable DC Model Schools Programs indicate potential underreporting on the number of schools teaching these topics in the classroom. This data has been compiled into a list of schools and what types of

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the *Healthy Schools Act of 2010*. The information collected in the SHP serves as a comprehensive means of monitoring and evaluating schools on how well they are meeting the requirements under the HSA. All data in the SHP are self-reported by each school. The complete 2015 SHP Questionnaire is available here: http://osse.dc.gov/sites/default/files/dc/sites/osse/publication/attachments/School%20Health%20Profile_2015_for%20distribution.pdf.

environmental education programming they are receiving (Appendix G). OSSE's Environmental Literacy Coordinator plans to coordinate and streamline channels for collecting more accurate and robust data. In addition to the data sources mentioned above, other methods may include:

- Chesapeake Bay Program's Environmental Literacy Indicator Tracking (E-LIT) Tool
- DC Environmental Education Consortium Member Survey
- Interviews with school administrators and community-based organizations

Provide environmental education guidance and technical assistance to public schools, public charter schools, and participating private schools

OSSE is in the process of developing a strategic plan for its Environmental Literacy Program that will include provisions for coordinating environmental education guidance and technical assistance for all District schools and incorporate recommendations from stakeholder surveys and interviews.

III. STATE OF ENVIRONMENTAL EDUCATION: ENVIRONMENTAL LITERACY PLAN

Pursuant to section 502 of Healthy Schools Act, as amended, OSSE's Environmental Literacy Program shall coordinate the efforts of DDOE, DCPS, PCSB, SBOE, UDC, DPR, DGS and DOES to triennially develop an environmental literacy plan for public schools, public charter schools, and participating private schools that includes, at minimum:

(1) Relevant teaching and learning standards adopted by the State Board of Education;
(2) Professional development opportunities for teachers;
(3) Suitable metrics to measure environmental literacy;
(4) Suitable methods to increase environmental literacy;
(5) Governmental and nongovernmental entities that can assist schools in the achievement of these goals; and
(6) A proposed implementation method for the plan.

These components are consistent with the requirements described in the North American Association for Environmental Education (NAAEE)'s guidance document, Developing a State Environmental Literacy Plan (NAAEE, 2008).

However, as discussed above, the call for an Environmental Literacy Plan in the Sustainable DC Omnibus Amendment Act of 2014 was not the District's first Environmental Literacy Plan. The District's first Environmental Literacy Plan was submitted to the Council on July 2, 2012. The first Environmental Literacy Plan, described further below, lays foundation for district-wide integration of environmental education into the K-12 curriculum which includes the development of academic standards and the measurement of student achievement with regards to environmental literacy.

The District's 2012 State Environmental Literacy Plan

The DC Environmental Literacy Plan (ELP) outlines the following objectives and goals for reaching them:

1) Integrate environmental literacy concepts into the K-12 curriculum.
    - Align environmental literacy concepts with current standards.
    - Engage every student in at least one Meaningful Outdoor Educational Experience at each grade level.
    - Provide downloadable materials and on-line access to environmental literacy resources.

- Create a strategy for integrating environmental literacy into Next Generation Science Standards roll-out to schools.

2) Increase and improve environmental education and training for all stakeholders.
   - Prepare pre-service and in-service teachers to be able to teach environmental education and foster environmental literacy.
   - Provide workshops and training for environmental education professionals.
   - Develop communities of practice to foster dialogue and capacity for environmental literacy.
3) Integrate environmental literacy into the secondary school experience.
   - Increase the number of high school students enrolled in an environmental science course.
   - Ensure that environmental literacy and meaningful outdoor educational experiences are discussed and addressed during revisions of the science graduation requirements.
   - Increase participation in environmental service-learning as part of the community service graduation requirement.
4) Create meaningful measures of student environmental literacy.
   - Collect baseline information of student performance in environmental literacy concepts within current science standards.
   - Create environmental literacy assessment opportunities that are not test-driven.
   - Incorporate environmental literacy into future student assessment tools.
5) Maximize school facilities and grounds to create learning opportunities for all students.
   - School facilities support environmental concepts and practices.
   - Create and maintain outdoor schoolyards spaces to encourage and support outdoor learning experiences.
   - Encourage schools to apply to the U.S. Green Ribbon Schools program.
6) Encourage collaboration and engagement across all sectors involved in implementation.
   - Cultivate and foster the knowledge and awareness necessary for the development and implementation of the DC Environmental Literacy Plan at Local Education Agencies (LEAs).
   - Individual LEAs develop an Environmental Literacy Scope of Work and Implementation Plan.
   - Each District agency demonstrates commitment and ownership of an Environmental Literacy Scope of Work and Implementation Plan.
   - Create state infrastructure for implementation of the DC Environmental Literacy Plan.

Results: Implementation of the DC 2012 Environmental Literacy Plan (2012-2014)

From 2012 to 2014, DDOE tracked progress on action items within the 2012 Environmental Literacy Plan. Since May 2015, OSSE has assumed the leadership role in implementation of the ELP and has begun to track progress. Below are updates on the plan action items from 2012-2015. An implementation table for the ELP can be found in Appendix A.

Relevant teaching and learning standards adopted by the State Board of Education

The ELP includes an appendix of relevant science and social studies standards, based upon the DC Content Standards for science. However, the SBOE adopted the Next Generation Science Standards (NGSS) in December 2013 so the standards identified in the initial ELP are out of date.

The intent of the NGSS is to integrate the following three dimensions into the curriculum to reflect the work of scientists and engineers: science and engineering practices, crosscutting concepts, and disciplinary core ideas. NGSS Performance Expectations integrate applications of science, technology,

and engineering into life, Earth, space, and physical science and clarify what students should know and be able to do at the end of a grade level or grade band.

In order to align environmental literacy concepts to the NGSS, DDOE collaborated with the Anacostia Watershed Society, DCEEC, and DC Greens, as well as teachers from the Sustainable DC (SDC) Model Schools (described on page 10) to create the Environmental Literacy Framework (ELF) (Appendix B). The Environmental Literacy Framework is a guide for schools that identifies the knowledge and skills District students need to become environmentally literate. The framework is outlined by grade level (Pre-K–Grade 8) or science subject area (high school) and aligned with the NGSS Performance Expectations. Included are environmental contexts for learning and guiding questions to serve as a starting point, with content appropriate to each grade level. Based on themes taken from the Sustainable DC Plan, sustainability initiatives provide starting points for in-depth investigations and suggestions for extending learning beyond the classroom. Schools can use the ELF as guidance to develop school-based environmental literacy implementation plans.

One concern with the NGSS related to environmental literacy is that as national standards, they do not contain local and relevant content that resonates with students. As a result, DDOE, OSSE, DCPS, and DCEEC have collaborated closely to address this issue. One approach has been to work directly with District teachers to develop curriculum units with local context. Results of these collaborative initiatives are further discussed in the sections below.

Professional development opportunities for teachers

- Science Professional Development Days: Environmental workshops have been presented at DCPS professional development (PD) days for science teachers for Grades 6-12. For the 2012-13 school year, DCEEC collaborated with DDOE and other non-profits to provide workshops around water and watersheds, air quality, and energy. During the 2013-14 school year, additional workshops were offered on Project Learning Tree's *GreenSchools!* Investigations[4] and an online virtual stream study of macroinvertebrates in the District's Watts Branch.[5] In 2014-15, the PD days focused on NGSS implementation. The Department of General Services (DGS) also provided a workshop on recycling.
- School Gardens Program: Since its inception, OSSE's School Gardens Program has provided environmental education training related to school gardens. Beginning in the 2012-13 school year, OSSE has partnered with DC Greens to provide a year-long professional development series, Growing Garden Teachers, for a cohort of 50 School Garden Coordinators. Each year, DDOE or DCEEC has conducted at least one session specifically on the ELP and how it can be integrated into garden education. OSSE's School Gardens Program also offers introductory training and seasonal training opportunities throughout the school year that are open to teachers or other stakeholders interested in school gardens.
- Early Learning Institutes: OSSE's Division of Early Learning has been partnering with environmental organizations, DDOE, and other OSSE divisions to offer environmental training (3-hour or 6-hour) opportunities around the District's Early Learning Standard for Scientific Inquiry.[6] Twelve workshops were offered in the 2013-14 school year and 10 workshops in 2014-15, at sites such as the Washington Youth Garden, Rock Creek Park, the National Zoo, and the

[4] https://www.plt.org/project-learning-tree-greenschools-investigations
[5] http://www.cacaponinstitute.org/Benthics/vss5.html
[6] http://SBOE.dc.gov/page/academic-standards

U.S. Botanic Garden, to encourage early learning educators to bring nature into their centers or take the District's youngest learners on environmental science field trips.

- Environmental Literacy Summer Institute: In July 2014, DDOE worked with OSSE, DCEEC, and the non-profit grantee Carnegie Academy for Science Education to organize and host a four-week professional development institute (Appendix C). The focus of the institute was to create curriculum units and lesson plans that are based on the NGSS, support the ELF, and are informed by local field experiences and sustainability issues. Thirty-three teachers from 27 schools worked in grade-level teams to develop nine curriculum units (Appendix G). During the 2014-15 school year, four teachers (two from high schools and two from elementary schools) from the summer institute and some of the SDC Model Schools (described on page 10) field-tested these curriculum units. OSSE will post the final curriculum units on the LearnDC web site.
- NGSS 3.0 – Translating the Next Generation Science Standards into Practice: As part of a pilot study developed by the American Museum of Natural History, WestEd, and Biological Studies Curriculum Center, OSSE, DCPS, DCEEC, Friendship Public Charter Schools, and Cesar Chavez Public Charter Schools provided 30 teachers from nine LEAs with a professional development series on a comprehensive set of tools to guide instructional planning, support, and design around the NGSS. Over seven 8-hour sessions, teachers focused on an ecosystems unit to learn how to translate the standards and inform their teaching practice.
- Climate Change Filmmaking Project: DCCEC organized and hosted a Climate Change Filmmaking Project which introduced a select group of DCPS and charter school teachers and students to the world of film and media arts as a tool to explore climate change. Teams of science and visual art/media teachers from wards throughout the District received training from the American Film Institute and engaged their students in creating one-minute films that simultaneously explored the local impact of climate change and careers in environmental communications. In March 2015, the films were screened at the Landmark E Street Cinema as part of the DC Environmental Film Festival.
- OSSE Summer Farm Field Trips for Teachers: In August 2014, OSSE partnered with the University of the District of Columbia (UDC) to take 41 teachers on two field trips to Muirkirk Farm (owned by UDC), in Beltsville, MD. There teachers had the opportunity to experience a farm field trip and to learn how to incorporate farm-to-school concepts into classroom lessons.
- Additional Opportunities for Teachers: District agencies and non-profit organizations provide professional development opportunities for teachers in addition to those described above. This information can be found in the Environmental Literacy Resource Directory (Appendix E), created by DCEEC.
- Opportunities for Non-Formal Educators: DDOE has also provided professional development for non-formal educators who work with District youth.
    - During the 2012-13 school year, DDOE conducted two Project Learning Tree curriculum trainings for DPR's after school program staff and other environmental education professionals.
    - During the 2013-14 school year, DDOE conducted three additional Project Learning Tree curriculum trainings for DPR Cooperative Play Program staff and summer hires.
    - In the spring of 2014, DPR after school program staff were trained to lead an after school program teaching youth how to observe and identify living things around them, while creating a field guide specific to their community.
    - In March 2013, DCEEC held a day-long workshop, Greening STEM (science, technology, engineering, and math), to demonstrate how a diverse group of professionals can work collaboratively to integrate environmental literacy into different STEM subject areas.

- In December 2014, DDOE hosted an NGSS EQuIP (Educators Evaluating the Quality of Instructional Products) training organized by the non-profit Achieve, OSSE, and DCEEC. This workshop served to build capacity of educators to evaluate and improve the quality of NGSS-aligned instructional materials used in environmental education programming.

Measuring progress in environmental literacy

In the District, science is tested in grades 5, 8, and high school biology. The District led the nation in field testing a new science assessment aligned to the Next Generation Science Standards in the 2014-15 school year, including questions that align with the ELF. For every grade level tested, the NGSS Performance Expectations for life science and earth science have environment-focused items.

Although assessments can be used to formally measure student progress with respect to environmental literacy education, many opportunities also exist for students to demonstrate their environmental knowledge through participation in school-based activities. Integrating environmental investigations into school curriculum or participating in school-wide environmental events allow students to demonstrate understanding of environmental concepts and environmentally responsible behaviors. Many efforts have been made to create meaningful measures of student environmental literacy that are not test-driven. These include:

- High school Environment Award presented by DCEEC at the DC STEM Fair;
- Anacostia Environmental Youth Summit, organized by DDOE, DCEEC, Earth Force, and other environmental non-profits, which includes events that showcase student investigations and action projects;
- School participation in DGS' Sprint to Savings Challenge; and
- School participation in Growing Healthy Schools Week.

Suitable methods to increase environmental literacy

A number of District agencies and environmental non-profit organizations have been involved in providing environmental literacy programming, developing methods to integrate environmental literacy into the curriculum, and providing professional development for teachers and others providing environmental education in schools. These efforts are described below. A full list of organizations that provide programs for students and teachers can be found in the DCEEC Environmental Literacy Resource Directory (Appendix E).

- Sustainable DC Model Schools: In 2013, DDOE was awarded a Sustainable DC Budget Challenge grant (SDC ELP grant) to begin implementation of the ELP. Through this grant, DDOE is working with non-profit sub-grantees Anacostia Watershed Society, DCEEC, and DC Greens to identify best practices to implementing the ELP in schools. Eight Sustainable DC (SDC) Model Schools (Table 2), one per ward, were recruited based upon evidence of successful environmental education programming and a principal who was supportive of the project. During the 2013-14 school year, representatives from each school met monthly with the non-profits to study the NGSS and develop the ELF. During the 2014-15 school year, the SDC Model Schools piloted the ELF through individual school-based environmental literacy implementation plans that will engage students in environmental literacy activities at every grade level (Appendix F). OSSE will evaluate the results of this pilot to determine how the model can be replicated at other District schools.

Table 2. Sustainable DC Model Schools

School	Ward
DC Bilingual PCS	1
Hardy Middle School	2
Janney Elementary School	3
E.L. Haynes PCS	4
Washington Yu Ying PCS	5
Eastern Senior High School	6
Sousa Middle School	7
Thurgood Marshall Academy PCHS	8

- Overnight Meaningful Watershed Educational Experience (MWEE) for Fifth Grade Students: DDOE partners with three local non-profit organizations (Alice Ferguson Foundation, Living Classrooms of the National Capital Region, and NatureBridge) on the Overnight MWEE Program. The MWEE is a three-day, two-night, overnight field study that engages students in environmental education programming and team-building activities. The concepts addressed in the MWEEs are tied to the NGSS, including characteristics that make up the Earth's systems; food chains and webs in ecosystems; and the interaction between humans and the earth, specifically focusing on ways to protect the environment.

  In the 2013-14 school year, DDOE piloted this program with all fifth grade students from Wards 7 and 8. The three organizations collaborated to develop a pre- and post-test that tested key concepts, including: watersheds, organism adaptations, consumers, producers, and decomposers. Other questions developed independently by each organization allowed for evaluation of specific program focus. A higher number of students responded correctly to questions related to the definition of and components of a watershed after the MWEE. They also gained knowledge about the scientific method, the role of decomposers in the food chain, and actions that farmers can take that have a positive effect on the environment. In the 2014-15 school year, DDOE was able to expand the program to serve students in all wards. Systemic implementation of a MWEE is a component of the Chesapeake Bay Agreement, which calls for students to engage in at least one meaningful watershed educational experience each in elementary, middle and high school.

- Curriculum Integration:
  - DCPS develops Scope and Sequence documents for each grade and subject area.[7] These documents establish consistency of instruction throughout the district - in different grade levels and subject areas - by providing clear guidance on what teachers should

[7] http://dcps.dc.gov/DCPS/In+the+Classroom/What+Students+Are+Learning/Scope+and+Sequence+Documents

teach and when they should teach it. DCPS has agreed to include environmental literacy resources in its revision of the Scope and Sequence documents for science.
  - The SCALE (Science Curriculum Advancement through Literacy Enhancement) Project is facilitated by the Center for Inspired Teaching and engages cohorts of DCPS teachers in creating K-12 science curricula that are infused with literacy benchmarks and aligned with NGSS. SCALE lessons covering weather and climate and ecosystems will provide opportunities to teach NGSS within an environmental context.
  - DCPS Cornerstone Assignments will provide opportunities for the local environment to be the context for real-world learning. Cornerstone Assignments are high-quality, in-depth lessons offered across the District during the same instructional window, which will result in synchronized experiences among all District students Cornerstone Assignments investigating pollinators, pollution, alternative energy, and climate change will provide opportunities to teach NGSS within an environmental context.

- U.S. Green Ribbon Schools: The U.S. Department of Education Green Ribbon Schools Award honors public and private elementary, middle, and high schools, districts, and postsecondary institutions that are exemplary in three Pillars: 1) reducing environmental impact and costs, including waste, water, energy use and alternative transportation; 2) improving the health and wellness of students and staff, including environmental health, nutrition and fitness; and 3) providing effective sustainability education, including robust environmental education that engages STEM, civic skills, and green career pathways.[8] To date, six schools in the District have received this national award: George Washington University, Mundo Verde Bilingual Public Charter School, Sidwell Friends Middle School, Stoddert Elementary School, Washington Yu Ying Public Charter School, and Woodrow Wilson High School. More information on these schools is available on the OSSE web site.[9]
- After School Environment/Nature Programming: In 2012, DPR created its Environment and Great Outdoors Division, which provides District area residents of all ages with outdoor recreation and environmental education experiences to cultivate a genuine connection to the great outdoors and to activate responsibility and stewardship for the environment. After school programs have included "What's Good in my Hood" (2012-13), intergenerational gardening and cooking programs (2013), and the Field Guide Project. Each summer, DPR also offers outdoor adventure camp programming.

Governmental and nongovernmental entities that can assist schools in the achievement of these goals
The 2012 ELP included an appendix that lists organizations with environmental literacy resources for schools. Creating access to this information has been important to spread the word about environmental education opportunities in the District. Other tools to connect schools to resources are described below:

- DCPS Educator Portal: DDOE provided DCPS with web links to environmental curricula, student programs, and web sites, which is posted in the science section of the DCPS Educator Portal under the tab "Other Curricular Resources on the Web."
- Resource Directory: DCEEC's Environmental Literacy Resource Directory (Appendix E) also references relevant sustainability initiatives. It was disseminated with the draft ELF and is posted on DCEEC's web site.

[8] http://www2.ed.gov/programs/green-ribbon-schools/factsheet.pdf
[9] http://osse.dc.gov/node/730682

- DC Teachers Night: Launched by DCEEC in 2008, this annual event hosted at the U.S. Botanic Garden features approximately 40 environmental organization exhibitors who present environmental hands-on activities, lesson plans, and resources for teachers to bring back to their classrooms. Information is also exchanged regarding classroom visits, student and teacher field experiences, and professional development opportunities. This event has grown from 100 teachers pre-registering to attend in 2008 to over 275 teachers pre-registering to attend in 2014.

A proposed implementation method for the plan

The ELP serves as a vehicle to navigate through local priorities, regional commitments, and national efforts. By viewing these initiatives through the lens of environmental literacy, many stakeholders have collaborated to foster environmental literacy integration in District schools. Below are descriptions of District agency commitments.

- Implementation of the ELP was integrated into DDOE's Performance Plans in FY14 and FY15. Actions are being executed through DDOE's Watershed Protection Division education programs and the summer youth Green Zone Environmental Program.
- Released in March 2014, DPR's master plan, PlayDC, includes "be green" principles and includes the goal of being a leading provider for youth and support for adults and seniors. Most residents throughout the District's wards expressed desire for DPR to be a leading provider of nature programming.
- One of the ultimate goals of UDC's College of Agriculture, Urban Sustainability, and Environmental Sciences is to increase agriculture literacy for teachers and students in grades PreK-12. Implementation of the ELP has been incorporated into this goal and supporting activities.
- In 2014, the SBOE established a Green Practices Committee to reduce waste, protect the environment, and better align its "green" efforts with best practices followed by government agencies and schools nationwide. Among its areas of interest is the promotion of and support for environmental education.

IV. PLANS FOR EXPANSION

During the 2015-16 school year, OSSE's Environmental Literacy Program plans to:

(1) Review recommendations from the SDC ELP Grant project (ends July 2015) and create a new strategy to implement the Environmental Literacy Framework in District schools;
(2) Conduct a survey to determine the extent environmental education initiatives are taking place in the District. This survey will include interviews with school administrators and environmental education program providers and provide the baseline data on the location and types of environmental education programs taking place in public schools, public charter schools, and participating private schools;
(3) Conduct an assessment to determine types of environmental education guidance and technical assistance needed by public schools, public charter schools, and participating private schools. The data collected will be used to communicate best practices, determine the greatest areas of need, and to ensure that relevant training and meaningful technical assistance is provided;
(4) Develop a comprehensive tracking system for collecting data on environmental education programs in schools;

(5) Increase the number of students participating in environmental education experiences by providing resources and assistance to teachers on curriculum integration, funding opportunities, and strategic partnerships with District agencies and community organizations;
(6) Begin development of a sustainable green school certification program for District schools;
(7) Identify and recruit members for the Environmental Literacy Committee and convene quarterly meetings;
(8) Explore and develop new innovative partnerships that will support existing environmental education programs and the establishment of new school programs.
(9) Work with OSSE's Healthy Schools Act Initiatives team and community-based organizations to engage teachers and administrators in professional development around connecting the environment with classroom lessons and integrating environmental literacy into the holistic well-being of students;
(10) Collaborate with DCEEC and its member organizations to develop and increase environmental education activities, as well as to support DCPS and charter schools in taking advantage of these types of educational activities;
(11) Determine the best methods to evaluate changes in student and teacher environmental literacy and establish metrics to track improvement; and
(12) Further collaborate with OSSE's STEM and Early Learning initiatives to increase scope and depth of environmental education programs.

VI. CONCLUSION

As the District moves forward with environmental literacy in conjunction with District-wide initiatives targeting student health and sustainability, OSSE will continue to develop, implement, and support the new Environmental Literacy Program authorized by the Healthy Schools Act. With other District agencies, non-profit partners, and stakeholders, OSSE will support the shared commitment to environmental literacy, education for sustainability, and children's health.

Healthy Schools Act of 2010
Environmental Literacy Report
APPENDICES

APPENDIX A:
Environmental Literacy Plan Implementation Table.

Goal	Action Items	Lead Organizations	Timeframe	Progress Description	Progress Status
A. Align environmental literacy (EL) concepts with current standards.	i. Analyze current standards and identify those that include EL concepts.	DDOE DCEEC	Short	Appendix E of the ELP for existing science and social studies standards that support environmental literacy. The ELF identifies NGSS Performance Expectations that can be taught with an environmental context.	●●●●
	ii. Create a cross-walk of the District's existing content standards with NAAEE Guidelines and Next Generation Science Standards to identify overlap and content gaps.	OSSE	Medium	NAAEE developed a resource that highlights some of the connections between the NGSS vision of science education and environmental literacy. This document can be accessed online: http://eelinked.naaee.net/n/guidelines/posts/Aligning-EE-NGSS-the-Common-Core-Standards-and-the-C3-Framework-for-Social-Studies-State-Standards.	●●●●
	iii. Integrate EL concepts into existing DCPS scope and sequence documents.	DCPS DDOE	Short	Environmental literacy resources will be included in the revised Scope and Sequence science curriculum planning documents, as well as curriculum developed through the SCALE (Science Curriculum Advancement through Literacy Enhancement) Project and Cornerstone Assignments.	●●○○
	iv. Determine best practices currently in place in District schools.	DDOE OSSE	Short	Snapshots have been created of schools recognized by the US Green Ribbon Schools program, and the Sustainable DC Model Schools project is also helping determine best practices.	●●○○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

B. Engage every student in at least one Meaningful Outdoor Educational Experience at each grade level.	i. Provide schools with a comprehensive list of outdoor opportunities on school grounds and throughout the District to be updated every 3 years.	DCEEC	Short	Discussions are taking place to develop a map of schools and nearby green spaces.	●○○○
	ii. Provide standards-based EL framework for schools to scaffold into their curriculum.	DDOE DCEEC	Medium	DDOE and partners have been working with 8 teachers to identify relevant NGSS for the Environmental Literacy Framework. The framework has been piloted at the SDC Model Schools during SY14-15, which will provide insights on how the framework can be used in other District schools.	●●●○
C. Provide downloadable materials and on-line access to environmental literacy resources.	i. Create searchable database for all environmental literacy resources.	DCEEC	Medium	The Environmental Literacy Resource Directory is the first step in creating a database.	●○○○
	ii. Update DCPS Science Educator Portal to include EL information.	DCPS DDOE	Short	Environmental information can be found in the portal under the tab "other curricular resources on the web." The scope and sequence documents are also on the portal, and these will be updated with EL resources before the beginning of SY15-16.	●●●●
	iii. Submit EL information to be included in the PCSB Tuesday Bulletin.	DDOE	Short		○○○○
D. Create a strategy for integrating EL into Next Generation Science Standards roll-out to schools.	i. Ensure the District's potential adoption of the Next Generation Science Standards maintains local and relevant content that resonates with students.	SBoE OSSE DCEEC	Long	Curriculum units developed during the Environmental Literacy Summer Institute all included connections to local environmental and sustainability initiatives.	●●●○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

<u>Objective 2</u>: Increase and improve environmental education and training for all stakeholders.

Goal	Action Item	Lead Organizations	Timeline	Progress Description	Progress Status
A. Prepare pre-service teachers to be able to teach environmental education and foster environmental literacy.	i. Work with local universities and teacher prep programs to offer at least 6 contact hours of training in environmental education.	DDOE UDC	Long	Sustainable DC can assist with making contact with sustainability directors from most of the eight universities in the District.	○○○○
B. Provide in-service teachers with workshops about how to teach environmental education and foster environmental literacy.	i. Create a crosswalk of the DCPS Teaching and Learning Framework and the NAAEE *Guidelines for the Preparation and Professional Development of Environmental Educators to determine existing overlap and any gaps.*	DCPS	Medium	DCPS will plan to look into the IMPACT rubric which has greater weight on teacher skills.	○○○○
	ii. Provide broad-based EL workshops for all District teachers.	DDOE OSSE UDC DCEEC	On-going Short Long On-going	Workshops are being conducted by DCEEC, DDOE, UDC, and non-profit partners through DCPS PD Days, OSSE School Garden Coordinator training, OSSE Early Learning Professional Development Team, NGSS implementation, and more. Continuous effort needed to create opportunities in which teachers will participate.	●●●○
	iii. Create a Summer Academy for teachers that provides intensive training in relevant grade bands.	UDC OSSE	Long Medium	UDC will work with OSSE and DCPS and other partners to provide/develop educational programs. DDOE, OSSE, DCEEC, and Carnegie Academy for Science Education partnered to complete the Environmental Literacy Summer Institute in July 2014.	●○○○ ●●●●

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

C. Provide workshops and training for EE professionals.	i. Hold at least 3 workshops per year for EE providers – intro courses and supplemental workshops.	DDOE DCEEC	Medium	DDOE has conducted Project Learning Tree workshops and DCEEC has conducted workshops on Greening STEM and the NGSS EQuIP rubric.	●●○○
	ii. Integrate EE workshops into existing DPR staff training.	DPR	Short	Environmental workshops integrated into the 2012 all-staff training. DDOE provided recreation center staff with Project Learning Tree training for the "What's Good in My Hood" program launch, and staff received additional training for other environmental programs. DDOE also provided Project Learning Tree training to all staff in the Cooperative Play program and their summer hires.	●●●○
D. Develop communities of practice to foster dialogue and capacity for environmental literacy.	i. Create Professional Learning Communities or other networks focused on environmental literacy.	OSSE	Medium	Members of OSSE's Science Educator Leadership Cadre participated in the Environmental Literacy Summer Institute, and continue to meet to discuss NGSS and environmental literacy. The environmental coordinators that participated in the SDC Model Schools project met monthly, developed the ELF, and piloted the ELF by developing school-based environmental literacy implementation plans.	●●●○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

Objective 3: Integrate environmental literacy into the secondary school experience.

Goal	Action Items	Lead Organizations	Timeline	Progress Description	Progress Status
A. Increase the number of high school students enrolled in an environmental science course.	i. Determine which schools currently offer this course and the existing barriers to schools offering this course.	OSSE DCPS PCSB	Medium	OSSE has determined the schools that offer the environmental science course but not the barriers that exist to offering the course in general.	●●○○
	ii. Offer an environmental science course in every District high school as an elective or science class.	DCPS Charter LEAs	Long	The number of schools in both DCPS and charter schools offering environmental science has been increasing each year.	●●●○
	iii. Monitor enrollment trends with the Statewide Longitudinal Education Data System (SLED).	OSSE	Long	These data are collected by DCPS and by OSSE in the School Health Profile, and enrollment is increasing. However, a method must be developed to verify enrollment, particularly for the charter schools.	●●●○
B. Ensure that environmental literacy and meaningful outdoor educational experiences are discussed and addressed during revisions of the science graduation requirements.	i. Define components that would qualify for a meaningful outdoor educational experience.	SBoE	Medium		○○○○
	ii. Analyze the implementation and results of environmental literacy graduation requirements in other states to determine applications for the District.	SBoE	Long	Maryland is the only state to have an environmental literacy graduation requirement, and it is too soon to determine results of implementation.	○○○○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

C. Increase participation in environmental service-learning as part of the community service graduation requirement.	i. Provide comprehensive information to the DCPS Office of Secondary School Transformation for inclusion in the DCPS Community Service Handbook.	DDOE DCEEC	Short	DCEEC has compiled the list of organizations, updates the list every August, and sends it to DCPS by the end of December.	●●●●
	ii. Meet with the DCPS Community Service Coordinators and Charter LEA representatives so they know about opportunities available.	DCPS Charter LEAs	Short		○○○○
	iii. Work with environmental education providers to provide meaningful volunteer opportunities.	DPR UDC DCEEC	On-going	DCEEC has compiled a dynamic list of organizations with opportunities and submitted the list to DCPS Community Service Coordinators. UDC has also partnered with non-profits to provide volunteer opportunities.	●●●●
	iv. Determine current number of students participating in environmental service-learning; determine whether the number increases over time.	DCPS Charter LEAs	Long		○○○○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

<u>Objective 4</u>: Create meaningful measures of student environmental literacy (assessment).

Goal	Action Items	Lead Organizations	Timeline	Progress Description	Progress Status
A. Collect baseline information of student performance in environmental literacy (EL) concepts within current science standards.	i. Convene a panel to designate science standards that contain EL concepts and write corresponding justifications.	DDOE	Short	The SDC Model School project has created the ELF, which identifies NGSS that can be taught with an environmental context.	●●●●
	ii. Analyze student performance data from 2007-2011 on these standards to create a baseline of what students know.	OSSE	Long	In 2012, OSSE provided DDOE with 2009 DC CAS scores on items testing science standards that support EL. DDOE began looking at the data to determine whether schools that had EE programming in place in 2009 performed better than schools that did not. It may be possible to look at how students performed on items local to the District, but it may be better to create a baseline with the new NGSS assessment.	●○○○
	iii. Determine best practices based on student performance (curriculum reviews, teacher interviews).	DDOE	Medium	With a Sustainable DC Grant, DDOE is working with partners to identify best practices at 8 model schools. Results of the Sustainable DC grant will be available in September 2015.	●●○○
	iv. Participate in the item development and selection process for upcoming DC CAS tests.	DDOE	Medium	DDOE did not participate in the creation of the new NGSS assessments that were piloted in SY14-15. However, the assessment included items that tested standards identified in the Environmental Literacy Framework.	●●○○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

B. Create environmental literacy assessment opportunities that are not test-driven.	i. Encourage and support student interest in completing an EL Capstone Project, Science Fair project, Portfolio, etc., and provide a showcase for EL student presentations.	DCEEC	Medium	DDOE, DCEEC, and non-profit partners continue to organize the annual Anacostia Environmental Youth Summit, which has begun to showcase more student presentations each year. OSSE's Growing Healthy Schools Week and DGS's school-wide competitions are increasing the opportunities for students to be engaged in environmental activities. DCEEC continues to present an environmental award at the DC STEM Fair to at least one high school student.	●●○○
	ii. Establish a tracking mechanism to monitor and evaluate student engagement/performance.	DCPS Charter LEAs	Long		○○○○
C. Incorporate environmental literacy into future student assessment tools.	i. Determine if and how EL can be integrated in to Common Core State Standards assessments developed by PARCC.	OSSE	Short	It is unlikely that EL can be integrated into PARCC. We will look to other states with ELPs to see whether they develop tools that we can consider adapting for use in the District.	○○○○
	ii. Monitor the development of the assessment items for the Next Generation Science Standards and EL correlations.	OSSE	Medium	The NGSS assessments that are being planned include alignment with the ELF.	●●○○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

Objective 5: Maximize school facilities and grounds to create learning opportunities for all students.

Goal	Action Items	Lead Organizations	Timeline	Progress Description	Progress Status
A. School facilities support environmental concepts and practices.	i. In keeping with LEED requirements, establish model schools that show the development of green building curricular integration best practices.	DGS UDC	Medium Long	DGS has established the DC Green Schools challenge "Sprint to Savings," in which approximately 25 schools participate. DGS also began the DCPS Recycles! Honor Roll, which recognizes excellent DCPS school recycling programs. UDC is a committee member of the Green Building Advisory Committee and partners with the committee to develop training opportunities for students and community members.	●●○○ ●○○○
	ii. Coordinated integration of HSA requirements as described in Section 501(Environment) at all District schools.	DGS	Medium	Established and expanded upon organics recycling and composting at schools. Facilitated discussion with the Healthy Schools and Youth Commission about indoor air quality and water testing.	●●○○
	iii. Next update of Local Wellness Policy to include greater emphasis on environmental sustainability and alignment with the DC Environmental Literacy Plan.	OSSE	Medium	Currently, local wellness policies (LWP) include guidance in the following environmental sustainability areas/indicators: school gardens, farm-to-school, local food sourcing, recycling, composting, and environmentally-friendly cleaning products. Looking into incorporating environmental literacy indicators into these guidelines as LEAs update their LWP for SY 15-16.	●○○○
	iv. Incorporate environmental literacy indicators into School Health Profiles.	OSSE	Medium	The 2014 and 2015 School Health Profiles included an environmental literacy section.	●●●●

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

B. Create and maintain outdoor schoolyard spaces to encourage and support outdoor learning experiences.	i. Increase the number of school gardens by 35%.	DCEEC, OSSE, DDOE, UDC	Medium	There are currently 107 active school (both DCPS and public charter) gardens, 49% of DC schools have active school gardens. SDC innovation funding has been provided to DCPS, OSSE, and DGS to create 3 new outdoor classroom and garden spaces by the 2016 school year. UDC provides support to Coolidge High School and other schools to increase the number of school gardens.	●●●○
	ii. Revise current DCPS Design Guidelines to include more information regarding parameters and best practices for schoolyard design to include outdoor learning environments (e.g., school gardens and outdoor classrooms) and community involvement.	DGS	Medium	Led by OSSE, produced design guidelines for outdoor classrooms now available at http://osse.dc.gov/sites/default/files/dc/sites/osse/publication/attachments/Design%20Guidelines%20for%20Outdoor%20Classrooms%20and%20School%20Gardens.pdf.	●●●●
C. Encourage schools to apply to the U.S. Green Ribbon Schools program.	i. Create and implement a DC Green Schools recognition program.	DDOE DCEEC	Long	OSSE and DGS have discussed the possibility of developing school badges that could support the ELP and Green Ribbon Schools applications. DCEEC has received funding to convene a series of meetings to determine next steps towards developing a sustainable schools certification as part of the Chesapeake Bay Agreement.	●○○○
	ii. Submit four qualified applicants to the U.S. Green Ribbon Schools recognition program.	OSSE	Long	Five schools in the District and one university have won the award.	●●○○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

<u>Objective 6</u>: Encourage collaboration and engagement across all sectors involved in implementing the DC Environmental Literacy Plan (ELP).

Goal	Action Items	Lead Organizations	Timeline	Progress Description	Progress Status
A. Cultivate and foster the knowledge and awareness necessary for the development and implementation of ELP at Local Education Agencies (LEAs).	i. Require administrators and guidance counselors to attend environmental literacy meetings and share information about resources.	DDOE	Medium	SDC Model Schools coordinators had meetings with administrators and other school staff. Will continue to attempt to meet with principals and instructional superintendents.	●○○○
	ii. Create mechanisms for informational exchange to encourage local, District-specific EE opportunities, such as web-based database and teacher's night.	DCEEC	On-going	Teachers Night at the US Botanic Garden remains an annual event. DCEEC is updating its web site, which will help disseminate information. OSSE also plans to create an environmental literacy section on its web site.	●●○○
B. Individual LEAs develop an Environmental Literacy Scope of Work and Implementation Plan based on framework template.	i. Explore integration of science/EL into DCPS School-Level Scorecards.	DCPS	Long		○○○○
	ii. Identify how the implementation plans can support U.S. Green Ribbon Schools applications.	OSSE	Short	Since EL is one of the pillars on the Green Ribbon Schools application, school-based implementation plans can be integrated into the District's application process.	●●○○
	iii. Develop LEA Guidelines and Training.	DDOE	Medium		○○○○
	iv. Create approval process for LEA plans.	OSSE	Long	LEA or school-based environmental literacy implementation plans were piloted at the eight Sustainable DC Model Schools. Based on the results and recommendations from that grant, available in September 2015, OSSE will be able to determine how to move forward.	●●○○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

C. Each District agency demonstrates commitment and ownership of an Environmental Literacy Scope of Work and Implementation Plan that supports schools.	i. Create implementation plans that are agency specific, city-wide, and collaborative in nature. ii. Agencies incorporate sections of ELP into missions, goals, strategic plans, and budget projections.	DDOE DPR UDC	Medium	The ELP was integrated into the following: • Sustainable DC Plan (District –wide initiative) • DDOE's Agency Performance Plans in FY14 and FY15 • DPR's master plan, PlayDC • UDC CAUSES Strategic Plan • SBOE's Green Practices Committee	●●●○
	iii. Develop Agency Guidelines/Training.	DDOE	Medium		○○○○
D. Create state infrastructure for implementation of the ELP.	i. Establish a permanent Environmental Literacy Council or Advisory Board.	OSSE	Medium	The Sustainable DC Omnibus Amendment Act of 2014 calls for OSSE to establish and convene an Environmental Literacy Advisory Committee. This will be done during summer 2015.	●○○○
	ii. Create a new EL coordinator (Full-Time) position within OSSE.	OSSE	Medium	The Sustainable DC Omnibus Amendment Act of 2014 created the position within OSSE, and the Environmental Literacy Coordinator was hired in May 2015.	●●●●
	iii. Designate staff within DDOE to support ELP efforts.	DDOE	Short	From July 2012-May 2015, DDOE had a point person on staff that convened meetings and facilitated implementation.	●●●○

Progress key:

○○○○ Not started ●○○○ Initiated ●●○○ Moderate progress ●●●○ Significant progress ●●●● Complete

APPENDIX B
Environmental Literacy Framework

Environmental Literacy Framework

for the District of Columbia

Environmental literacy is the development of knowledge, attitudes, and skills necessary to make informed decisions concerning the relationships between natural and urban systems.

An environmentally literate* person:

- can discuss and describe ecological and environmental systems and human impacts on these systems;
- engages in hands-on, outdoor learning experiences that involve discovery, inquiry, and problem solving;
- is able to question and analyze information pertaining to his or her surrounding environment; and
- has the capacity to take actions that respect, restore, protect, and sustain the health and well-being of human communities and environmental systems.

*as defined in the DC Environmental Literacy Plan adopted 2014

The Environmental Literacy Framework is a guide for schools that identifies the knowledge and skills District students need to become environmentally literate. The framework is outlined by **grade level** (Pre-K–Grade 8) or **science subject area** (high school) and aligned with the **Next Generation Science Standards (NGSS) Performance Expectations**. Included are **environmental contexts for learning** and **guiding questions** designed to scaffold content appropriate to each grade level. Based on themes taken from the Sustainable DC Plan, **sustainability initiatives** provide starting points for in-depth investigations and suggestions for extending learning beyond the classroom.

Grade Level	NGSS Performance Expectations	Environmental Contexts for Learning: Guiding Questions	Sustainability Initiatives
Pre-K	See the District of Columbia's Early Learning Standard 5.0: Scientific Inquiry*	**The World Around Us:** How can we use our five senses to learn about the environment?	**Nature:** Extend your classroom into the schoolyard.
K	K-PS3-1, K-PS3-2. K-LS1-1. K-ESS2-2, K-ESS3-1, K-ESS2-1, K-ESS3-2.	**Living Things:** What do plants and animals need to survive?	**Nature/Food:** Visit an urban garden or farm.
1	K-2-ETS-1-1. 1-LS1-2, 1-LS3-1. 1-ESS1-1, 1-ESS1-2.	**Patterns and Growth:** How do natural patterns affect living things? How do plants and animals change over the course of their lives?	**Nature:** Visit a zoo/ aquarium.
2	2-PS2-1, 2-PS2-2. 2-LS2-1, 2-LS2-2, 2-LS4-1. 2-ESS2-1, 2-ESS2-2, 2-ESS2-3.	**Changing Landscapes:** How do plants and animals support each other in our community? What forces change our local landscape?	**Water:** Explore a local waterway. **Built Environment:** Survey your neighborhood.
3	3-LS2-1, 3-LS3-2. 3-LS-4. 3-ESS2-1, 3-ESS2-2, 3-ESS3-1.	**Environmental Changes and Adaptations:** How have local changes in climate affected the environment? How do living things adapt to changes in the environment?	**Nature:** Travel to a rural farm. **Waste**: Tour a recycling center or landfill.
4	4-PS3-2, 4-PS3-4. 4-ESS3-1, 4-ESS3-2. 4-LS1-1, 4-LS1-2. 4-ESS1-1, 4-ESS2-1.	**Earth's Resources:** How do humans use natural resources? What processes influence the Earth's physical features?	**Waste:** Conduct a cafeteria waste audit. **Transportation:** Organize a walk/bike to school day.
5	5-PS3-1. 5-LS1-1, 5-LS2-1. 5-ESS2-1.	**Web of Life:** We are what we eat; how does energy cycle through the food web? How do the four spheres of the Earth's systems interact?	**Food/Water/Nature:** Engage in an overnight Meaningful Watershed Educational Experience.

*NGSS does not include standards for Pre-K.

Grade Level	NGSS Performance Expectations	Environmental Contexts for Learning: Guiding Questions	Sustainability Initiatives
6	MS-ESS3-1, MS-ESS3-2, MS-ESS3-3, MS-ESS3-4, MS- ESS3-5.	**Earth and Human Activity:** What are the consequences of human activity on air, land, and water over time?	**Built Environment:** Tour a green infrastructure site.
7	MS-LS2-1, MS-LS2-2, MS-LS2-3, MS-LS2-4, MS-LS2-5.	**Exploring Solutions:** How can we creatively address the environmental consequences of human activity?	**Nature/Water:** Improve local watershed health by reducing stormwater runoff at your school. **Food**: Define healthy-healthy eating and design a personal healthy-eating goal.
8	M5-PS3-1, M5-PS3-2, M5-PS3-3, M5-PS3-4, M5-PS3-5.	**Earth Works:** How do the choices you make affect the environment?	**Waste:** Analyze your carbon footprint and create a personal action plan to reduce it. **Energy:** Conduct a school-wide energy audit.

High School Subject Area	NGSS Performance Expectations	Environmental Contexts for Learning: Guiding Questions	Sustainability Initiatives
Earth Science	HS-ESS2-2, HS-ESS2-4. HS-ETS1-1. HS-ESS3-1, HS-ESS3-5. HS-ETS1-1.	**Our Changing Planet**: How do changes in climate occur, and how do they impact Earth's systems and human activity?	**Waste/Transportation:** Research the ways current transportation and waste systems impact climate.
Biology	HS-LS1-5, HS-LS1-6, HS-LS1-7. HS-LS2-1, HS-LS2-2, HS-LS2-7. HS-ETS1-2.	**Designing and Evaluating Solutions**: What are the ecological impacts of our food choices? How can humans reduce their environmental footprint?	**Food:** Design and evaluate a nutrition plan for a healthy adult that supports a sustainable local food system. **Nature:** Conduct a biodiversity transect.
Chemistry	HS-PS1-2, HS-PS1-3, HS-PS1-6. HS-ESS2-2, HS-ESS2-5, HS-ESS2-6. HS-ETS1-3.	**Collect and Analyze Data:** What evaluation can be made about the health of the District and it's residents based on a cross-section of data?	**Nature/Water:** Conduct water-, soil-, and air-quality tests in the District and analyze the results.
Physics	HS-PS3-3, HS-PS3-4. HS-ETS1-4.	**Alternative Energy:** What innovations will help meet future energy needs?	**Energy/Built Environment:** Compare the efficiency of existing power systems and design a carbon-neutral energy generation system.

The DC Healthy Schools Act of 2010 recognizes that the environment plays a central role in supporting learning outcomes and maintaining life-long, healthy behaviors. The Act called for the development of the DC Environmental Literacy Plan, a road map that lays the foundation for District-wide implementation and integration of environmental and sustainability education into the K-12 curriculum.

Informed by experienced District teachers, the Environmental Literacy Framework is the next step towards the implementation of the Environmental Literacy Plan. By providing place-based applications to science content, students will have a better understanding of the relevant health, economic, and environmental concerns of the local and global community and will be prepared for the opportunities and challenges of the 21st century.

The DC Environmental Literacy Plan and Framework are also the local components for regional and national environmental literacy efforts, such as the Chesapeake Bay Agreement and the No Child Left Inside Act of 2013. Additionally, these efforts complement the Sustainable DC Plan of 2013, which includes the goal of ensuring that all school-age children in the District are educated in sustainability and prepared for a changing green economy.



"Today's children will one day be responsible for making decisions that will shape the future health of the environment. To prepare them for such responsibilities, they need a sound environmental education as a foundation upon which to make those decisions."
- *Deborah Mitchell, senior editor for Environmental Protection*

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DCEEC DISTRICT OF COLUMBIA ENVIRONMENTAL EDUCATION CONSORTIUM

DISTRICT DEPARTMENT OF THE ENVIRONMENT

SUSTAIN ABILITY DC

ANACOSTIA WATERSHED SOCIETY

dcgreens

APPENDIX C

Environmental Literacy Summer Institute Agenda

CASE: CARNEGIE ACADEMY FOR SCIENCE EDUCATION

	Monday	Tuesday	Wednesday	Thursday	Friday
Session 1	Orientation (9am-10:30am) **Standards Deconstruction - P1:** Using the NGSS to plan for instruction.	**Standards Deconstruction - P2:** Determine acceptable evidence of learning—performance expectations.	BRING YOUR LUNCH Field Experience at Camp Fraser	**Standards Deconstruction - P3:** Learning an instructional model to plan for instruction • NGSS Lesson Study • 5 E Lesson Plan Framework	**Standards Deconstruction - P4:** Connecting to the Core with Science and Engineering
Session 2 Grade Level Teams	**Standards Deconstruction P1:** Using the NGSS to plan for instruction: Bundling Standards Collaborative Planning: • Grade level teams will confirm unit performance expectation. • Grade level teams will receive an overview of the unit plan template. • Teams will determine essential questions address planning questions.	Collaborative Planning: • EE Performance Tasks • Identify the Performance Task(s) and complete the GRASPS document. • Identify currently used assessment items and (SR and Constructed Response Items)	Session with Erica Harper of LiveIt-LearnIt!	Collaborative Planning: • Determine how the unit lessons will be divided (instructional sequence). • Outline lesson objectives. • Complete the instructional sequence portion of the unit planning document.	Collaborative Planning: • Apply lessons learned around ELA/Math to Unit Plan. • Identify aligned ELA/Math activities and associated materials and resources.

	Monday	Tuesday	Wednesday	Thursday	Friday
Outcome	Define: • essential questions and • prior understandings.	• EE Performance Tasks • Translating summative assessments to performance tasks.	Community-Building Soak-time for NGSS Deconstruction	• Translating Lessons and Units. • Identify currently used assessment items and (SR and Constructed Response Items)	• CCSS- ELA Alignment of Unit Plan and associated resources. • Identify currently used assessment items and (SR and Constructed Response Items)
Materials	Chart paper Index cards Post-Its Markers Speakers/Laptop/ projector Copies of: • 5th grade NGSS Standard • NRC essential questions for HS and MS. • The progressions • The ELF • Part 1 of the Unit Plan	Chart Paper Post-Its Markers Speakers/Laptop/ Projector or Copies of : • ELF • Part 2 of the Unit Plan • Planning Questions	**PLEASE...** **BRING YOUR LUNCH** **and, a re-usable Water Bottle** Wear your **Sustainability DC T-Shirt** Wear your **Carnegie Cap**	Chart Paper Post-Its Markers Speakers/Laptop/Projector Copies of: • 5-E Framework from Translating the NGSS • Parts 3 & 4 of the Unit Plan • 5-E Template • NGSS Lesson Study Worksheet. • Planning Questions	Chart Paper Post-Its Markers Speakers/Laptop/Projector Copies of: • Part 5 of the Unit Plan • Common Core Alignment Venn Diagram • Planning Questions

ELF: Environmental Literacy Framework (inside the front Cover of your Binder), selected by Model Project Teachers of DC with the DCEEC and DDOE from the NGSS
NGSS: Next Generation Science Standards
NRC: National Research Council: Producers of the Framework for K-12 Science and Engineering Education with Teachers and Scientists

CARNEGIE SCIENCE | CASE: CARNEGIE ACADEMY FOR SCIENCE EDUCATION

Field Trips

	Monday July 14	Tuesday July 15	Wednesday July 16	Thursday July 17	Friday July 18
Session 1	**Context** (9am-9:30am) Rebecca Davis: **DCEEC** Background on this ELSI Program **CLIMATE CHANGE** Judy Braus: **NAAEE** Shannon Sprague: **NOAA** Jen Desimone: **Metro Washington Council of Governments**	**-- Lunch provided -- We harvest it!** **LAND USE** **Farm to Classroom** Field Trips to: **Rocklands Farm Montevideo Rd, Poolesville MD** Anna Glenn **Washington Youth Garden National Arboretum** Nadia Mercer and Charla Wanta Damien Ossi and Lindsay Rohrbaugh, DDOE Tanya Zastrow, National Arboretum	BRING YOUR LUNCH **WATER** **Anacostia Park AREC** with On the Water with Chris Lemieux and Paul Ryberg Anacostia Watershed Society DC's Watersheds Josh Burch **Fish and Wildlife Biologist, DDOE** **Modeling Water's actions on rivers** **Trinh (Patricia) Doan, DDOE** **Theresa Rodriguez, AREC** **and** Nancy Rybicki, **US Geological Survey** and **Earthforce**	BRING YOUR LUNCH **The BUILT ENVIRONMENT** 9:00-9:40 – Presentation by **DC Consumer and Regulatory Affairs** Dave Epley 9:40-9:50 - Presentation by **US Green Building Council** Hannah Debelius 10:00 - Bus departs from Carnegie Institution of Washington to go to Canal Park	BRING YOUR LUNCH Mapping 9:00 Introductions (Toby/Grace) Eva Stern: **OCTO DC ATLAS/GIS** Elena Takaki: **National Geographic/Fieldscope** 9:10-40 Rope DC mapping exercise (Elena) in Rotunda 9:40- 10:00 Layers & Transparencies (Eva) in Ballroom Computer Lab/CASE Library 10:00-10:45 Field Scope (Elena) 10: 45- 11:30 Atlas (Eva) Lunch Bus departs 12:30 NMAI meet Ed Schupman at SOUTH Entrance
Session 2	Chris Field: **Carnegie's Department of Global Ecology** **Lunch**			10:30 – 11:15 - **Tour of 201 I St SE** Mark Chambers **Tour of Canal Park**	**CITY as a CLASSROOM** Smithsonian Institution and USBG Elementary grades: with Lee Coykendall, **US Botanical Garden**

CASE: CARNEGIE ACADEMY FOR SCIENCE EDUCATION

Field Trips

Session 2	Chris Field: **Carnegie's Department of Global Ecology** **Lunch**		Intern, Genora Givens	12:00 – 1pm – Lunch and transit to National Building Museum **National Building Museum**	Middle School : with Gale Robertson and Nicole Webster, **Q'rius, National Museum of Natural History, SI** High: With Edwin Schupman, **National Museum of the American Indian, SI** (Meet at SOUTH Entrance - Independance Ave)
Session 3	**Marian Koshland Science Museum: Earth Lab Climate Change 525 E St, NW with Kitty Lou Smith**			1:00 PM – **Green School Initiatives** from DC Department of General Services: Beth Gingold 1:30-2:30 – Green Community Toolkit presentation Tim Wright Timothy Wright: - **Green Community Toolkit** 2:30 – bus back to Carnegie (or teachers go to Designing for Disaster exhibit?)	

CASE: CARNEGIE ACADEMY FOR SCIENCE EDUCATION

Field Trips

	Monday July 14	Tuesday July 15	Wednesday July 16	Thursday July 17	Friday July 18
Materials	Projector	Teachers! Please bring hat/t-shirt/sunblock/insect repellent LUNCH PROVIDED	Teachers! Please bring hat/t-shirt/sunblock/insect repellent Water test kits (Genora will bring from Earthforce) Vernier LabQuest and probes	Projector and computer	Computer Lab DC Atlas Plus App Transparency handouts and grids Rope Fieldscope App Data from water testing on the Anacostia
A	• Become familiar with Field Excursions that you can relate to your Unit plans • **Revise** your Unit plans to incorporate one of these field trips (Camp Fraser, Koshland, Farms, Anacostia, Building, Smithsonian/USBG) • **Recommend** additional sites/field trips that you think would be helpful for you and colleagues • **Request** additional sites that you think will be helpful for your Unit plan				

ELF: Environmental Literacy Framework (inside the front Cover of your Binder), selected by Model Project Teachers of DC with the DCEEC and DDOE from the NGSS

NGSS: Next Generation Science Standards

NRC: National Research Council: Producers of the Framework for K-12 Science and Engineering Education with Teachers and Scientists

OCTO: DC's Office of the Chief Technology Officer

ASLA: American Society of Landscape Architects

DCRA: DC Department of Regulatory and Consumer Affairs

NGS: National Geographic Society

CARNEGIE SCIENCE | CASE: CARNEGIE ACADEMY FOR SCIENCE EDUCATION ASSESSMENT

	Monday	Tuesday	Wednesday	Thursday	Friday
Session 1	• Intro to Assessment • Teaching Comparison: 5E Instruction Intro	• 5- E Framework • Concept mapping your 5E learning sequence.	Creating Rubrics	Performance Assessments: Constructed Response and Appendix M of NGSS	Performance Assessments: Critical Review-Connecting Plans and Assessments PLEASE WEAR YOUR T-Shirt for a Group Picture
Session 2 Grade Level Teams	• **5E** – Bybee rationale paper • **5E** matching activity • **Connecting to the Performance Task:** Developing evidence of student learning.	**Collaborative Planning:** Developing an Instructional Sequence for Learning (**5E**)	**Collaborative Planning:** Rubric design	**Collaborative Planning:** Refining the Assessment and Connecting to the Core.	**Review and Debrief of Next Steps** **August:** Completed unit plan submitted by Aug 12 for round 1 of feedback. **September:** Final draft of unit plan submitted for Learn DC.
Outcomes	Teams will determine the evidence of student learning that are associated with performance task.	Developing an Instructional Sequence for Learning Determine acceptable evidence of learning—performance expectations.	Develop a rubric for the grade-level performance tasks.	Refine 2 constructed response prompts for your performance expectation.	Complete the instructional sequence.

APPENDIX D
Environmental Literacy Resource Directory

Environmental Literacy Resource Directory

Icon Legend: Energy, Nature, Water, Food, Waste, Transportation/Air Quality, Climate Change, Built Environment, Money

Organizations	Sustainability Initiatives	Links	Field Experiences	School-based Presentations	Curricular Resources	PD	Community Service
21st Century School Fund		www.21csf.org		x			x
Alice Ferguson Foundation		www.ferguson foundation.org	x		x	x	x
Anacostia Watershed Society		www.anacostiaws.org	x	x		x	x
Arcadia		www.arcadiafood.org	x	x	x		
Audubon Naturalist Society		www.anshome.org		x		x	x
Casey Trees		www.caseytrees.org		x	x		x
Chesapeake Bay Foundation		www.cbf.org	x				
City Blossoms		www.cityblossoms.org			x		
Clean Air Partners- MW Council of Governments		www.mwcog.org		x	x	x	
DC Department of Parks and Recreation		www.dpr.dc.gov	x		x		x
DC Greens		www.dcgreens.org				x	
DC Greenworks		www.dcgreenworks.org	x	x			x
DC Historic Preservation Office – Archaeology		www.dc.gov/dc/planning/historic+preservation	x	x	x	x	x
DC Office of the State Superintendent of Educ.		www.osse.dc.gov	x				
DC Water		www.dcwater.com	x	x	x	x	x
District Department of the Environment		www.green.dc.gov			x		
Earth Day Network		www.earthday.org		x	x		
Earth Force		www.eartforce.org	x	x	x	x	
Environmental Concern		www.wetland.org	x	x	x	x	
EnvironMentors		www.ncseonline.org/program/environmentors	x	x	x		

Environmental Literacy Resource Directory

Icon Legend: Energy, Nature, Water, Food, Waste, Transportation/Air Quality, Climate Change, Built Environment, Money

Organizations	Sustainability Initiatives	Links	Field Experiences	School-based Presentations	Curricular Resources	PD	Community Service
George Washington Carver Outdoor School		www.gwcods.org	x		x		x
Green Living Project		www.greenliving project.com		x			
Groundwork Anacostia River DC		www.groundwork dc.org	x	x	x	x	x
Kenilworth Aquatic Gardens		www.nps.gov/keaq	x				x
Kid Power Inc.		www.kidpowerdc. org		x	x		x
Live It Learn It		www.liveitlearnit. org	x	x	x	x	
Living Classrooms of the National Capital Region		www.livingclass rooms.org	x	x	x		x
National Environmental Education Foundation		www.neefusa.org			x	x	
National Geographic Society		www.national geographic.com	x	x	x	x	
National Oceanic and Atmospheric Admin. (NOAA)		www.noaa.gov	x	x	x	x	
National Park Service		www.nps.gov	x	x	x	x	x
Natural Partners		www.npartners.org	x	x	x	x	x
Project Learning Tree		www.plt.org			x	x	
Saturday Environmental Academy		www.environment alacademy.us	x				x
Student Conservation Association		www.thesca.org	x	x		x	x
U.S. Forest Service		www.fs.fed.us			x		
UDC Master Gardener Program		www.udc.edu		x	x		
Washington Youth Garden		www.washington youthgarden.org	x	x	x	x	

DISTRICT DEPARTMENT OF THE ENVIRONMENT

This resource list is adapted from Appendix F of the DC Environmental Literacy Plan (2012). For the complete resource lists, go to http://ddoe.dc.gov/service/dc-environmental-literacy-plan.

DCEEC DISTRICT OF COLUMBIA ENVIRONMENTAL EDUCATION CONSORTIUM

APPENDIX E
Sample Sustainable DC Model Elementary Schools Implementation Plans

	DC Bilingual PCS	Janney ES	Washington Yu Ying PCS
PreK-3	Five Senses Unit School/Community Walks	Sensory Gardening Composting	Edible garden harvest and planting Field trip to Rocklands Farm Studied living/nonliving things
PreK-4	Zoo/Farm trip Books Gardening lessons	Trip to Turtle Park Community Gardens (insects/bee hives, gardening)	Pollinators and bee hives Field trip to Franciscan Monastery
K	Plants and animals (crabs/fish; aquatic/non aquatic plants/frogs) Trip to Common Good City Farm	Peter Rabbit Gardening Worm bin composting Trip to Rocklands Farm	Chicken and tadpole hatching projects Grow herbs for market unit
1st	Monarch butterflies Field trip to Smithsonian Gardens Butterfly Habitat	Chicken hatching Ancient civilization garden Field trip to Arcadia Farm and US Botanic Garden	Habitats and care of animals Trip to National Zoo Ancient civilization garden design and planting
2nd	Plants and animals support the community Field trip to Common Good City Farm	Pollinator Garden Beekeeping Trip to Kenilworth Aquatic Gardens, Montgomery County Recycling Center, and Brookside Butterfly Gardens	Pond ecosystem Water quality testing of nature center pond Grew native rice and transplanted into pond
3rd	Living things adapt to environmental changes Field trip to Common Good City Farm	Ecosystem changes Trip to Audubon Naturalist Society's Woodend Sanctuary Rock Creek Oak Tree	Climate Change Film Project Weather station Yangtze River env project

		Restoration project – tree planting	Tree Planting Waste audit Environmental signage
4th	Food lessons Field trips to Smithsonian Environmental Research Center and Common Good City Farm	Landforms study Energy and Cafeteria Waste audit studies Chesapeake Bay Foundation boat trip Earth Day clean up	Erosion study School nature center design project Renewable Energy unit Home energy audit
5th	Energy and the food web Trip to Rocklands Farm	Green House/interaction of Earth's spheres School Garden Market Overnight trip to Echo Hill Outdoor Center Climate Change Project Earth Day clean up	Potable water – rain barrels Natural filtration of stormwater Visit with Anacostia Watershed Society Strawberry Farm study (US/China) Smithsonian Challenge

APPENDIX F

Schools that Received Environmental Education Programming, 2014-15 School Year

SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
District of Columbia Public Schools (DCPS)										
DCPS Alternative Schools										
C.H.O.I.C.E. Academy at Emery										
Incarcerated Youth Program, Correctional Detention Facility	**1**	**1**								
Luke C. Moore HS	**1**	**1**								1
Washington Metropolitan HS (formerly YEA)	**1**	**1**								1
Youth Services Center										
DCPS Alternative Schools Total	***3***	***3***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***2***
DCPS Special Education Schools										
Mamie D. Lee School	**1**							1		
Sharpe Health School										
DCPS Special Education Schools Total	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***1***	***0***	***0***
DCPS Schools										
Aiton ES	**1**				1				1	
Amidon-Bowen ES	**1**				1					
Anacostia HS	**1**	**1**							1	
Ballou HS	**1**	**1**								1
Ballou STAY	**1**	**1**								
Bancroft ES	**1**				1	1	1	1		
Barnard ES	**1**					1	1			
Beers ES	**1**						1		1	1
Benjamin Banneker HS	**1**	**1**								1
Brent ES	**1**						1			
Brightwood EC	**1**						1			
Brookland EC at Bunker Hill										
Browne EC	**1**				1				1	
Bruce Monroe ES at Park View	**1**						1	1	1	1
Burroughs EC	**1**		1				1	1		
Burrville ES	**1**				1			1		
C.W. Harris ES	**1**						1	1		
Capitol Hill Montessori at Logan	**1**					1	1	1		
Cardozo EC	**1**	**1**						1		
Cleveland ES	**1**						1	1	1	
Columbia Heights EC (CHEC)	**1**	**1**				1	1	1		
Coolidge HS	**1**	**1**								
Deal MS	**1**						1	1		

Some experiences are one-day only (such as a presentation or field trip), others are multi-day programs.
These programs DO NOT include teacher professional development or other projects that are teacher-centered.

SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
Drew ES	**1**				1		1			
Duke Ellington School of the Arts	**1**	**1**								1
Dunbar HS	**1**	**1**						1		
Eastern HS	**1**	**1**		1			1			1
Eaton ES	**1**				1	1	1			
Eliot-Hine MS										
Garfield ES	**1**				1			1	1	
Garrison ES	**1**						1			
H.D. Cooke ES	**1**		1		1		1	1		
H.D. Woodson HS	**1**	**1**								1
Hardy MS	**1**			1			1		1	
Hart MS	**1**		1							
Hearst ES										
Hendley ES	**1**				1		1			
Houston ES	**1**				1					
Hyde-Addison ES	**1**						1	1		
J.O. Wilson ES	**1**						1	1		
Janney ES	**1**			1			1	1	1	
Jefferson Middle School Academy	**1**								1	1
Johnson MS										
Kelly Miller MS	**1**							1		
Ketcham ES	**1**				1					
Key ES	**1**						1	1	1	1
Kimball ES	**1**				1		1	1	1	
King ES	**1**				1					
Kramer MS										
Lafayette ES	**1**					1	1	1		
Langdon EC	**1**				1			1	1	1
Langley ES	**1**				1		1		1	
LaSalle Backus EC	**1**		1		1					
Leckie ES	**1**				1		1	1		
Ludlow-Taylor ES	**1**						1			
Malcolm X ES at Green	**1**				1					
Mann ES	**1**						1	1		
Marie Reed ES	**1**				1		1			
Maury ES	**1**						1	1	1	1

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SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
McKinley Middle School										
McKinley Technology HS	**1**	**1**						1	1	
Miner ES	**1**				1		1		1	
Moten ES	**1**							1		
Murch ES	**1**				1		1			
Nalle ES	**1**				1		1			
Noyes EC										
Orr ES	**1**				1		1	1		
Oyster-Adams Bilingual School	**1**		1		1					
Patterson ES	**1**				1					
Payne ES	**1**				1					
Peabody ES	**1**						1	1		
Phelps Architecture Construction and Engineering HS	**1**	**1**						1	1	1
Plummer ES	**1**									1
Powell ES	**1**					1	1	1	1	
Randle Highlands ES	**1**				1		1			
Raymond EC										
Roosevelt HS at MacFarland	**1**	**1**						1	1	
Roosevelt STAY at MacFarland	**1**	**1**								
Ross ES	**1**							1		
Savoy ES	**1**				1					
School Within School at Goding	**1**					1	1	1		1
School Without Walls at Francis Stevens	**1**		1				1	1	1	1
School Without Walls HS	**1**	**1**							1	1
Seaton ES	**1**						1	1		
Shepherd ES										
Simon ES	**1**				1					
Smothers ES	**1**						1			
Sousa MS	**1**		1	1			1	1		
Stanton ES	**1**				1			1		1
Stoddert ES	**1**				1		1	1		
Stuart-Hobson MS	**1**							1		
Takoma EC	**1**		1				1	1		
Thomas ES	**1**							1		
Thomson ES	**1**						1	1		
Truesdell EC	**1**					1				

Some experiences are one-day only (such as a presentation or field trip), others are multi-day programs.
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SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
Tubman ES	**1**				1		1	1	1	
Turner ES	**1**				1				1	
Tyler ES	**1**					1	1	1		
Walker-Jones EC	**1**				1		1			
Watkins ES	**1**					1	1			
West EC	**1**						1			
Wheatley EC										
Whittier EC	**1**								1	
Wilson HS	**1**	**1**					1	1		
DCPS Schools Subtotal	***94***	***17***	***8***	***4***	***35***	***11***	***52***	***45***	***25***	***17***
DCPS Overall TOTAL	**98**	**20**	**8**	**4**	**35**	**11**	**52**	**46**	**25**	**19**

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SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
Public Charter Schools										
Public Charter Alternative Schools										
Latin American Youth Center Career Academy PCS										
Maya Angelou Evans Campus PCS	**1**									1
The Next Step PCS	**1**									1
Youthbuild PCS										
Public Charter Alternative Schools Total	***2***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***2***
Public Charter Special Education Schools										
St. Coletta Special Education PCS	**1**						1			1
Public Charter Special Education Schools Total	***1***	***0***	***0***	***0***	***0***	***0***	***1***	***0***	***0***	***1***
Public Charter Schools										
Achievement Preparatory PCS - Elementary										
Achievement Preparatory PCS - Middle School	**1**				1					
AppleTree Early Learning Center PCS - Columbia Heights										
AppleTree Early Learning Center PCS - Lincoln Park										
AppleTree Early Learning Center PCS - Oklahoma										
AppleTree Early Learning PCS - Southeast										
AppleTree Early Learning Center PCS - Southwest										
Basis DC PCS	**1**									1
Bridges PCS	**1**						1			
Briya PCS										
Capital City PCS - High School	**1**	**1**					1			1
Capital City PCS - Lower School	**1**						1			
Capital City PCS - Middle School	**1**				1		1			
Cedar Tree Academy PCS										
Center City PCS - Brightwood	**1**				1					
Center City PCS - Capitol Hill										
Center City PCS - Congress Heights										

Some experiences are one-day only (such as a presentation or field trip), others are multi-day programs.
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SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
Center City PCS - Petworth										
Center City PCS - Shaw										
Center City PCS - Trinidad										
Cesar Chavez PCS for Public Policy - Capitol Hill										
Cesar Chavez PCS for Public Policy - Chavez Prep	**1**						1			
Cesar Chavez PCS for Public Policy - Parkside MS										
Cesar Chavez PCS for Public Policy - Parkside HS										
Community Academy PCS - Amos I	**1**				1					
Community Academy PCS - Amos II										
Community Academy PCS - Amos 5	**1**				1					
Community Academy PCS - CAPCS Online										
Community College Preparatory Academy PCS										
Creative Minds International PCS	**1**					1				
DC Bilingual PCS	**1**			1		1	1			1
DC Preparatory PCS - Benning Elementary	**1**						1			
DC Preparatory PCS - Benning Middle	**1**						1			
DC Preparatory PCS - Edgewood Elementary	**1**						1			
DC Preparatory PCS - Edgewood Middle										
DC Scholars PCS										
Democracy Prep PCS-Congress Heights	**1**				1					
District of Columbia International School										
E.L. Haynes PCS - Georgia Avenue	**1**						1			1
E.L. Haynes PCS - Kansas Avenue (Elementary School)	**1**			1		1	1			1
E.L. Haynes PCS - Kansas Avenue (High School)	**1**	**1**				1	1			1
Eagle Academy PCS - New Jersey Avenue										
Eagle Academy PCS - The Eagle Center at McGogney										
Early Childhood Academy PCS										

Some experiences are one-day only (such as a presentation or field trip), others are multi-day programs.
These programs DO NOT include teacher professional development or other projects that are teacher-centered.

SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
Elsie Whitlow Stokes Community Freedom PCS	**1**						1			
Excel Academy PCS-DREAM										
Excel Academy PCS-LEAD	**1**				1	1	1			
Friendship PCS-Blow-Pierce Elementary	**1**						1			1
Friendship PCS - Blow-Pierce Middle	**1**				1		1			1
Friendship PCS-Chamberlain Elementary										
Friendship PCS - Chamberlain Middle	**1**				1					1
Friendship PCS - SouthEast Elementary Academy										
Friendship PCS - Technology Preparatory Academy	**1**	**1**					1			1

Some experiences are one-day only (such as a presentation or field trip), others are multi-day programs.
These programs DO NOT include teacher professional development or other projects that are teacher-centered.

SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
Friendship PCS - Woodridge Elementary	**1**						1			
Friendship PCS - Woodridge Middle	**1**						1			1
Friendship PCS - Woodson Collegiate Academy	**1**	**1**								1
Harmony DC PCS-School of Excellence										
Hope Community PCS-Lamond	**1**						1			
Hope Community PCS-Tolson	**1**									1
Hospitality High PCS	**1**	**1**								1
Howard University Middle School of Math and Science PCS	**1**									1
IDEA (Intergrated Design Electronics Academcy) PCS	**1**	**1**								1
Ideal Academy PCS - North Capitol Street Campus ES										
Ingenuity Prep PCS	**1**					1				
Inspired Teaching Demonstration PCS	**1**				1					
KIPP DC - AIM Academy PCS										
KIPP DC - Arts and Technology Academy PCS										
KIPP DC - College Prepartory PCS	**1**	**1**								1
KIPP DC - Connect Academy										
KIPP DC - Discover Academy PCS										
KIPP DC - Grow Academy PCS										
KIPP DC - Heights Academy PCS										
KIPP DC - KEY Academy PCS										
KIPP DC - Lead Academy										
KIPP DC - LEAP Academy PCS										
KIPP DC - Northeast Academy PCS										
KIPP DC - Quest PCS										
KIPP DC - Promise Academy PCS										
KIPP DC - Spring Academy										
KIPP DC - WILL Academy PCS										
Latin American Montessori Bilingual (LAMB) PCS	**1**					1				1
Latin American Youth Center Career Academy PCS	**1**					1				
Lee Montessori PCS										
Mary McLeod Bethune Day Academy PCS Slowe Campus	**1**						1			1

Some experiences are one-day only (such as a presentation or field trip), others are multi-day programs.
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SCHOOL	Select Environmental Education Student Programs									
Program Name	Env Ed Program (School Year 14-15)	HS Environmental Science Course (DCPS and School Health Profile)	Anacostia Environmental Youth Summit (DDOE-WPD/DCEEC)	Sustainable DC Model Schools (DDOE/DCEEC)	5th Grade Overnight Meaningful Watershed Educational Experience (DDOE-WPD)	Farm Field Trip Grants (OSSE)	Active School Gardens (Compiled by OSSE)	DCPS Recycling Honor Roll (DGS)	DC Green Schools Challenge Sprint to Savings (DGS)	Reported in School Health Profile (Compiled by OSSE)
Maya Angelou PCS - Evans High School	**1**	**1**								
Meridian PCS										
Mundo Verde Bilingual PCS										
National Collegiate Prep PCS HS	**1**	**1**								1
Options PCS										
Paul PCS - International High School	**1**					1	1			
Paul PCS - Middle School	**1**						1			
Perry Street Prep PCS										
Potomac Preparatory PCS										
Richard Wright PCS for Journalism and Media Arts	**1**	**1**								1
Roots PCS	**1**				1		1			
SEED (School for Educational Evolution and Development) PCS	**1**						1	1		
Sela PCS	**1**						1			
Shining Stars Montessori Academy PCS										
Somerset Prep Academy PCS										
The Next Step/El Proximo Paso PCS										
Thurgood Marshall Academy PCS	**1**	**1**		1		1	1			1
Tree of Life Community PCS	**1**						1			
Two Rivers PCS	**1**				1	1				1
Washington Latin PCS - Middle School	**1**		1				1			
Washington Latin PCS - Upper School	**1**	**1**					1			
Washington Math Science Tech PCS HS										
Washington Yu Ying PCS	**1**			1		1	1			1
William E. Doar, Jr PCS for the Performing Arts										
Public Charter Schools Subtotal	***53***	***12***	***1***	***4***	***12***	***12***	***31***	***1***	***0***	***24***
PUBLIC CHARTER OVERALL TOTAL	**56**	**12**	**1**	**4**	**12**	**12**	**32**	**1**	**0**	**27**

DCPS	**98**	**20**	**8**	**4**	**35**	**11**	**52**	**46**	**25**	**19**
PUBLIC CHARTER	**56**	**12**	**1**	**4**	**12**	**12**	**32**	**1**	**0**	**27**
STATE TOTAL	**154**	**32**	**9**	**8**	**47**	**23**	**84**	**47**	**25**	**46**

Some experiences are one-day only (such as a presentation or field trip), others are multi-day programs.
These programs DO NOT include teacher professional development or other projects that are teacher-centered.

NGSS Unit Plan

Title of Unit	Our Changing Planet (Global Climate Change)	**Grade Level**	9th
Curricular Theme (s)	*Environmental Literacy Connection*	**Time Frame**	8 weeks
Essential Questions to be Addressed	How do changes in climate occur, and how do they impact Earth's systems? How do changes in climate influence human activity, and how do we develop analyze the criteria and constraints for solutions?		
Background Information and Context			

NGSS Performance Expectations:

HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.][*Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.*]

HS-ESS2-2. Analyze geosciences data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

HS-ESS3-5. Analyze geosciences data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [*Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.*]

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Common Core Standards (CCSS ELA and CCSS Math)

ELA/Literacy

- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS3-1, HS-ESS3-5, HS-ESS2-2)
- RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (HS-ESS3-5, HS-ESS2-2)
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ESS3-5)
- WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS3-1)
- SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-ESS2-4)

Mathematics

- MP.2 Reason abstractly and quantitatively. (HS-ESS3-1, HS-ESS3-5, HS-ESS2-2, HS-ESS2-4)
- MP.4 Model with mathematics. (HS-ESS2-4)
- HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS3-1, HS-ESS3-5, HS-ESS2-2, HS-ESS2-4)
- HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS3-1, HS-ESS3-5, HS-ESS2-4)
- HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS3-1, HS-ESS3-5, HS-ESS2-2, HS-ESS2-4)

Prior Understandings

From Middle School:

- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)
- Human activities, such as the release of greenhouse gases from burning of fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)
- Greenhouse Effect should be use as an analogy rather than a literal description.
- Emphasis should be placed on climate versus weather.
- Earth's climate is controlled BOTH by the atmosphere circulation AND ocean circulation, not just the atmosphere

Community Connection: Sustainability Initiative
• Koshland Museum • Canal Park and National Building Museum • Smithsonian Institution Museum of Natural History • NOAA

Disciplinary Core Ideas: (Students will know …)

ESS1.B: Earth and the Solar System

Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. (secondary to HS-ESS2-4)

ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-1, HS-ESS2-2)
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)

ESS2.D: Weather and Climate

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-2, HS-ESS2-4)
- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-4)

ESS3.A: Natural Resources

- Resource availability has guided the development of human society. (HS-ESS3-1)

ESS3.D: Global Climate Change

- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5)

Science and Engineering Practices: (Students will …)

Analyze and Interpret Data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3-5)
- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-ESS2-2)

Construct Explanations and Design Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1)

Develop and Use Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- Use a model to provide mechanistic accounts of phenomena. (HS-ESS2-4)

Scientific Investigations Use a Variety of Methods

- Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5)
- New technologies advance scientific knowledge. (HS-ESS3-5)

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based on empirical evidence. (HS-ESS3-5)
- Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS2-4, HS-ESS3-5)

Cross Cutting Concepts (Students will connect …)

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS2-4, HS-ESS3-1)

Stability and Change

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3, HS-ESS3-5)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS2-2)

Performance Task *(should be directly related to performance expectations)*
Performance Task Description: *(Note: The performance task should include elements from the three dimensions from the NGSS (both knowing and doing)* Students will, in groups, choose a region of the world that has been or will be impacted by climate change and develop a presentation to share at a ***Global Climate Change Summit*** for their community. Each group will choose a different region of the world (some of which are global countries/cities/regions and some of which are local US states/cities/regions) from a given list on which to focus their research.

Goal	Students will analyze data gathered from research to construct an explanation about how energy flow has resulted in climate change in their region as a result of changes in Earth's systems, how it has influenced human activity, and what future impacts it will have on the region.
Role	Student Scientist and Region Specialist: Students will need to work like Scientists to analyze data and use evidence to support their understanding of the general processes by which climate change occurs and its impact. Students will also need to become Region Specialists who deeply understand how climate change has influenced human activity and what future impacts it will have on their specific region.
Audience	Outreach event (***Global Climate Change Summit***) to the community (parents, siblings, peers, community members, etc) and/or elementary school students in their classes
Situation	The challenge involves a focus on a specific region and predicting future impacts of climate change for that research. (For example, increasing desertification in Western US and the Middle Easter, coral reef destruction in Australia's Great Barrier Reef, and rising sea level's effect on business in South Beach, FL.)
Product/ Performance	Students will develop a summit presentation using data and models to share their research and solution criteria and constraints at the Global Climate Change Summit.
Standards and Criteria for Success	Student presentations need to include data analysis, models, feedback mechanisms, climate changes as a result of energy flow into and out of Earth's systems, influences on human activity, evidence-based forecast of rate of climate change, future impacts to Earth's systems, and constraints and criteria for solutions that account for societal needs and wants.
Other Evidence	*See Rubric file.

Grouping Strategies	Materials and Equipment Required
Groups of 2 to 4	Access to computers with Internet for current research and data gathering List of regions for students to select from (some international countries/cities/regions and some of local US states/cities/regions. Each region should include key vocabulary, concepts, and suggested impacts for students to examine; for example, maple syrup production changes in NE USA, polar bear habitats in the Arctic, fresh water access and cyclone patterns in Bangladesh). For the Greenhouse Effect laboratory investigation: 50 ml beakers, thermometers, Saran wrap, incandescent or heat lamps

Learning Plan / Instructional Sequence

GLOBAL CLIMATE CHANGE—9TH EARTH SCIENCE
Part 1 – Effects of Global Climate Change
Part 2 – Climate vs. Weather
Part 3 – Cycles of Climate Change Over Time (Natural and Human)
Part 4 – Greenhouse Effect

Part 1 – Effects of Global Climate Change

1. **5E Stage: Engage**

DCI: HS-ESS3.1A, ESS3.5D
Scientific Practices: Data Analysis
Cross Cutting Concept: Cause and Effect
Narrative: Students complete a Gallery Walk (pictures from around the world that demonstrate the effects of climate change are posted around the room), make observations about what they see happening and inferences about why they think it is happening. After the Gallery Walk, students share their observations and inferences as a class and begin to compile a list on a poster of the effects of climate change around the world (students update this list throughout the unit). Students will note some of the effects of climate change and the teacher will be able to elicit students' previous understanding of the cause(s) of these effects and of climate change.

2. **5E Stage: Explore**

DCI: HS-ESS3.1A, ESS3.5D Global Climate Change
Scientific Practices:
Cross Cutting Concept: Cause and Effect
Narrative: Students will watch the first 5-10 minutes of a video of effects of Climate Change in Bangladesh and record their observations and thoughts. As a class, they discuss what was reported as happening there and how it compares to their developing list of climate impacts.
http://www.pbs.org/now/shows/543/index.html

3. 5E Stage: Explain

DCI: HS-ESS3.1A, ESS3.5D Global Climate Change
Scientific Practices:
Cross Cutting Concept: Cause and Effect
Narrative: Teacher will provide an overview of the Unit Performance Task. Students, in groups, will each choose a region of the world that has been or will be impacted by climate change and develop a presentation to share at a Global Climate Change Summit for their community. Each group will choose a different region of the world on which to focus their research. Teacher generates a list of international countries/ cities/regions and local US states/cities/regions.

- A series of fact sheets of different regions around the world will be provided, each containing 2-4 facts, pictures, and clues about how climate change is affecting that region. Each group will select a different fact sheet that they're interested in and the teacher will reveal and assign that region of the world to them.
- Teacher will model with students how to analyze data and allow students time to practice with data sets of climate change evidence from their chosen region [See Resources file for links to datasets.]
- Students will set up a poster/Google Doc to use throughout the quarter to record their findings about their specific region (to reference during their performance task at the end of the quarter). Students should record the effects of climate change they collect on this document starting first thing, including data and source information/citations according to the school's choice of format (MLA/APA, etc. – check with the teachers of English/Literature).
- Students will then conduct their own research on their region to gather more data and evidence of the effects of climate change in their region and record these findings on their document.

4. 5E Stage: Elaborate

DCI: HS-ESS3.1A, ESS3.5D Global Climate Change
Scientific Practices: Data Analysis and Explanation with Evidence
Cross Cutting Concept: Cause and Effect
Narrative: Students will share their findings about the effects of climate change on their region with the class and make comparisons between the different regions.

- As a class, they will continue to update the list of the effects of climate change around the world on the poster.
- Groups that find similar effects could collaborate to help each other understand effects that are similar in different regions.

5. 5E Stage: Evaluate

DCI: HS-ESS3.1A, ESS3.5D Global Climate Change
Scientific Practices: Data Analysis and Explanation with Evidence
Cross Cutting Concept: Cause and Effect
Narrative: As an assessment, students will be presented with data from another region of the world (a region not chosen by any group) and information about that region. Using that data and information, students will have to analyze the data and determine the effects of climate change on that region, allowing the teacher to assess both their ability to analyze data and their understanding of the effects of climate change.

Part 2 – Climate vs. Weather

6. 5E Stage: Engage

DCI: HS-ESS2.D
Scientific Practices: Data Analysis
Cross Cutting Concept: Stability and Change
Narrative: Teacher will introduce the lesson with NASA connect videos (URLs below) and then explain the difference between weather and climate.
Weather: the state of the atmosphere at any time and place in regards to temperature, cloudiness, wind, pressure, precipitation.
Climate: the pattern of average weather for a place, determined from data and observations collected over many years**.**

http://www.youtube.com/watch?v=wUiwtVSkUwQ
http://www.youtube.com/watch?v=rBKB-q9obdw

Students and Teacher discuss the following:

- If you were going to travel to a new city, you would want to know what the climate is like there. What parts of the climate would you want to know about?

7. 5E Stage: Explore

DCI: HS-ESS2.D
Scientific Practices: Data Analysis
Cross Cutting Concept:
Narrative: Students will use statistical data provided on precipitation and temperature for a given city to create a climatograph for that city.

Students will analyze their own climatograph and other students':

- What does the graph tell you about the climate of that city?
- How does the climate of your city compare to those of other cities examined by your classmates?
- Based on the graphical analyses, where in the U.S. would you most like to travel, based on the climate there? (SEE CLIMATOGRAPH WORKSHEET IN THE Grade 9 FOLDER)

8. 5E Stage: Explain

DCI: HS-ESS2.D
Scientific Practices: Data Analysis
Cross Cutting Concept: Cause and Effect
Narrative: Students will compare climates of designated cities (by referencing climatographs) and their location (with maps provided).

- Students will analyze this data to make inferences about how location affects climate and then use assigned readings to check the accuracy of their inferences in examining the geographical factors that determine climate for a given area.

9. 5E Stage: Elaborate

DCI: HS-ESS2.D
Scientific Practices: Data Analysis
Cross Cutting Concept: Cause and Effect
Narrative: Students will research the climate of their region for their Performance Task and make a poster about how geographical factors affect the climate for their given region.

10. 5E Stage: Evaluate

DCI: HS-ESS2.D
Scientific Practices: Data Analysis and Explanation with Evidence
Cross Cutting Concept: Cause and Effect
Narrative: As an assessment, using geographical information provided about a location, students should be able to predict the climate of that region and justify their claim with evidence and explanation.

- Students will also interpret climatographs for other cities to assess their ability to accurate use climatographs and analyze data.

Part 3 – Cycles of Climate Change Over Time (Natural and Human)

11. 5E Stage: Engage

DCI: HS-ESS1.B, ESS2.A
Scientific Practices: Data Analysis
Cross Cutting Concept: Stability and Change
Narrative: Students will analyze pictures of NYC marks and make predictions about how the marks might have been produced. (These pictures are really of marks that indicate glacier movement from historical ice ages.)

12. 5E Stage: Explore

DCI: HS-ESS1.B, ESS2.A
Scientific Practices: Data Analysis
Cross Cutting Concept: Stability and Change
Narrative: Students will analyze temperature data from the last 20,000 years to determine the extent of ice ages and how climate has naturally changed throughout history.

13. 5E Stage: Explain

DCI: HS-ESS1.B, ESS2.A
Scientific Practices: Explanation with Evidence
Cross Cutting Concept: Stability and Change
Narrative: Students will conduct a lab investigation to model the Earth's orbit and how it changes over longer periods of time, as well as how the tilt of the Earth has wobbled over time.

- Students will use their understanding from this lab and read texts to create a graphic organizer or infographic that explains how and why the climate has changed throughout time as a result of natural events.

14. 5E Stage: Elaborate

DCI: HS-ESS1.B, ESS2.A
Scientific Practices: Explanation with Evidence
Cross Cutting Concept: Stability and Change
Narrative: Students will analyze tree rings and watch videos about ice cores to understand how scientists obtained their data to study how the climate has changed over time.

15. 5E Stage: Evaluate

DCI: HS-ESS1.B, ESS2.A
Scientific Practices: Explanation with Evidence
Cross Cutting Concept: Stability and Change
Narrative: Students will write an explanation, using evidence of how the cyclical changes of the Earth's orbit and tilt have causes cycles of ice ages and gradual climate change throughout history through natural occurrences.

- Teacher will provide instruction/reintroduce/review how to develop/write and discuss arguments using claims, evidence and reasoning.

Part 4 – Greenhouse Effect

16. 5E Stage: Engage

DCI: HS-ESS2.D
Scientific Practices: Explanation with Evidence
Cross Cutting Concept: Cause and Effect
Narrative: Students will view a picture of a black car in the sun. They describe what it would be like to be in the car in the summertime, as well as how the car would create the conditions they describe. (NOTE: collect some news articles deaths of babies inside cars; see Resources excel file) Why might there be an organization called Kids and Cars?

- Teacher should point out that the way the car traps heat is similar to the way the Greenhouse Effect works to trap heat on the Earth.
- Have students draw a model or diagram of what they think is happening and then revise the diagram in the EXPLAIN phase to compare/contrast the hot car with the Earth.
- Teacher posts a (KWL) chart on the board labeled with three columns. (Know, Want to Know, and Learned) "**Let's discuss what you know already from your work thus far**! And then…"
- Students will draw the same chart on a piece of paper. After a class discussion about what the students know and want to know about the greenhouse effect and greenhouse gases, points from the discussion will be recorded on the board and students should record these points in their notes. Students receive a diagram, "The Greenhouse Effect and Greenhouse Gases."

17. 5E Stage: Explore

DCI: HS-ESS2.D
Scientific Practices: Explanation with Evidence
Cross Cutting Concept: Cause and Effect
Narrative: Students will investigate the heating of the Earth by completing a lab investigation.

- In this lab, students will measure temperature changes inside two separate beakers (one covered with Saran wrap) as a heat lamp is shined on them to model the Greenhouse Effect.

- Students predict which one will reach a higher temperature, modeling the Greenhouse Effect.
- Groups of students measure the change of temperature inside the beakers with inserted thermometers.
- To conduct the experiment, they fill both beakers with 50 ml of water, insert the thermometer and record the temperature of each beaker, then cover one beaker thoroughly with Saran/Cling wrap and record the temperature again (should be the same initial temperature). Place both water-filled beakers under an incandescent or heat lamp.
- Students record the (change/increase in) temperature of each beaker over a twenty- minute time period.
- The beaker with Saran wrap on top should have a greater increase in temperature than the beaker without Saran wrap.
- This lab demonstrates the fundamental concept that underlies climate change science while providing data that are easy for students to interpret.

18. 5E Stage: Explain

DCI: HS-ESS2.D
Scientific Practices: Explanation with Evidence
Cross Cutting Concept: Cause and Effect
Narrative: Students work in groups of two or three to interpret a diagram of the Greenhouse Effect to examine: the steps of the process and what happens as a result.

- Students record questions they have about the diagram under the "Want to Know" column of their chart.
- Teacher will help students understand the diagram by clarifying their interpretations.
- As a class, begin a list in the "Learned" column adding the new information.
- Students write down what they have learned and keep a record of additional questions they have about the Greenhouse Effect.
- Optional extension: Students make a poster of their own Greenhouse Effect diagram, complete with an explanation of the greenhouse effect and greenhouse gases.

19. 5E Stage: Elaborate

DCI: HS-ESS2.D
Scientific Practices: Explanation with Evidence
Cross Cutting Concept: Cause and Effect
Narrative: Compare the function of the atmosphere on Earth with the atmosphere of other planets to make predictions about how their different atmospheres would affect the temperature of those planets.

Elaborate Discussion Questions:

1. What would happen if there were more greenhouse gases in the atmosphere? In your answer discuss:
   a. change in temperature of our atmosphere
   b. effect on living things on Earth

2. Venus is the 2nd planet from the sun, while we are the third. Its atmosphere has 93 times the mass of Earth's atmosphere. Venus has the densest atmosphere in the solar system. Most of the atmosphere is CO_2. Compare the greenhouse effect on Venus with Earth using the following guiding questions:

a. Describe what will happen to the radiation on Venus compared to the radiation on Earth.
b. Predict the temperature of Venus compared with Earth. Explain your answer.

3. Mercury is the smallest planet. It has the least gravity and cannot hold its own atmosphere. This means that it has hardly any atmosphere. It is the closest planet to the sun. The temperature on Mercury can reach 850^{o}F during the day and drop as low as -275^{o}F at night.

(Diagram of planet during day and at night)

a. Why do you think Mercury is so hot during the day?
b. Why do you think Mercury is so cold at night?

20. 5E Stage: Evaluate

DCI: HS-ESS2.D
Scientific Practices: Data Analysis
Cross Cutting Concept: Cause and Effect
Narrative: In place of a quiz, design a performance assessment to give students the capstone opportunity to share what they have learned in the different parts of the unit (regional changes, climatographs, greenhouse effect, weather and climate) producing a short documentary movie (in the genre of Gore's *"An Inconvenient Truth"*) or a website advocating awareness of Global Climate Change

Universal Access: *(Note: Add additional rows as needed)*

Supporting English Language Learners

Reading, Writing, or Speaking Activity *(listed in Learning and Instructional Sequence)*	**Supports for *Emerging* learners?**	**Supports for *Expanding* learners?**	**Supports for *Bridging* learners?**
Segments: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 16, 17, 18, and 19	• Match visual representations to words/phrases • Match sentence-level descriptions to visual representations • Compare content-related features in visuals and graphics	• Apply multiple meanings of words/phrases to social and academic contexts • Classify or organize information presented in visuals or graphs	• Interpret visually- or graphically-supported information • Infer meaning from text/images • Evaluate usefulness of data or information supported visually or graphically
Segments: 7, 13, and 17	Follow multi-step instructions supported by visuals or data	• Interpret visually- or graphically-supported information • Infer meaning from text	Infer significance of data or information in grade-level material
Segments: 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, and 18	• Make content-related lists of words, phrases, or expressions • Take notes using graphic organizers or models	• Complete reports from templates • Outline ideas and details using graphic organizers • Compare and reflect on performance against criteria (e.g., rubrics)	• Summarize content-related notes from lectures or text • Revise work based on narrative or oral feedback • Justify or defend ideas and opinions • Produce content-related reports

Supporting Struggling Learners

Activity *(listed in Learning and Instructional Sequence)*	**Supports for Students who need Minor Support**	**Supports for Students who Need Intensive Support**
N/A		

Supporting Advanced Learners

Extensions for Advanced Students

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]

All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)

Connecting to the Core: NGSS Aligned Performance Task

(Note: Add additional rows as needed)

ELA Connections- *(Reading, Writing or Speaking Activity)* *listed in Learning and Instructional Sequence*
Students will need to cite textual evidence in their presentations (RST.11-12.1)
Students will need to draw conclusions from a complex text as they do their research for their presentation (RST.11-12.1) and evaluate multiple sources in order to fully address a question (RST.11-12.7)
Students will need to make strategic use of digital media in their presentation (SL.11-12.5)
Math Connections – *listed in Learning and Instructional Sequence*
Students will need to use appropriate units for data measurements (HSN.Q.A.1) and define appropriate quantities for the purpose of descriptive modeling in their presentations (HSN.Q.A.2)
Students will need to utilize appropriate accuracy to limitations on measurement when reporting quantities of data in their presentation (HSN.Q.A.3)

Global Climate Change Performance Task Rubric

Share this Performance Task Rubric with your students at the start of the Unit. Inform students that the Unit will culminate in their presentations at a ***Global Climate Change Summit*** to which visitors/experts may be invited. Point out specific parts you will be assessing, such as numbers of examples, format for citing sources, types of reliable sources and provide whole class instruction with examples of these features, such as using the Climatograph worksheet. Be sure to remind students that the Performance Task is asking not only for impact on climate change, but also ***their recommendations for solutions to mitigate climate change***.

Unit Feature	Novice (0-69%)	Apprentice (70-79%)	Practitioner (80-89%)	Expert (90-100%)
Stability and Change of Climate over Time	Does not accurately describe how the concepts of stability and change apply to short and long periods of Earth's climate Does not accurately shows any examples of how natural and human feedback (negative or positive) can effect climate	Generally describes how the concepts of stability and change apply to short and long periods of Earth's climate Shows an example of how natural and human feedback (negative or positive) can affect climate	Explains how the concepts of stability and change apply to short and long periods of Earth's climate Shows multiple examples of how natural and human feedback (negative or positive) can affect climate	Fully explains how the concepts of stability and change apply to short and long periods of Earth's climate Shows multiple examples of how natural and human feedback (negative or positive) can effect climate
Greenhouse Effect Explained	Does not list or explain all steps of the greenhouse effect or describe the impact humans are having on it over time	Lists ***some*** steps of the greenhouse effect and describes the impact humans are having on it over time	Explains all steps of the greenhouse effect and the impact humans are having on it over time	Fully and accurately explains all steps of the greenhouse effect and the impact humans are having on it over time
Cause and Effect of Change	Uses little evidence to make claims about inaccurate causes of global climate change Explains at least 1 primary and secondary effects of climate change on a specific region	Uses some evidence to make claims about general causes of global climate change Explains at least 2 primary and secondary effects of climate change on a specific region	Uses some evidence to make claims about specific causes of global climate change Explains at least 3 primary and secondary effects of climate change on a specific region	Uses evidence to make claims about specific causes of global climate change Explains at least 4 primary and secondary effects of climate change on a specific region

Unit Feature	Novice (0-69%)	Apprentice (70-79%)	Practitioner (80-89%)	Expert (90-100%)
Data Analysis	Makes observations from 1 data source regarding climate change and makes illogical inferences about their impact on humans	Accurately makes observations from at least 2 data sources regarding climate change and makes logical inferences about their impact on humans	Accurately makes observations from at least 3 data sources regarding climate change and makes logical inferences about their impact on humans	Accurately makes specific observations from at least 4 data sources regarding climate change and makes logical inferences about their impact on humans
Explanations based on Evidence	Does not construct explanations based on evidence. Evidence is not contextually by anticipating the reader's knowledge and concerns and does not attribute evidence to sources.	Constructs all explanations based on at least 2 reliable sources of evidence. Evidence is contextually by anticipating the reader's knowledge and concerns and attribute evidence to sources somewhat appropriately.	Constructs all explanations based on at least 3 reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review). Evidence is contextually by anticipating the reader's knowledge and concerns and attribute evidence to sources appropriately.	Constructs all explanations based on at least 4 reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review). Evidence is effectively contextually by anticipating the reader's knowledge and concerns and attribute evidence to sources appropriately; evidence is woven into your writing seamlessly.
Constraints and Criteria of Solution	Does not accurately list or explain appropriate constraints and criteria of a solution for the occurrence of global climate change over time	Lists at least 3 appropriate constraints and criteria of a solution for the occurrence of global climate change over time	Explains at least 3 appropriate constraints and criteria of a solution for the occurrence of global climate change over time	Fully explains at least 4 appropriate constraints and criteria of a solution for the occurrence of global climate change over time
Overall Presentation	Poor eye contact, volume too low or loud, poor enunciation.	Inconsistent with eye contact, volume, and enunciation. Obvious distracting mannerisms.	Regular eye contact, few distracting gestures, appropriate volume, generally clear and consistent enunciation.	Excellent eye contact, no distracting gestures, appropriate volume, clear and consistent enunciation.

Garrett – Geography NAME: _____

CLIMOGRAPH worksheet

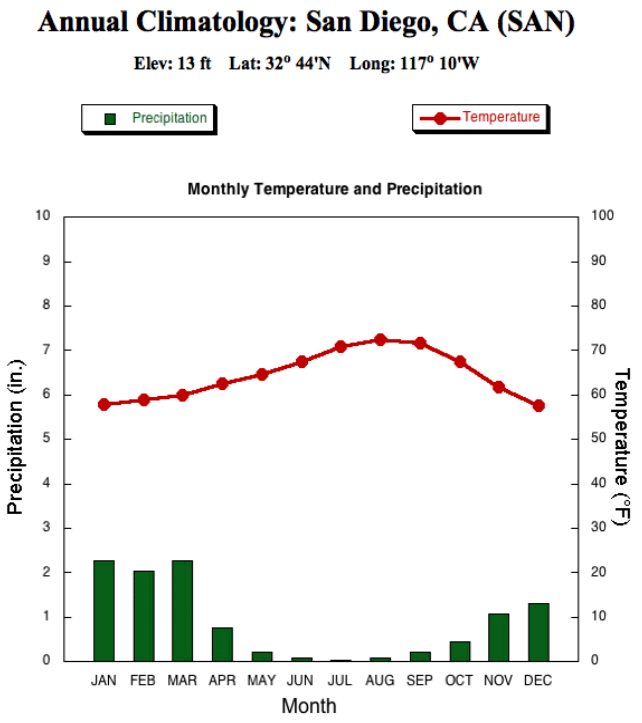
VOCABULARY

climograph – A graph that shows the annual (yearly) cycle of temperature and precipitation for a geographical location.

climate – The average weather conditions prevailing in an area over a long period of time.

weather - The state of the atmosphere at a place and time with regard to temperature, cloudiness, dryness, sunshine, wind, rain, etc.

DIRECTIONS: Use the following *climographs* to answer each of the related questions.



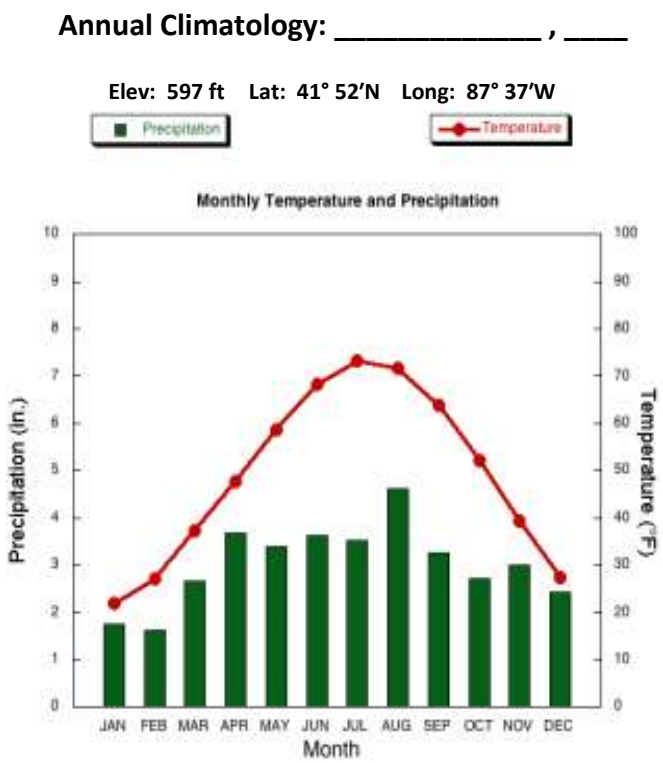


Figure 1: Average Temperatures and Precipitation 1971-2000. (NCDC Data)

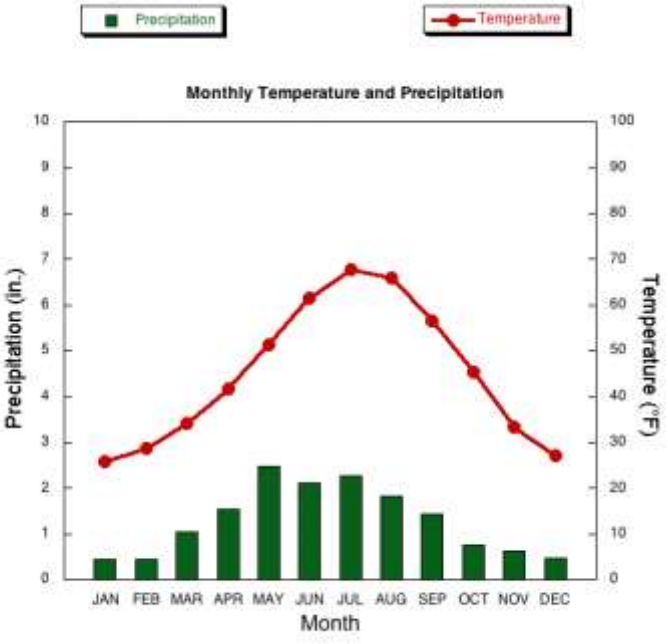
1) The data used for the *climograph* of San Diego, CA. was collected over how many years?
2) Approximately how many inches of precipitation does San Diego get in January?
3) In which month would you be <u>least likely</u> to need an umbrella in San Diego?
4) Approximately how many inches of precipitation fall in San Diego during an entire year?
5) Which month has the highest average temperature in the "mystery city"?
6) What is the average temperature in the "mystery city" during its hottest month?
7) What is the average temperature in the "mystery city" during its coldest month?
8) What is the temperature difference between the hottest month and the coldest month in the "mystery city"?
9) What is the temperature difference between the hottest and coldest months in San Diego?
10) Does it ever snow in the "mystery city"? Explain your answer using information from the *climograph*.

<u>Use your atlas and the listed coordinates to identify the "mystery city" on this page.</u>

DIRECTIONS: Use the following *climographs* to answer each of the related questions

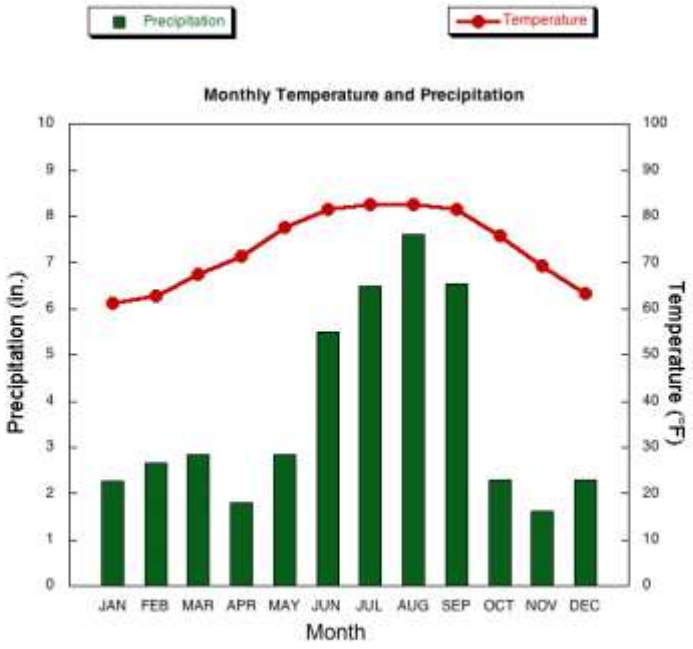
Annual Climatology: _____ , ____

Elev: 6062 ft Lat: 41°8′ N Long: 104°48′ W



Annual Climatology: _____ , ____

Elev: 48 ft Lat: 27°56′ N Long: 82°27′ W



Use your atlas and the listed coordinates to identify each of these cities.

1) Which city has the most precipitation during the year?
2) How many inches of precipitation fall in this city during an average year?
3) For the city on the right, list the type of clothes would you want to have in your closet to wear anytime?

4) Explain what type of clothes would you **NOT** waste your money buying if you planned on living in the city on the right?

5) In which city would you expect it to rain during your 4th of July barbecue?
6) In which city would your dreams of having a "white snowy Christmas" most likely come true?
7) Explain your answer to question #6 using the information from the *climograph*.

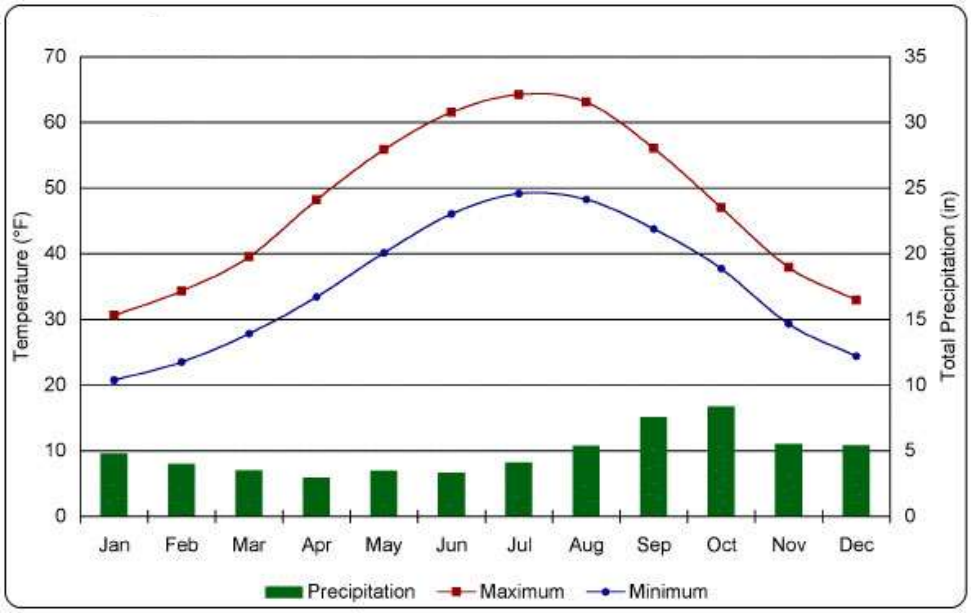
8) After studying the climates of these four cities – San Diego, Chicago, Cheyenne and Tampa – explain which city you would most like to move to and the reasons why.

DIRECTIONS: Use the following *climographs* to answer each of the related questions

Use your atlas and the listed coordinates to identify each of these cities.

Annual Climatology: _____ , ____

Elev: 56 ft Lat: 58°26′ N Long: 134°13′ W

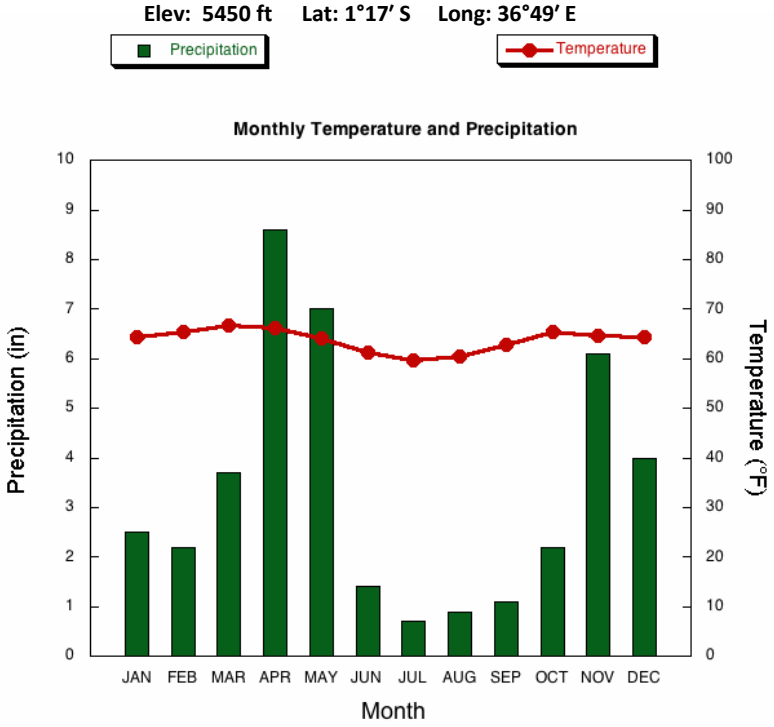


1) Explain how this *climograph* is different from all the others you have looked at.

2) During which months of the year could you grow a vegetable garden in this city?

Annual Climatology: _____ , _____

Elev: 5450 ft Lat: 1°17′ S Long: 36°49′ E



3) Which one of these cities has the most precipitation in the month of December?

4) Which one of these cities is in the *tropics*?

5) Give **two (2)** reasons why you know this city is in the *tropics*.

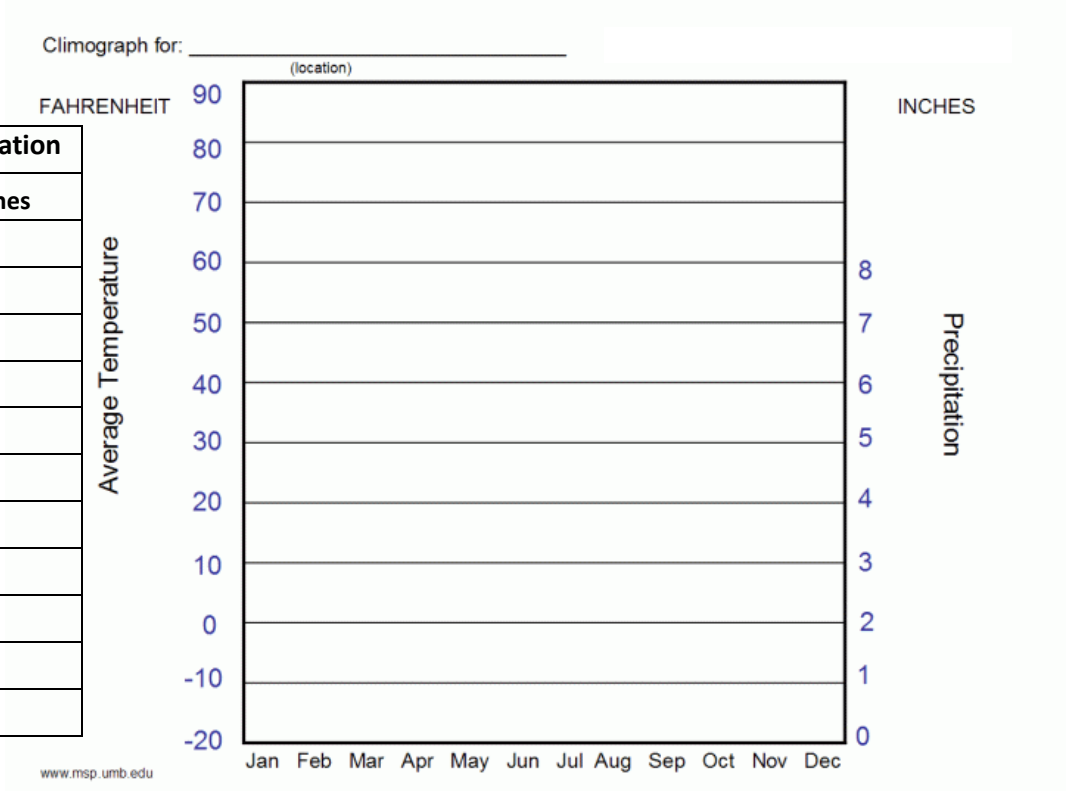
6) During which season (winter, spring, summer or fall) would it be the **best time** to plant crops in this climate? Explain your answer.

CREATE YOUR OWN CLIMOGRAPH!

Directions: Use the statistics on precipitation and temperature in each table to create a *climograph* for each city in the blank graph. Use the examples you used if you need help.

Elev: 118 ft Lat: 32°47′ N Long: 79°56′ W

	Temperature	Precipitation
January	48 degrees	3.5 inches
February	51	3.5
March	58	4.5
April	65	3
May	73	4
June	78	6.5
July	82	7
August	81	7
September	76	5
October	67	3
November	58	2.5
December	51	3



Elev: 4751 ft Lat: 38°56′ N Long: 119°44′ W

	Temperature	Precipitation
January	32 degrees	1.5 inches
February	37	1.2
March	42	1.1
April	47	.3
May	54	.5
June	63	.4
July	69	.2
August	68	.3
September	61	.4
October	50	.6
November	40	1
December	32	1