

Tennessee Environmental Literacy Plan

Explore, Learn, Engage



Accepted by
Tennessee Department of Environment and Conservation
and
Tennessee Department of Education

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“A person is environmentally literate when they have the knowledge of environmental processes and issues needed to make informed decisions and participate in civic affairs.”

-National EE and Training Foundation and EL Council

Dedication

The Tennessee Environmental Literacy Plan is dedicated to Edwin Gardner, who was the primary author of Tennessee's newest state recreation plan, *Tennessee 2020: Vision for Parks, People, and Landscapes*. Edwin was a long-time advocate of connecting children to nature through place-based education and the Environment as an Integrating Concept (EIC) teaching model. He inspired countless others with his commitment to a sustainable lifestyle.



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Chapter 1: Introduction

Environmental literacy involves an awareness and knowledge of the interrelationships among life forms and natural systems; understanding of ecological, social, economic and cultural processes and issues; and knowledge and skills needed to make informed decisions and to become environmental stewards (Tennessee Environmental Literacy Working Group, 2010).

The Need for Environmental Literacy

The U.S. and the world are faced with unprecedented environmental concerns, such as species loss, water shortages, climate change, desertification, invasive species, high ozone levels, dramatic changes in forest composition, loss of ocean fisheries, and concerns about food security. With limited education in conservation and environmental fields, many people find it difficult to comprehend the nature, extent, and implications of these concerns and what it means for personal well-being and economic viability. We have the creative capacity to develop strategies to address these concerns as demonstrated in the recovery and management of our forests after their wholesale devastation in the late 1800's and early 1900's. We have also brought species such as the bald eagle, wild turkey, and American bison back from the brink of extinction. Unfortunately, we are currently seeing unprecedented crashes in populations of amphibians, bat species, freshwater mussels, darters, and quail. In Tennessee, tree species that have been lost or are threatened include the American chestnut, elm, hemlock, black walnut, and dogwood. Not only are we seeing loss of species and populations, but we are seeing unprecedented changes in the normal range of species as they respond to climate change.



These environmental changes are occurring at the same time there is a perceived disconnect between children and nature. In addition, for many people there is growing alarm about the world in which children live. There is concern about children's safety, the quality of their education, their connection to family and community, demands for achievement in and out of the classroom, and even concerns about their physical and mental health. There is also a growing "sense of loss" in adults – a feeling the world we have created is denying children an opportunity to simply be a child, to be free and playful, to be outdoors and explore nature on their own terms, to feel the sense of magic and wonder in nature and be connected to the natural world that sustains them.

Why is it Important for Children to be Outdoors and Connected to Nature?

If children are not spending time connecting to nature, how can we expect them to become future conservation leaders or to become scientists of tomorrow with an intrinsic desire to learn about the complexities of nature? It is through increased opportunities for structured and unstructured time in nature and "wild areas" that children can learn about the uniqueness and special characteristics of the natural world in which they live and develop a personal connection to nature. Children need to have consistent, positive experiences in the outdoors when they are young in order to become engaged and informed advocates for the natural environment. Therefore, we need increased opportunities in both formal and non-formal educational settings for children to learn about nature and its role in human existence. As this personal connection develops and matures, children (and later, adults) will find the means to sustain and enjoy nature at the local level and beyond and become the conservation leaders of tomorrow.

In addition to educational benefits, a number of physical and mental health benefits also derive from children's time outdoors. When children are in natural settings they often engage in activities requiring physical exercise (Hinkley et al. 2008), which produces numerous health benefits, including healthy body mass indices (BMI), improved muscle, bone and joint strength, and lowered risk of diabetes and heart disease (Kaczynski and Henderson 2007; Bell et al. 2008). Cleland (2008) demonstrated that children ages 5-12 who spend more time playing outdoors are less likely to be overweight compared to other children. At schools that provide green areas (e.g., a lawn with trees) children engage in higher levels of physical activity and exhibit increased levels of curiosity and exploration of nature (Dyment and Bell 2008).



Tennessee 2020

In 2009, the Tennessee Department of Environment and Conservation (TDEC) finalized Tennessee's newest state recreation plan, *Tennessee 2020: Vision for Parks, People, and Landscapes* (TN 2020), which can be found at <http://www.tn.gov/environment/recreation/plan/>. Tennessee 2020 is a comprehensive planning document focused on the future of Tennessee's parks, people, and landscapes. The plan documents the most critical needs facing conservation and recreation over the next 10 years including connecting children with nature. In the chapter on Environmental Education, the plan calls for the development and implementation of a Tennessee Environmental Literacy Plan (TELP). The purpose of TELP is to ensure environmental literacy among all students in Tennessee and to provide Tennessee teachers the resources needed to integrate local environmental topics into every subject at every grade level.

No Child Left Inside Legislation

As the TN 2020 planning process was getting underway, a new opportunity in the area of environmental education emerged. The U.S. House of Representatives passed the No Child Left Inside Act (NCLI), which authorized a total of \$500 million over five years to fund environmental education for K-12 students.

While the Act did not become law in the last Congress, it has been reintroduced with strong bipartisan support, and enactment could occur by 2012. Provisions of the No Child Left Inside Act are expected to apply to Tennessee as follows:



Federal Grants for Environmental Education

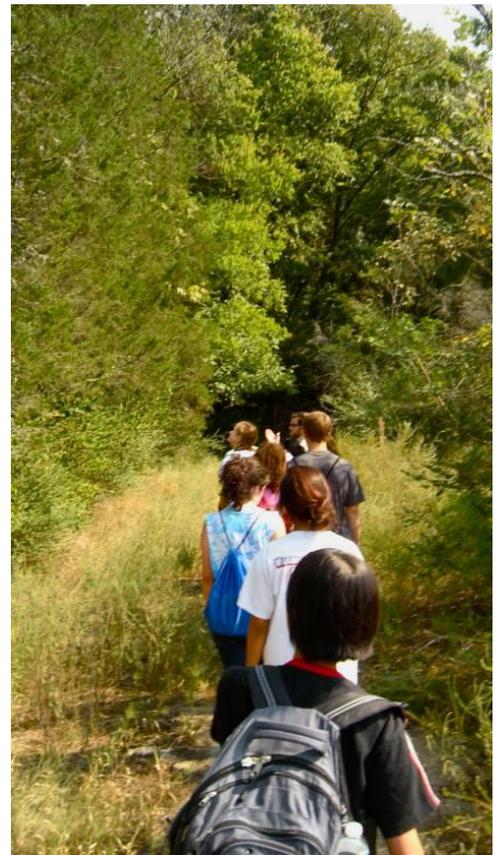
A federal grants program will provide funding to the Tennessee Department of Education (TDOE) in the range of \$2 million annually for five years to fund professional development of teachers and educators and to provide outdoor learning experiences for students. Eligible partners in these programs can include TDEC, TWRA and other state and federal natural resource management agencies; local parks and recreation departments; and nonprofit or for-profit organizations that provide outdoor environmental education experiences, such as private nature centers and zoos.

State Environmental Literacy Plans

To qualify for environmental education grants, TDOE will develop a K-12 plan and submit it to the U.S. Department of Education. The purpose of this plan, called a State Environmental Literacy Plan (SELP), is to ensure environmental literacy among elementary and secondary school students. It will be prepared in consultation with TDEC, TWRA and other state natural resource management agencies, colleges and universities and both public and relevant non-profit organizations. The SELP must include:

- Relevant content standards, content areas or subjects where instruction will take place.
- Description of how the plan relates to state graduation requirements.
- Description of programs for professional development of teachers to improve their environmental content knowledge, skill in teaching about environmental issues, and field-based pedagogical skills.
- Description of how TDOE will measure the environmental literacy of students.
- Description of how TDOE will implement the plan, including securing funding and other necessary support.

TN 2020 states that Tennessee should adopt the Environment as an Integrating Concept (EIC) learning model (see page 10) in its Environmental Literacy Plan and that the curriculum should be place-based and focused on Tennessee's rich natural and cultural environment.



Every Child Outdoors-Tennessee (ECO-TN)



Inspired by the national “No Child Left Inside” movement, a Tennessee No Child Left Inside Stakeholder’s meeting was held at Warner Park Nature Center in November 2008. The meeting was sponsored by the National Wildlife Federation, the Tennessee Wildlife Federation and Vanderbilt School of Science and Math. The event included 45 representatives from TN State Parks, TN Department of Health, and City and State

Departments of Education, as well as individuals from universities, businesses, non-profits, and non-formal education who share a common interest in getting kids outdoors and connected to nature. As a result of this meeting, the Every Child Outdoors-Tennessee Coalition (ECO-TN) was created with a mission “to promote and support opportunities that encourage children to engage with and experience the outdoors.” Five goals with objectives and action steps were identified, including one that focused on formal and non-formal education.

1. Raise awareness of the benefit of outdoor experiences for children.
2. Provide resources to increase children’s outdoor experiences.
3. Increase outdoor learning and stewardship opportunities for children (in both formal and non-formal educational settings).
4. Improve children’s health through outdoor experiences.
5. Expand access to the outdoors for children through infrastructure planning, development and policy.



In February 2010, the Tennessee General Assembly passed a formal Resolution adopting the Tennessee Children's Outdoor Bill of Rights (TCOBOR) and supporting the work of the ECO-TN Coalition. The TCOBOR states that "Every child, before entering



high school, should have the opportunity to walk in the woods, play outside, explore nature, watch wildlife, grow a garden, splash in the water, camp under the stars, learn to swim, climb a tree, go fishing, fly a kite, and visit a farm."

In May 2010, The ECO-TN Coalition hosted the first ever Tennessee Governor's Summit on Every Child Outdoors at Montgomery Bell State Park. Over 150 community leaders from the educational, natural resources, health, governmental and

other sectors attended the summit to better understand and discuss the symptoms and consequences of children's disconnect from nature and strategize methods for reconnecting kids to the outdoors. Participants were divided into breakout groups and developed action items to promote ECO-TN. The breakout groups included:

- Connecting Families to the Outdoors (Non-formal Education)
- Integrating Outdoor Learning into Class time (Formal Education)
- Developing Healthy Children (Health)
- Promoting Every Child Outdoors - (Media/Awareness)
- Growing Healthy Communities (Infrastructure/Planning)

The Formal Education group comprised a list of action items to integrate outdoor learning into class time. The objective to "Develop an environmental literacy plan for Tennessee," was well underway at this time.



Tennessee Environmental Literacy Working Group (TELWG)

In the fall of 2009, the Tennessee Environmental Literacy Working Group (TELWG) was formed with leadership from TEEA and ECO-TN. In January 2010, a facilitator was provided with grant monies from NAAEE to initiate training for the creation of the Tennessee Environmental Literacy Plan (TELP) and a mission statement was established.

TELWG includes education and natural resource professionals who have volunteered their time to develop and facilitate implementation of this State Environmental Literacy Plan in cooperation with statewide partners. (Appendix A).



ELP Vision and Mission Statement

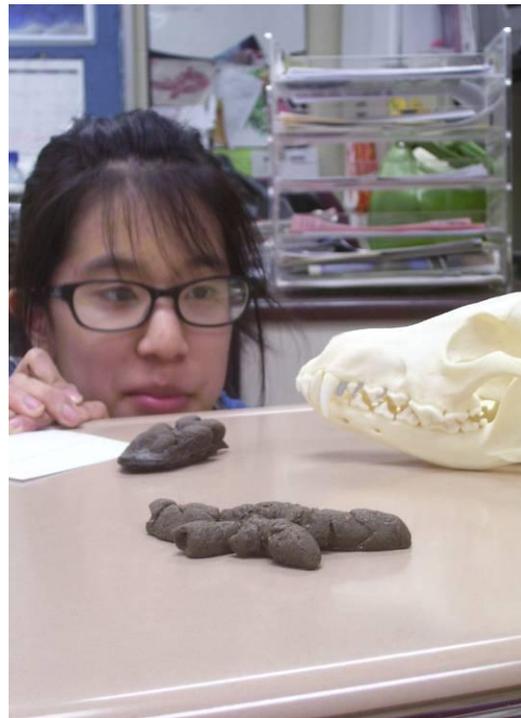
The mission of the Tennessee Environmental Literacy Plan is

to use statewide partnerships to increase environmental literacy in Tennessee by focusing on children and youth through a place-based Environmental Literacy Program.



Ideally, environmentally literate Tennesseans will have

awareness and knowledge of the interrelationships among life forms and natural systems; understanding of ecological, social, economic and cultural processes and issues; and the knowledge and skills needed to make informed decisions and to become environmental stewards.



The TELWG vision is for the program to be standards-based and include inquiry and hands-on learning, professional development, and progressive assessment. As TELP is implemented, high quality environmental education resources will be at the fingertips of every Tennessee educator. The result will be Tennessee students who have the problem-solving, critical thinking, and decision-making skills needed to be globally competitive environmental stewards.

Environmentally literate citizens understand ecological systems; can make informed decisions about complex environmental issues affecting the economy, public health and shared natural resources on local to global levels; and, most importantly, can act on those decisions to effect changes that sustain the health of nature and the health and well-being of all citizens of Tennessee and beyond, including a sustainable and healthy economy. Environmental literacy broadly encompasses conservation, agriculture, sustainability, environmental, nature, and outdoor education.



Tennessee: A Special Laboratory for Outdoor Learning

Tennessee's rich natural environments and biodiversity represent valuable assets for teaching students environmental literacy and improving academic performance while strengthening their appreciation of nature. With nine eco-regions, Tennessee's aquatic, amphibian, and plant diversity is the highest of all inland states making Tennessee number five overall in total biodiversity (Stein, 2002). As just one example of the state's biological richness, the Duck River, Tennessee's longest free flowing stream at 269 miles, contains more fish species (151) than all the rivers of Europe combined and has more varieties of freshwater animals than any river on the North American continent (Stein, et al, 2000). Tennessee's biological diversity and its rich cultural heritage, from the Cherokee of the eastern highlands to the people of the Mississippi Coastal Plains, provide an excellent laboratory for student inquiry into the social, cultural, and natural heritage of the state. This dynamic outdoor classroom is well-suited for Place-Based Education (PBE) and for using Tennessee's natural environment as a laboratory for learning across the curriculum. PBE occurs when children, teachers, and adults in the community use the social, cultural, and natural environment in which they live as an inquiry-based learning laboratory to gain knowledge and skills across subjects (Sobel, 2005).



Through Place-Based Education, students in Tennessee can learn more about the natural world they personally experience than they learn about faraway places like the rainforests of South America. Learning about the natural world and the streams, watersheds and eco-regions in which they live also increases a sense of place, self-identity, regional pride, and conservation ethics in Tennessee students.



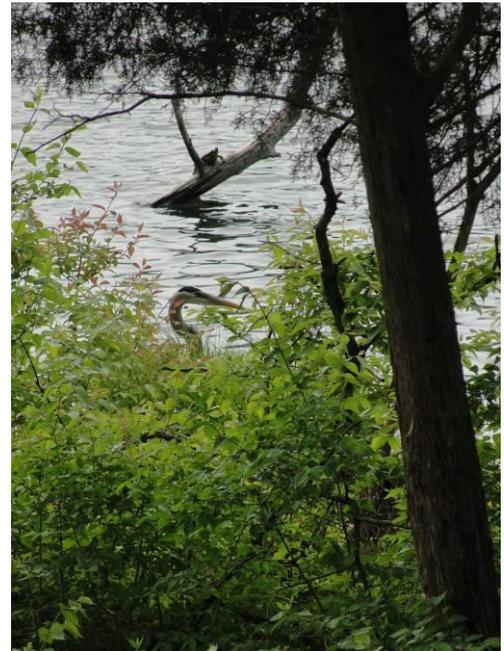
Place-Based Education and Using the Environment as an Integrating Concept

Place-Based Education creates opportunities for students to learn about their community through inquiry, critical thinking, service learning, and creativity. Students collect, analyze, synthesize, and critique information and data; gain experience using technology while conducting field assessments and preparing presentations; then develop their communication skills by reporting their research findings via presentations to their peers and the community as well as via printed and online publications.

As school systems incorporate the environmental literacy goals outlined in TN 2020, two important needs will be met:

The need of students to understand the natural world they will inherit in a time of daunting environmental challenges.

Most Tennessee students have only a cursory understanding about the natural world, particularly within the community where they live, and that, coupled with the decline in outdoor play in nature, is giving them little reason to care. Students given the opportunity to engage in hands-on learning about the environment and their local ecosystem will be better prepared to make difficult decisions in the face of climate change and other environmental challenges and opportunities. Integrating environmental content into the school curriculum has been shown to increase student engagement in all subjects and produce measurable improvement in test scores (Leiberman and Hoody, 1998; NEETF, 2000; SEER, 2005).



The need of children to interact with nature as a necessary part of their healthy development.

Teenagers are turning away from nature and the out-of-doors in favor of television, computers, and other electronic media and younger children have far less unstructured outdoor play than previous generations. Unstructured play in nature is essential for a child's healthy physical and emotional development, and the lack of it is reflected in the rising incidence of a host of disorders in the young: attention deficit hyperactivity disorder (ADHD), anxiety, teen depression and suicide, high blood pressure, vitamin D deficiency, obesity and Type 2 diabetes (Cleland, et al, 2008; Faber and Kuo, 2009; Kumar, et al, 2009; Wells, 2000).

The comparative advantages of using the local environment as a framework and focus for learning in all subject areas is well established (Lieberman and Hoody, 1998). A 1998 study by the Pew Center, for example, looked at 40 schools nationwide that had adopted a teaching model called Environment as an Integrating Concept (EIC). The study concluded:

"Evidence gathered from this study indicates that students learn more effectively within an environment-based context than within a traditional framework. By providing a comprehensive educational framework instead of traditional compartmentalized approaches, EIC appears to significantly improve student performance in reading, math, science and social studies and enriches the overall school experience."

It is a well established principle of effective teaching that students are more engaged when offered opportunities for active, hands-on learning, and the level of engagement is the single most significant factor in student performance in any subject. Two indicators of the level of student engagement in place-based learning include the decrease in absenteeism and in behavioral problems. Also, when students are engaged in active learning on topics relevant to the "real" world environment they experience, it is easier for them to focus or concentrate, especially students with attention deficit concerns.



The EIC model builds on these principles, using several interrelated components:

Local Context

Following a place-based education model, use local, natural and community surroundings as a context for standards-based instruction.

Natural and Social Systems

Develop students' understanding of natural systems, of social systems and their community's cultural characteristics, and of interrelationships and interactions among natural and social systems.

Hands-on Learning

Use direct student interaction with natural and social systems to provide greater personal engagement with the learning process.

Integrated, Interdisciplinary Instruction

Work across traditional disciplinary boundaries to develop comprehensive understanding of natural and social systems. The real-world interdependence of these systems makes them an ideal vehicle for integrated, cross-curricular instruction.

Community-Based Investigations

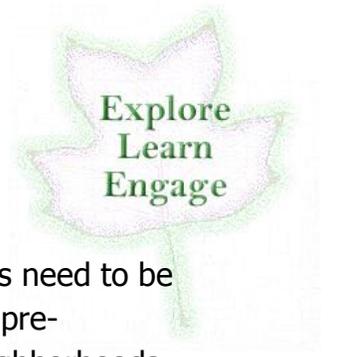
Provide students with opportunities to investigate real-world community problems and issues and to use higher-level thinking and creative problem-solving skills in pursuit of authentic issues of personal interest to them, in effect to become citizen scientists.

Service Learning

Create a continuum of learning and long-term engagement that crosses grade levels and allows students to conduct multi-year research and service-learning projects that contribute to their community.



Chapter 2: Environmental Literacy Standards



Strands and Themes for All Grade Levels

The task of developing environmental literacy means all Tennessee students need to be engaged in interdisciplinary, place-based experiential learning starting with pre-kindergarten. Teachers are encouraged to turn schoolyards, backyards, neighborhoods and communities into outdoor “classrooms” for use in all subject areas. Those that have already embraced this method of teaching have found using their schools’ outdoor environment and the community beyond to be an effective and enjoyable teaching tool for achieving curricular standards.

To meet the goal of having environmentally literate Tennesseans, the Tennessee Department of Education will use the environmental education standards presented in the NAAEE document *Excellence in EE – Guidelines for Learning* as a means to organize current environmental literacy standards and as a template for future revisions. The organization of the standards will include four strands that will be addressed at each grade level:

- 1) Inquiry**
- 2) Interdependence**
- 3) Issues and Informed Decisions**
- 4) Individual Rights and Responsibilities**



Upon graduation from high school, the environmental literacy skills for which Tennessee students will be evaluated include:

Strand	Environmental Literacy Skills
Inquiry	The learner is able to ask questions about the world around them; design an investigation to seek answers; use appropriate tools and technology to collect precise and accurate data, apply qualitative and quantitative measures to analyze data; draw conclusions that are free of bias; and synthesize information to develop and communicate findings.
Interdependence	The learner is able to identify physical and biological forces and chemical changes that shape our environment; model or simulate interrelationships among life forms and natural systems; discuss cultures and human patterns of resource use of places and eco-regions of the world over time, starting with the community in which they live; understand that people depend on, affect, and are affected by their environment; and describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.
Issues and Informed Decisions	The learner is able to research and recognize different viewpoints and identify different stakeholders in an issue in their local environment and community; assess social, economic, and environmental consequences of proposed solutions to issues; demonstrate active-listening skills and the ability to collaborate and negotiate with disparate groups; and decide whether action is needed and whether he/she should be involved.
Individual Rights and Responsibilities	The learner is able to identify individual rights held by Tennessee citizens; discuss his/her own belief about local and global environmental and societal issues; understand and know how to participate in the legislative process; describe ways in which individuals and groups act within their community to create positive environmental changes that foster sustainability; and recognize his/her personal responsibilities as a Tennessee citizen.

In addition to the four major strands, there will be three underpinning themes to be applied to each grade level's "checks for understanding" in meeting environmental literacy standards. These are:

1) Systems Just like watersheds are nested within other watersheds, natural, economic, social, cultural, and political systems can be nested within other systems. Learners can understand these systems by examining their parts and comprehending the interdependent relationships among the parts, as well as recognize how they define our whole environment. Learners easily make connections with, explore, and understand their immediate surroundings and the ecological system in which they live, particularly their local watershed. The organization of watersheds in a landscape provides a way for a learner to expand from his/her local connection to understanding larger ecological systems and broader issues.



2) Sustainability The task of creating a sustainable environment involves the natural sciences, social sciences, and humanities. Learners develop and apply problem solving skills across curricula through direct experience with the environment and society.

3) Stewardship Meaningful learning that leads to lifelong learning and environmental stewardship begins with instilling an appreciation for the natural world and involves teaching learners critical and creative thinking, decision making, and communication skills in a collaborative setting. Learners come to appreciate Tennessee's biologically diverse eco-regions and to understand their role in protecting this rich natural heritage in response to a continually changing environment.



Application to Science and Social Studies Content

The four strands of environmental literacy, Inquiry, Interdependence, Issues and Informed Decisions, and Individual Rights and Responsibilities, will be woven through the science and social studies content areas for grade level evaluations of achievement. Currently, Inquiry is embedded in the standards of every grade level and high school science course. An environmental literacy task force will identify current science standards that are connected to the existing Interdependence concept progression and make suggestions for additional links for social studies standards. The task force will also apply environmental literacy skills outlined for Issues and Informed Decisions to the “Groups and Interactions” concept progression for social studies standard revisions. The skills for Individual Rights and Responsibilities will be worked into the “Governance and Civics” concept progression.

Using the three underpinning themes of environmental literacy, the task force will also identify the current presence of and suggest application to the “checks for understanding” for the science and social standards for all grade levels. The following are suggested connections between EL themes and Tennessee’s concept progressions in science and social studies:

- 1) Systems** have been applied to the following progressions in science: Technology and Engineering, Cells, Interdependence, Biodiversity and Change, Matter and Energy, The Universe, The Earth, and The Atmosphere. Systems will be connected also to the Geography, Culture and Economics progressions in social studies.
- 2) Sustainability** is loosely connected to Interdependence and The Earth concept progressions in science. Sustainability will also be connected to Culture, Economics, Governance and Civics, and History progressions in social studies.
- 3) Stewardship** will be connected to the Governance and Civics progression in social studies and Biodiversity and Change progression in science.



While the emphasis for environmental literacy has been placed on science and social studies standards, each theme can be applied also to math, English, physical education, and the arts. As standards and concept progressions are revised in the future, environmental literacy can be further implemented across the curriculum as described in the EIC model. For example, the systems theme involves humans and natural systems interacting in the environment and community in which children live. Within walking distance of most schools in Tennessee is a creek or stream that can easily show connections among an area's ecology, history, and culture. Students can follow a point of inquiry (science), take measurements (math and technology), make maps (geography, engineering, and art) and communicate findings (social studies, English and the arts – paintings, music, photos, storytelling and writing).

Watersheds as Teaching Tools

Tennesseans love to celebrate their relationship with the land, especially the rural countryside. They sing about it, tell stories about it, and have built a global entertainment industry around the vicissitudes of rural life. This cultural asset and sense of place can serve to boost environmental learning in Tennessee by tapping into our innate sense of our state as a collection of unique places.



A strategy of environmental education content focused on Tennessee places will mesh well with TDEC's transition toward the Watershed Management Approach, described in the TN 2020 plan's initiative on Recreational Waters. As the department shifts its regulatory framework to the watershed as the basic unit of reference and compiles new online GIS data for each watershed, educators will have access to the same watershed data to help students in conducting local investigations. Hands-on field studies of local streams coupled with service-learning projects will help foster a sense of stewardship of the local watershed and train students to be the scientists of tomorrow.



Sample Theme to Introduce Environmental Literacy Into the Curriculum

Understanding the Local Watershed

Experiencing and observing the local environment is an essential part of environmental education. Streams and creeks are readily available portions of the local watershed and are accessible to virtually every student in Tennessee. Direct experience in the environment also helps foster the awareness and appreciation that motivates learners to further questioning, better understanding, and appropriate concern and action. The organization of watersheds in a landscape provides a way for a learner to expand from his/her local connection to larger systems and broader issues. Major topics that can be addressed are water supply or availability, flooding, water quality, biodiversity, recreation and the role of water in the local economy (where and how it is used). The following chart suggests ways in which learners at different grade levels might explore and understand the local watershed.

Grades PreK	Grades K-5	Grades 6-8	Grades 9-12
<p>Identify basic hydrologic processes, such as precipitation and runoff.</p> <p>Record weather observations such as precipitation and temperature.</p> <p>Explore watershed protection through water conservation.</p>	<p>Identify basic watershed habitats, such as rivers and lakes.</p> <p>Explore specialized watershed areas, such as wetlands and reservoirs.</p> <p>Investigate the impact of the area’s geology on major watershed features.</p> <p>Understand the complete hydrologic cycle, particularly the interconnectedness of groundwater and surface water.</p> <p>Trace the source of local drinking water and where it goes after it is used.</p> <p>Investigate the biological and chemical components of water quality and watershed biodiversity.</p> <p>Explore watershed protection through proper waste disposal and prevention of littering.</p>	<p>Describe how drinking water and wastewater are treated.</p> <p>Create a map of the local watershed which highlights the major watershed features, including topography, flow patterns of rain water and snow melt, etc.</p> <p>Evaluate the cumulative effects of human activities on a stream or watershed.</p> <p>Recognize the importance of wetlands in supporting migratory species.</p> <p>Monitor changes in water quality and how this is related to watershed health.</p> <p>Explore watershed protection through groundwater protection.</p>	<p>Evaluate sources of nonpoint source pollution of local water bodies, including sources that are not local.</p> <p>Explore the impact of major weather events, including floods and droughts, on the watershed.</p> <p>Investigate short- and long-term environmental changes in a local watershed or aquifer.</p> <p>Document the effect of human population growth on watersheds and water resources.</p> <p>Research the social and political issues that impact a complex watershed, such as the Tennessee, Cumberland, and Mississippi River basins.</p> <p>Discuss the intended and unintended effects of citizen actions on watershed health.</p> <p>Explore watershed protection through land use control.</p>

Vision of an Environmentally Literate Community

The TELWG recognizes that support for environmental literacy within educational standards happens on a variety of levels: the classroom, the school, the school district, and at the state level. The following recommendations visualize what an environmentally literate community in Tennessee could be at each of these levels.

In the Classroom

- Teachers will be trained in and encouraged to use high quality, proven EE materials, such as curricula provided by Project WILD, Project WET, Project Learning Tree, and Ag in the Classroom, which have been directly correlated to the Tennessee PreK-12 State Standards of Curriculum, along with other national curricula such as Facing the Future and Population Connection.
- Teachers will be encouraged to integrate content areas using the environment as the learning context for curriculum (EIC Model) through place-based education.
- Outdoor and field service learning experiences will be integrated into the regular school curriculum at every grade level.

In the School

- Guidance counselors and Career & Technical Education professionals will support career and college choices that emphasize environmental literacy and careers in agriculture, sustainability, conservation, and the environment.
- Schools will support extracurricular student academic and/or service-oriented environmental clubs.
- Schools will work with partners to provide opportunities for students to participate in service learning projects and/or internships that relate to the environment and environmental issues.
- Schools will participate in the Green Schools Program and will work with partners to promote environmental competitions like Envirothon, Future Farmers of America, 4-H Wildlife and Forestry Programs, and Science Olympiad.



In the School District

- School districts will encourage the establishment and use of and collaboration with EE centers.
- School districts will encourage collaboration with colleges and universities, local, state and national parks and forests, 4-H extension offices, wildlife resource agencies, and related non-profit organizations.
- School districts will be encouraged to establish public/private partnerships to support full-time EE coordinators for each school.

In the State

- TDOE and TDEC will collaborate to create an environmental literacy coordinator position to direct implementation of the environmental literacy plan.
- Environmental literacy coordinator will work with partners to further align the Tennessee PreK-12 State Standards of Curriculum with the NAAEE PreK-12 Guidelines for Learning.
- The State DOE will recognize Environmental Literacy as certifiable area of teaching and/or an area for which an add-on endorsement can be granted.
- TDOE will work with TEEA to expand EEinTN website's database of EE opportunities for each region, e.g. field trip options, speakers.
- TDOE and TDEC will continue to support the Green Schools program which is designed to identify, recognize and provide incentives for schools to include education for environment literacy as an integral part of the curriculum.



Non-formal Education Opportunities

Environmental literacy is dependent upon both formal and non-formal education opportunities that lead to an environmentally literate citizenry. Non-formal learning opportunities are those that occur outside the formal K-12 education system, often at museums, local, state, and national parks, state and national forests, state and federal wildlife management areas, farms, nature centers or other environmental education centers. In addition to programming for formal school groups, these centers provide educational opportunities and places for people of all ages to explore the outdoors.

- TDOE will recognize Tennessee's network of parks, forests, wildlife management areas and other EE Centers as places to find EE resources, professional development, professional environmental educators, school programs, and outdoor experiences for students.
- State and metro parks, EE Centers, and other non-formal providers, such as Ag in the Classroom, will correlate their environmental education programming to the Tennessee PreK-12 State Standards of Curriculum.



Chapter 3: TN High School Graduation Requirements

Explore
Learn
Engage

Environmental Literacy (EL) in Current Requirements

The Tennessee Diploma Project (TDP), a broad overhaul of standards and curriculum designed to challenge students and better prepare them for college and the workforce,

was initiated Fall 2009 with the graduating Class of 2013. These new requirements are designed to better prepare each student for success in college, work, and citizenship. To earn a diploma, students will need to successfully complete the credit requirements and demonstrate proficiency in essential skills on the PLAN College Readiness Test (given in the 10th grade), the ACT, and End-of-Course (EOC) exams. As described in Chapter 2 and detailed in Appendices B and C, Environmental Literacy (EL)



Strands are easily tied to current standards in Science and Social Studies. Thus, aspects of EL are already found in current Tennessee graduation requirements in the following ways:

- Biology, U.S. Government, Economics, and U.S. History are required for graduation and all contain some standards and objectives tied to environmental literacy.
- Students may choose an ecology, earth science, or environmental science course for their third lab science required for graduation.
- In districts that require a Capstone Experience, students may choose a project related to the environment.

Recognizing “Environmental Literacy” as a context to assist students in satisfying diploma requirements in all subjects by demonstrating proficiency should also be explored.

Examples for how skill requirements might be met and assessed through environmental literacy activities should be further developed and disseminated by the state ELP coordinator.

Requirements for Students Beginning High School in Fall 2009

TOTAL CREDITS REQUIRED: 22

MATH: 4 Credits

Including Algebra I, II, Geometry and a fourth higher level math course

SCIENCE: 3 Credits

Including Biology, Chemistry or Physics, and a third lab course

ENGLISH: 4 Credits

SOCIAL STUDIES: 3 Credits

PHYSICAL EDUCATION AND WELLNESS: 1.5 Credits

PERSONAL FINANCE: 0.5 Credits

***FOREIGN LANGUAGE: 2 Credits**

***FINE ARTS: 1 Credit**

*May be waived for students not going to a University to expand and enhance the elective focus

ELECTIVE FOCUS: 3 Credits

Math and Science, Career and Technical Education, Fine Arts, Humanities, Advanced Placement (AP) or International Baccalaureate (IB)

CAPSTONE EXPERIENCE:

Requirements to be determined by local Board of Education

Future Goals

It is strongly recommended that Tennessee create a new graduation requirement for environmental literacy following the lead of the Maryland Department of Education. As of 2011-2012, Maryland DOE requires all students entering high school to complete a locally designed environmental literacy program that is approved by the state superintendent of schools.

(<http://www.dsd.state.md.us/comar/getfile.aspx?file=13a.04.17.01.htm>)

TELWG further recommends an environmental science course be one of the three required science courses (one biological, one physical, and one environmental). In addition it is recommended that physical education requirements be met by recognizing outdoor recreation activities such as canoeing, kayaking, climbing, mountain biking, caving, hiking, and camping.



Chapter 4: Professional Development

(Adapted with permission from the Oregon Environmental Literacy Plan)

Schools play a critical role in the preparation of environmentally literate students. Teachers are largely responsible for guiding the learning experiences that lead to environmental citizenship. Although there are numerous examples of individual teachers, whole schools, and districts integrating environmental literacy into their curricula throughout Tennessee, more needs to be done if we are to meet our ultimate goal of an environmentally literate citizenry.

Effectively implementing a strong State Environmental Literacy Plan will necessitate a many-pronged approach, reaching teachers currently in the classroom, those who are preparing to become teachers, and even the home-school and non-formal education communities. Classroom teachers must be made aware of the fact that they are already incorporating aspects of EL into their teaching, although they may be unfamiliar with the term. Thus, the need to define, refine, and expand their knowledge, skills, and abilities as they relate to EL is key.

The development of an effective environmental literacy professional development plan is predicated on a series of interrelated considerations. Best Practices of Environmental Literacy Instruction are included in Appendix D. With best practices and each of the following in mind, a comprehensive environmental literacy professional development program can be designed and implemented:

- Guiding Principles of Environmental Literacy Professional Development
- Systems of Support for Environmental Literacy Programming
- Educator Competencies for Environmental Literacy
- Key Characteristics of Professional Development



Guiding Principles of Environmental Literacy Professional Development

Professional development for environmental literacy is built from a core of guiding principles:

- All school personnel (administrators, teachers, and support staff) are integrally involved in fostering students' environmental literacy.
- A systematic approach to environmental literacy is taken when curriculum and instruction are planned, implemented and coordinated at all levels: district, school, and classroom.
- A systematic approach to professional development for environmental literacy is taken when professional development programs are planned, implemented and coordinated at all levels: district, school and classroom.
- To support a systematic approach to environmental literacy, professional development should be designed to meet the needs of administrators, teachers and support personnel, and should not be limited to the classroom teachers alone.



Systems of Support for Environmental Literacy Programming

Although the implementation of environmental literacy lies primarily in the hands of teachers, they do not work in a vacuum. Teachers rely upon a variety of networks and support systems to plan and implement a comprehensive and cohesive curriculum dedicated to the development of environmental literacy. To facilitate these efforts, various systems of support are recommended, including but not limited to: policy, school-community partnerships, communities of practice, curricular and material support systems, involvement of school facilities and operations, and training of administrators and all other school/district staff and funding. (See Chapter 6: Implementing TELP). As school systems revise and rework district requirements and curricula, they are encouraged to include EL within the documents.



Educator Competencies for Environmental Literacy (NAAEE, 2010)

Effective educators possess the understandings and skills associated with environmental literacy and instruction. They must be able to plan and implement high-quality, research-based, developmentally appropriate programs focusing on the environmental literacy learning of all students. Environmental literacy educators must possess competencies in: Environmental Literacy; Planning and Implementing Instruction for Environmental Literacy; Fostering Learning; Assessment; and Professional Responsibilities.



Environmental Literacy

- *Educators possess the understandings and skills as outlined in the Environmental Literacy Strands (Chapter 2). They:*
 - Develop questioning, analysis and interpretation skills through inquiry.
 - Apply knowledge of the physical and biological world and our interdependent relationship with it.
 - Investigate environmental issues and make informed decisions.
 - Understand and achieve personal and civic responsibility.

Planning and Implementing Instruction for Environmental Literacy

- *Educators are familiar with and can employ a range of instruction methods. They:*
 - Use a variety of settings to teach, including, but not limited to the school grounds, outdoor classrooms, the local neighborhood and off-site field trips to explore the local community.
 - Use a variety of teaching methods and strategies appropriate for the environmental content and context, including hands-on observation and discovery, inquiry, community-based action research and problem solving, service learning, problem-based learning, and project-based learning.
 - Allow students the opportunity to observe, explore, discover and experience.

- Facilitate systems thinking.
- Use the community, or place, as the context for learning.
- Provide students with experiences that create deep and lasting connections to place.
- Give students the opportunity to investigate and address real community issues



- Give students the opportunity to become citizen scientists.
- Build intrinsic motivation in students to guide their own powerful, learning experiences.
- Engage in long-term evidence-based investigative studies.
- Provide students with opportunities to participate in valuable work beyond the classroom.

- *Educators understand the importance of a safe and conducive learning environment both indoors and outdoors. They:*

- Demonstrate concern for learner safety in designing, planning and implementing instruction, especially experiences that are hands-on or take place outside the classroom.
- Identify, create, and use diverse settings for environmental literacy instruction appropriate to different subject matter and available resources.
- Facilitate learning in a variety of settings including, school yards, parks, field settings, community settings, farms, museums, zoos, demonstration sites, outdoor schools, etc.
- Plan and implement instruction that first links content to learners' immediate surroundings and experience, then expands learners' horizons as appropriate to larger environmental issues and contexts.



- *Educators are familiar with a range of curricular materials, resources, technologies, and settings for use in environmental literacy instruction. They:*
 - Describe the characteristics of effective environmental literacy instructional materials, resources, technologies, and settings.
 - Identify close-by local applied learning sites.
 - Engage with community, state and national partners.
 - Use a variety of tools for environmental observation, measurement, and monitoring.
 - Identify ways in which the community can be used as a resource, including local businesses, service organizations, government agencies, non-profit organizations, and others that may participate in and support instructional programs.
- *Educators seek opportunities to incorporate environmental literacy. They:*
 - Integrate environmental literacy into standards-based curricula and school programs.
 - Work with colleagues to enhance identified opportunities to integrate environmental literacy into their curriculum.
 - Organize instruction and, when appropriate, integrate instruction around environmental contexts and themes.
 - Build multi-disciplinary experiences.

Fostering Learning

- *Educators understand how to create a climate in which learners are intellectually stimulated and motivated to learn about the environment and sustainability. They:*
 - Relate the idea of lifelong learning to instruction practices that engage learners in taking responsibility for their own learning and expectations for achievement.



- Instill instruction with a sense of the importance and excitement of the content.
- Provide opportunities for experiences that increase learners' awareness of – and enthusiasm for – the natural and human-designed environment.
- Identify and use instructional techniques that encourage learners to ask questions and explore a variety of answers.
- *Educators know how to maximize learning by fostering openness and collaboration among learners. They:*
 - Identify and use ways to encourage flexibility, creativity, and openness, while considering the assumptions and interpretations that influence the conclusions drawn by others.
 - Relate learners' capacity for collaborative work to their ability to function as responsible and effective citizens.
 - Implement management techniques that foster independent and productive group work.
 - Include diverse cultures, races, genders, social groups, ages, and perspectives with respect, equity, and an acknowledgement of the value of such diversity.
 - Use diverse backgrounds and perspectives as instructional resources.
- *Educators know how to augment proper planning with the flexibility that allows them to take advantage of new instructional opportunities. They:*
 - Modify instructional plans and approaches, when appropriate, to take advantage of unexpected opportunities (e.g., new developments in community issues, recent events or phenomena that are in the news, or breakthroughs in scientific understanding) and learner questions and interests.



- Blend a variety of instructional methods and activities to meet instructional objectives.
- Work collaboratively with other educators and discipline areas, adapting instructional approaches as needed to blend or complement instructional styles and to meet shared environmental literacy goals.

Assessment

- *Educators understand the importance of tying assessment to learning.*
- *Educators are familiar with ways of incorporating assessment into environmental literacy instruction.*
- *Educators know how to use their instructional experiences and assessments to improve future instruction.*
- *Educators integrate assessment that meets the needs of diverse students into environmental literacy instruction.*

Professional Responsibilities

- *Educators understand their responsibility to provide environmental literacy instruction that is appropriate, constructive, and aligned with state standards.*
- *Educators understand that their commitment is to provide accurate, balanced, and effective instruction – not to promote a particular view about environmental conditions, issues, or actions. They:*

- Implement instructional techniques for presenting differing viewpoints and theories in a balanced manner and identify potential sources of bias in information.
- Commit to creating a classroom atmosphere that is open to inquiry.
- Identify and differentiate among informational sources and instructional materials on the basis of their factual accuracy and bias.
- Where there are differences of opinion or competing scientific explanations, select and use materials that present a range of differing viewpoints, ethical positions and interpretations.



- *Educators can articulate the need for environmental literacy. They:*
 - Develop a well-articulated rationale for environmental literacy instruction that describes key benefits to students and the importance of an environmentally literate citizenry.
 - Describe the multiple roles that alliances and partnerships play in advocacy efforts for K-12 environmental literacy.
- *Educators engage in environmental literacy professional development opportunities. They:*
 - Express the need for professional development, identify immediate professional development needs, and identify potential providers to meet these needs.
 - Participate in selected professional development that strengthens their environmental literacy, fosters reflection on practice, and improves environmental literacy instructional skills.
 - Engage in a reflective process to improve environmental literacy teaching and learning. They incorporate information gained from assessment results and feedback from students, parents and education professionals into their reflective process.
 - Identify, access, and use technology based resources in support of their environmental education professional development.
- *Educators identify and seek sources for instructional materials and funds, including public and private grants.*



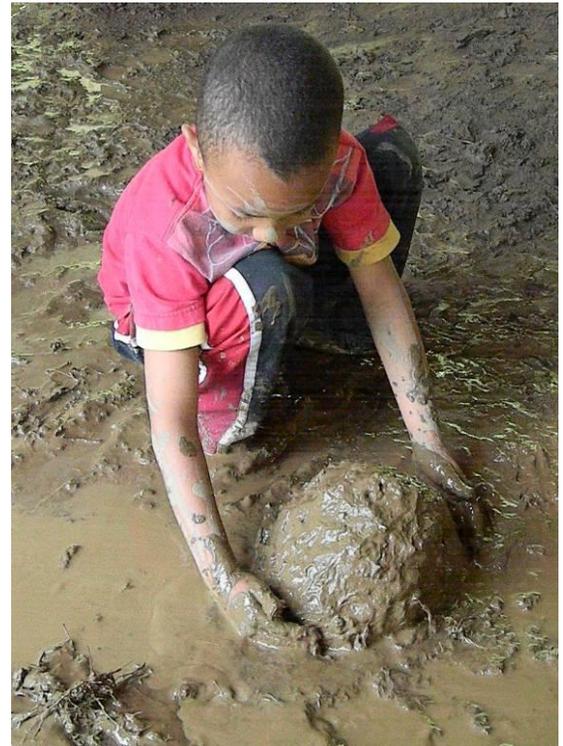
Key Characteristics of Professional Development (NSDC, 2001)

Providers of professional development programs support educators by providing the following critical content and skills in their trainings:

Content Information and Process Skills

- *Align content and skills to the Environmental Literacy Strands.*
- *Align content and skills to the Educator Competencies for Environmental Literacy.*

- *Clearly communicate fundamental, evidenced-based information.*
- *Teach content and skills by using an interdisciplinary process, inquiry, and application.*
- *Provide opportunities for educators to fully participate as learners in inquiry, field strategies, issues investigations, etc.*
- *Practice civil discourse to engage in difficult issues.*
- *Provide curricular/support materials to supplement training and ensure an ease of transference into the classroom.*



Developmentally Appropriate Lessons

- *Ensure age suitable learning by matching instructional materials to the ages of learners being taught.*
- *Scaffold experiences and concepts.*
 - Demonstrate for educators how to build the foundation of learning experiences in early years and expand them as students mature – what starts small as a schoolyard investigation in 1st grade can develop into problem solving and schoolyard restoration projects in 5th grade.
 - Provide instructional strategies that help to manage cognitive loads; (i.e., introduce inquiry in 5th grade using 4th grade concepts)

Engaging, Hands-on Activities

- *Provide safe environments where educators can take risks to understand the balance between trust and control.*

Tools and Techniques to Engage Students in Outdoor Learning

- *Present learning opportunities in the natural and built environment within and around the school to help educators locate easily accessible learning settings.*
- *Build efficacy by providing educators with the resources they need to feel comfortable and prepared.*

Inquiry-based Learning

- *Provide first hand experiences that give educators opportunities to explore, ask their own questions, investigate, and collect information.*

- *Demonstrate how child-directed and teacher-directed inquiry lessons are structured.*
- *Provide opportunities for educators to participate as active learners, practicing inquiry and essential skills.*

State Standards, Essential Skills and Diploma Requirements

- *Exhibit ties to educational standards and diploma requirements.*
- *Show connections between topics, standards, disciplines, and career preparation.*
- *Use essential skills and diploma requirements to support civic and global learning experiences.*

Encourage the Discovery of “Sense of Self” – Teach About Connecting with the Individual

- *Promote the social and emotional or affective learning domains along with the cognitive domain.*
- *Foster respectful and trusting learning environments.*
 - Student-to-student, teacher-to-student, etc.
 - Model a sense of caring and respect
 - Respect for elders
 - Respectful engagement
 - Model caring and kindness

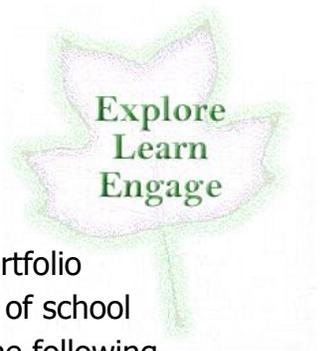


Community Partners

- *Provide guidance on recruiting and training chaperones and working with local partners and volunteers.*
- *Demonstrate collaboration – provide trainings in coordination with other entities.*
- *Offer internships with appropriate professionals/scientists.*

Chapter 5: Environmental Literacy Measurement

Strategies for Measuring Environmental Literacy



A wide range of assessments should be used, perhaps implementing a portfolio approach using many different projects and assessments over the course of school careers to effectively measure their environmental literacy. Inclusion of the following criteria is recommended:

- Student completion of a senior year graduation project (Capstone Project) on a local environmental issue.
- Strengthen the state program for assessment through thorough use of the crosswalk of environmental literacy strands, Tennessee State standards and existing assessment tools.
- Assess a student's environmental literacy via Work Samples – “A work sample is a representative sample of individual student work (e.g., research paper, statistical experiment, speaking presentation) that is scored using an official state scoring guide (i.e., writing, speaking, mathematics problem solving, scientific inquiry, and social science analysis). A rubric will be created to be shared with students and a scoring guide provided to teachers.
- Student participation in service learning projects that focus on environmental topics. Student knowledge and skills will be assessed via an oral presentation or paper after project completion.
- Student participation in Envirothon and other competitions with an environmental focus, such as science fairs, in which the research topic is a local environmental issue. Local Education Agencies (LEAs) will be provided with guidance for assessing student learning and be responsible for assessment.
- Enrollment and pass rates in Career and Technical Education classes that relate to green technology (the application of one or more of environmental science, green chemistry, environmental monitoring and electronic devices to monitor, model and conserve the natural environment and resources, and to curb the negative impacts of human involvement).



- Pass rate for questions related to standards/objectives aligned with environmental literacy from currently required TCAP and End of Course (EOC) tests.
 - 5th Grade Science TCAP
 - 8th Grade Science TCAP
 - Biology EOC
 - US History EOC
- Use test scores from Ecology, Environmental Science, and Earth Science. Local Education Agencies will report student enrollment and pass rate for these courses.
- Number of students participating in non-formal education experiences at EE Centers that are integrated in the school curriculum. Student learning will be assessed with pre- and post-trip quizzes for all grades and an additional oral or written presentation for grades 6-12.
- Amount of time students spend outside engaging with nature as part of the school curriculum. Assessment will be obtained from a teacher survey.

In addition, student access to an environmentally literate school community might figure into the assessment:

- Number of schools that have designated outdoor learning environments.
- Number of schools designated as "green schools" for their sustainability initiatives. Green Schools involve students in campus and community projects that reduce waste, conserve energy and water, decrease hazardous chemicals, improve air quality, and create wildlife habitat.

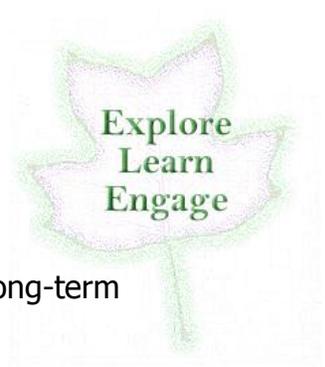


Baseline Data

A December 2010 pilot study assessed a sample of seniors at five Tennessee high schools using an abridged assessment focused on demographic information and cognitive learning outcomes (Appendices E and F). TELWG recommends that this study be duplicated to determine the environmental literacy levels of existing high school students. The Tennessee test will be based on the widely accepted Wisconsin environmental literacy assessment (<http://www.csu.edu/cerc/researchreports/documents/EnvironmentalEducationInWisconsinAreWeTalkingTheTalk.pdf>) with forty questions taken from Wisconsin's longer survey. An extended baseline test will include schools representing East, Middle and West Tennessee, with a mixture of urban and rural, public and independent, large and small schools. The purpose of the assessment will be to determine environmental literacy in Tennessee students, not compare schools to each other. Once schools are selected and agree to participate, paper surveys and Scantron answer sheets will be provided to the schools, and students will be given 30 minutes to complete the 40 question survey, as in the pilot study. Once the surveys are returned, the answers will be analyzed to determine the baseline environmental literacy levels. This same test can be used in assessing the environmental literacy of future students.

TELWG has completed a Crosswalk with DOE science standards and has proposed standards to be included in the Social Studies standards, which are currently under review. This crosswalk will be useful in determining how the testing currently in place evaluates environmental literacy.





Chapter 6: Implementing TELP

TELP has wide-reaching implications and consists of both short-term and long-term goals. Ultimately, the TELP expects to see the following goals met:

- TELP is integrated across disciplines and grade levels in all K-12 institutions with mentoring programs at the university level.
- Every grade level has aspects of environmental literacy built into the curriculum at the school and district level.
- Every graduating K-12 student in Tennessee can demonstrate proficiency in all



Environmental Literacy Strands.

- Every K-12 student has environmental education experiences outside the classroom throughout their educational career.
- Every student impacts their subsequent jobs, families and organizations through the knowledge, skills, perspectives and values they demonstrate as environmentally literate citizens.

Educational Stakeholders

Implementation of the TELP will involve all aspects of the K-12 system. Each of the following educational stakeholders should be involved with each aspect of implementation:

- Tennessee Department of Education
- State curriculum specialists (e.g. Social Studies, Science, Math, Language Arts)
- All school district staff, including administrators and non-teaching staff
- Individual schools, and individual teachers of all grade levels and subjects
- Independent, charter and home-school networks
- State and local school boards

- Teacher preparation colleges and universities
- Non-profit and government entities
- Parents and students
- School-related associations
- Each of these entities is vital to ensuring that the TELP is integrated throughout the state.

EE in Tennessee

The “EE in Tennessee” website (www.eeintennessee.org), hosted by diverse partners and funded by TEEA, has a search engine that allows educators to find environmental education resources across Tennessee sorted by region or topic or type of resource. The website also has links to the correlations of Project WET, Project WILD, and Project Learning Tree with the state standards for Grades K-8 and Secondary Science Courses (Biology, Agri-science, Environmental Science, and Ecology). Since the Projects are correlated to the national standards for EE as established by NAAEE (*Excellence in EE - Guideline for Learning*), when Tennessee teachers use the correlated activities for each grade level, Tennessee students will be developing environmental literacy.

Launching the Plan

The following steps are recommended to ensure environmental literacy in every high school graduate. Many steps are dependent on finding and allocating funding resources.

Tennessee Environmental Literacy Plan Working Group

- TELWG will submit an environmental literacy plan for adoption to TDOE.

Statewide Coordinator

- For the TELP to attain its full potential, a state environmental literacy coordinator is needed. This coordinator will occupy the former Project CENTS position within the Tennessee Department of Education, to be funded by TDEC (See the EL Coordinator job description in Appendix G).



- The statewide coordinator will serve as a liaison among state agencies to review existing “inquiry” materials and develop Tennessee specific learning materials and guides, which will include place-based education.
- The statewide coordinator, in conjunction with TDEC and TDOE, will establish an ongoing Environmental Literacy Steering Group, with term limits for members. The steering group will advise the statewide plan coordinator and aid in implementation of the plan. The steering group will include, but not be limited to, members of TDOE, TDEC, TWRA, TEEA, and ECO-TN (after plan’s adoption by DOE).
- The statewide coordinator and the environmental literacy steering group will identify and define the roles for each level of the school system in order to fully and successfully integrate the content, professional development and assessment of environmental literacy.

Strands and Standards

- Cross-reference and align the Environmental Literacy Strands with Tennessee standards and diploma requirements.
- Identify any gaps that exist and create a plan to incorporate them into standards and graduation requirements.

Student Outcomes

- Schools provide students weekly outdoor environmental activity.
- Identify research opportunities, internships and EE programs for high school student participation.
- Require students to research and participate in an environmental project within the community. This could serve as the student’s Capstone Project.
- Create a new graduation requirement that requires all students to complete an environmental literacy program. This would include environmental science as one of the three required science courses.
- Work with local school districts to design a place-based environmental literacy program to satisfy the environmental literacy graduation requirement.



Outreach

- Create ELP tab on EEinTN website and invite stakeholders across the state to review draft EL Plan.
- Provide EL resources to all school systems including the TDOE, school districts, teachers, and communities, regarding environmental education, its benefits and the TELP.
- Provide training in environmental literacy topics at professional development conferences to further integrate aspects of environmental education across disciplines.



Inventory Current Efforts

- Inventory existing professional development programs and resources in the state and identify gaps. (2010/2011)
- Create report from survey of non-formal institutions. (2011)
- Survey teachers in all school districts about their interest in EE, their use of EE opportunities and their current training. (2011)
- Survey school districts and non-profits to ascertain existing loanable EE materials (water quality kits, nets, etc.) (2011)
- Coordinate with STEM Hubs to provide EL resources.
- Increase EEinTN website's database of EE opportunities, e.g. field trip options, speakers, for each region.

Professional Development

- Create and implement strategies to fill statewide professional development gaps with opportunities that can be accessed statewide to support environmental literacy.
- Conduct needs assessment to identify which environmental literacy strands are not currently supported with adequate professional development opportunities (gaps).
- Conduct a series of "Introduction to EE" workshops statewide to bring practicing teachers 'up to speed' on EL and its ramifications.
- Develop and implement a plan to fill the formal and non-formal educator EL professional development gaps.
- Align plan with NAAEE Guidelines.
- Explore ways to measure professional development –both formal and non-formal; consider endorsements, incentives and/or certification programs.

- Disseminate benefits of EE and use of EEinTN website resources.
- Evaluate environmental literacy content in Tennessee university and college Schools of Education.
- Develop and implement an environmental education training plan for all pre-service teachers.
- Require pre-service teachers to take EE Praxis exam. (Dept. of Licensure)
- Establish certification in environmental literacy/EL education at the state level (or at the minimum, a secondary endorsement).

Resources/Regional Hubs & Coordinators

- Develop digital libraries to house the state inventory of environmental literacy resources.
 - Easily accessible and searchable collections of vetted materials, lesson plans, innovative programs that demonstrate environmental literacy.
 - Links to Tennessee Department of Education standards.
 - Directory of local partners, grant or other funding opportunities, field trip sites, etc.
 - Case studies from all levels that support environmental literacy.
 - Opportunity for users to write reviews.
 - Identify sites with easily accessible libraries including DOE, school districts, schools, community libraries and www.eeintennessee.org.
- Create a template for regional hub development including:
 - Parameters for establishing regional boundaries (East, Middle, West).
 - Frameworks to support the development of mutually beneficial partnerships with schools/districts, community organizations, businesses and government agencies.
 - Suggestions for creating regional lending libraries for shared instructional materials and kits, tools, monitoring equipment, etc.
- Hire Regional Coordinators to oversee each regional hub and serve as the go-to person for the region.



Teacher Support/Green Learning Environment

- Provide appropriate planning support and substitute time for teachers who provide environmental literacy experiences.
- Encourage teachers to use PLC days to plan EL incorporation with guidance from administration and partners.
- Develop strategies for promoting staff expertise in environmental literacy – cultivate an understanding of how to measure EL.
- Create green school buildings to support environmental literacy education and to serve as inspiration and example to students and faculty.
- Work closely with Education departments in Tennessee colleges and universities.
- Educate all school staff, including custodians and groundskeepers, on the importance of a green learning environment.

Partnerships

- Coordinate efforts with other state initiatives in Tennessee, including initiatives by DOE Coordinated School Health, Tennessee Obesity Prevention (Eat Well, Play More), TEEA, TCOBOR, Science, Technology, Engineering and Math (STEM), TRPA (The Nature of Play), Tennessee Wildlife Federation, Cumberland River Compact, State and National Parks and Forests and wildlife management areas.



Funding and In-Kind Contributions

- Request that TDEC reinstate funds for ELP Coordinator/Project CENTS position.
- Find funding to supporting regional coordinator positions.
- Identify potential sources across the state for funding and in-kind contributions for ELP implementation with a focus on place-based education:
 - Local: PTAs, non-profits (particularly those involved with conservation, agriculture, and the environment), businesses, education association chapters, watershed groups, parks and recreation departments, service organizations and clubs (e.g. Rotary Clubs) and community groups, etc.
 - State: TDEC, TWRA, TEEA, TN Division of Forestry, TWF, Dept. of Health, etc.
 - Federal: No Child Left Inside Act, Innovation Fund, EPA, Health, DOT, NOAA, NRCS, etc.
- Identify an entity to hold the funds and an agency for grant administration.
- Establish a grant program focused on equitable, regional distribution of funds.
- Develop guidelines for accessing Plan funds.
 - Small grants disbursed to individual teachers and classrooms.
 - Larger regional grants might go to a regional hub, watershed, school district, etc.
 - Consider three-year grant cycles to support planning and implementation.

Assessment

- Develop and implement a detailed prescription for assessing the environmental literacy of Tennessee students, specifically on 5th grade EOG and 9th grade Biology EOC exams.



Chapter 7: Timelines



Short Term Timeline for Establishing TELP

October 2009 – January 2011

2009	Benchmarks
October	ECO-TN and TEEA representatives have first conference call to establish mission and review the 5 elements of an Environmental Literacy Plan as described by the No Child Left Inside Act.
November	TELP committee members meet with Dr. Timothy Webb, Commissioner of the TN Dept. of Ed., to pitch environmental literacy plan. TEEA receives a \$750 grant from EETAP to support an environmental literacy planning workshop.
December	TELP committee organizes an environmental literacy planning workshop for January and expands list of stakeholders, cementing partnership with TDOE.
2010	
January	Alison Heimowitz facilitates an ELP workshop using the <i>Guidelines for Excellence in Environmental Education</i> with a variety of stakeholders.
February	Executive committee for TELP forms.
March	Smaller working groups form so that TELP members can serve in best capacity for their interest/expertise. Work on establishing our own definition of EL and Strands for Standards begins.
April	TDOE sets up Wiki for TELP working groups to discuss elements of the plan.
May	TELP is discussed with wider audience of stakeholders at the Tennessee Governor's Summit on Every Child Outdoors at Montgomery Bell State Park. TELP Executive Committee submits NCLI Activities Survey to NAAEE.
June	TELP committee reviews draft short-term timeline, introduction and EL Standards documents for TELP.
July	TELP committee is renamed TELWG. Definition of environmental literacy is established. Three underpinning themes for EL standards are identified.
August	Draft pre-proposal for a NOAA professional development grant is reviewed.
September	Survey for non-formal educators is created and distributed. ELP progress is presented at TEEA annual conference's business meeting.
October	TELWG members begin cross-referencing Science standards with NAAEE Guidelines.
November	Baseline survey of EL for High School Seniors is developed and distributed.

December	High school survey results are compiled into a report.
January 2011	Executive committee member participates in EL conference call with New England states and reports new ideas. Long Term Timeline is drafted.
October 2011	Environmental Literacy Plan Draft is posted on www.eeintennessee.com for review.
December 2011	Draft review period ends.
January-May 2012	TELWG discusses comments received during review period. Work on Science Crosswalk continues. Document is edited.
July 23, 2012	TELWG members meet with TDEC and TDOE to present the ELP. ELP is accepted by Brock Hill on behalf of TDEC and by Linda Jordan on behalf of TDOE. Tennessee has an official Environmental Literacy Plan.

Long Term Timeline for Implementing TELP

2011 – 2015

Objective	2011	2012	2013	2014	2015
1. TELWG will submit environmental literacy plan for adoption to TDOE.		X			
2. Establish an ongoing Environmental Literacy Steering Group.			X		
3. State EL coordinator will occupy the former Project CENTS position within the Department of Education, to be funded by Tennessee Department of Environment and Conservation.			X		
4. Cross-reference/align the Environmental Literacy Strands with Tennessee standards and diploma requirements.	X	X	X	X	X
5. Develop and implement a detailed prescription for assessing the environmental literacy of Tennessee students.		X	X		

Objective	2011	2012	2013	2014	2015
6. Require students to research and participate in an environmental project within the community.		X			
7. Provide EL resources to all school systems including the TDOE, school districts, teachers, and communities, regarding environmental education, its benefits and the TELP.		X	X		
8. Inventory existing professional development programs and resources in the state and identify gaps in environmental literacy training.		X			
9. Survey teachers in all school districts about their interest in EE, their use of EE opportunities, and their current training.	X	X			
10. Increase EEinTN website's database of EE opportunities, e.g. field trip options, speakers, for each region.	X	X	X	X	X
11. Conduct needs assessment to identify which environmental literacy strands are not currently supported with adequate professional development opportunities (gaps).				X	X
12. Explore ways to measure professional development –both formal and non-formal; consider endorsements, incentives and/or certification programs.			X	X	X
13. Create regional hubs for EL lending libraries of shared instructional materials and kits, tools, monitoring equipment, etc.			X		
14. Secure funding for and hire regional coordinators to oversee each EL hub.				X	X
15. Coordinate efforts with other state initiatives in Tennessee.	X	X	X	X	X

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Appendices

- A. Tennessee Environmental Literacy Working Group (TELWG)
- B. Tennessee Science Standard Crosswalk
- C. Tennessee Social Studies – Embedded Environmental Literacy
- D. Best Practices for Environmental Literacy Instruction
- E. Tennessee Pilot Test for Environmental Literacy
- F. Results of Tennessee Pilot Test for Environmental Literacy
- G. Statewide EL Coordinator Job Description



APPENDIX A:

Tennessee Environmental Literacy Working Group

Executive Committee

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APPENDIX B:

Tennessee Science Standard Crosswalk

The following crosswalk aligns the Tennessee State science standards (<http://www.tn.gov/education/ci/sci/index.shtml>) to the guidelines for environmental education created by the North American Association for Environmental Education (NAAEE). The guidelines are organized into four strands, each of which represents a broad aspect of environmental education and its goal of environmental literacy. The strands are as follows:

Strand 1: Questioning, Analysis and Interpretation Skills

Environmental literacy depends on learners' ability to ask questions, speculate, and hypothesize about the world around them, seek information, and develop answers to their questions. Learners must be familiar with inquiry, master fundamental skills for gathering and organizing information, and interpret and synthesize information to develop and communicate explanations.

Strand 2: Knowledge of Environmental Processes and Systems

An important component of environmental literacy is understanding the processes and systems that comprise the environment, including human social systems and influences. That understanding is based on knowledge synthesized from across traditional disciplines. The guidelines in this section are grouped in four sub-categories:

- ☐ 2.1—The Earth as a physical system
- ☐ 2.2—The living environment
- ☐ 2.3—Humans and their societies
- ☐ 2.4—Environment and society

Strand 3: Skills for Understanding and Addressing Environmental Issues

Skills and knowledge are refined and applied in the context of environmental issues. These environmental issues are real-life dramas where differing viewpoints about environmental problems and their potential solutions are played out. Environmental literacy includes the abilities to define, learn about, evaluate, and act on environmental issues. In this section, the guidelines are grouped in two sub-categories:

- ☐ 3.1—Skills for analyzing and investigating environmental issues
- ☐ 3.2—Decision-making and citizenship skills

Strand 4: Personal and Civic Responsibility

Environmentally literate citizens are willing and able to act on their own conclusions about what should be done to ensure environmental quality. As learners develop and apply concept based learning and skills for inquiry, analysis, and action, they also understand that what they do individually and in groups can make a difference.

To view the NAAEE guidelines see Excellence in Environmental Education: Guidelines for Learning (K-12) at <http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf>

TENNESSEE SCIENCE STANDARDS CROSSWALK

Life Science Standard 1.0: Cells

Conceptual Strand 1

All living things are made of cells that perform functions necessary for life.

Guiding Question 1

How are plant and animals cells organized to carry on the processes of life?

Grade Level Expectations		NAAEE
K	GLE 007.1.1 Recognize that many things are made of parts.	Strand 2.2.A Identify similarities and differences among living organisms. Strand 2.2.B Identify some basic traits of plants and animals.
1	GLE 0107.1.1 Recognize that living things have parts that work together.	Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences. Strand 2.2.B Identify some basic traits of plants and animals.
2	GLE 0207.1.2 Use tools to examine different body parts (e.g., skin, eyes, hair, fingernails, ears) and plant structures.	Strand 1.C.i Observe and record characteristics, differences, and change in objects, organisms, events, places, and relationships. Strand 1.C.iv Use tools such as rulers, thermometers, watches, scales, magnifiers, and microscopes to make observations and measurements. Strand 1.C.v Use computers, calculators, and other devices to conduct investigations and manipulate information.
	GLE 0207.1.1 Recognize that plants and animals are made up of smaller parts that use food, water, and air to survive.	Strand 2.2.A.i Identify similarities and differences among living organisms. Strand 2.2.A.iii Describe the basic needs of all living things and describe how organisms meet their needs in different environments.
3	GLE 0307.1.1 Use magnifiers to make observations of specific plant and body parts and describe their functions.	Strand 1.C.4.iiii Use tools such as rulers, magnifiers, and microscopes to make observations and measurements.
4	GLE 0407.1.1 Recognize that cells are the building blocks of all living things.	Strand 2.2.A.i Identify similarities and differences among living organisms ranging from single-celled organisms they can observe under microscopes to plants and animals they encounter through direct observations, videos, books, or other media.

Life Science Standard 2.0: Interdependence

Conceptual Strand 2

All life is interdependent and interacts with the environment

Guiding Question 2

How do living things interact with one another and with the non-living elements of their environment?

Grade Level Expectations		NAAEE
K	GLE 0007.2.1 Recognize that some things are living and some are not.	Strand 1.C.i Observe and record characteristics, differences and change in objects, organisms, events, places and relationships in the environment.
	GLE 0007.2.2 Know that people interact with their environment through their senses.	Strand 1.A.i Identify questions they are likely to be able to answer by combining their own observations and investigations of the environment with existing information. Strand 2.2.C.i Describe ways in which an organism's behavior patterns are related to its environment.
1	GLE 0107.2.1 Distinguish between living and non-living things in an environment.	Strand 2.B Learners are able to identify basic characteristics of and changes in matter.
2	GLE 0207.2.1 Investigate the habitats of different kinds of local plants and animals.	Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations. Strand 1.B.i, ii, iii Learners are able to design simple investigations. Strand 1.C.i, ii, iii, iv Learners are able to locate and collect information about the environment and environmental topics. Strand 2.2.A.iii Describe the basic needs of all living things and explain how organisms meet their needs in different types of environments such as deserts, lakes, or forests.
	GLE 0207.2.2 Investigate living things found in different kinds of places.	Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations. Strand 1.B.i, ii, iii Learners are able to design simple investigations. Strand 1.C.i, ii, iii, iv Learners are able to locate and collect information about the environment and environmental topics. Strand 2.2.A.iii Describe the basic needs of all living things and explain how organisms meet their needs in different types of environments such as deserts, lakes, or forests.

	GLE 0207.2.3 Identify basic ways that plants and animals depend on each other.	Strand 2.2.C.iii Identify ways in which organisms are interdependent.
3	GLE 0307.2.1 Categorize things as living or non-living.	Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics. Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter.
	GLE 0307.2.2 Explain how organisms with similar needs compete with one another for resources such as food, space, water, air, and shelter.	Strand 2.2.A.iii Describe the basic needs of all living things and explain how organisms meet their needs in different environments. Strand 2.2.B.i Describe ways in which an organism's behavior patterns are related to its environment. Strand 2.2.B.iii Identify ways in which organisms are interdependent.
4	GLE 0407.2.1 Analyze the effects of changes in the environment on the stability of an ecosystem.	Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations. Strand 1.C.i, ii, iii, iv Learners are able to locate and collect information about the environment and environmental topics. Strand 1.G Learners can develop simple explanations that address their questions about the environment. Strand 2.2.C Learners understand basic ways in which organisms are related to their environments and to other organisms. Describe ways in which an organism's behavior patterns are related to its environment. Identify examples of environmental change and discuss how these changes may be helpful or harmful to particular organisms. Identify ways in which organisms (including humans) cause changes in their own environment. Strand 3.1.B.ii Discuss how an environmental issue affects individuals, groups, and the ecosystem.

5	GLE 0507.2.1 Investigate different nutritional relationships among organisms in an ecosystem.	<p>Strand 2.2.C.i. Describe and give examples of producer/consumer, predator/prey, and parasite/host relationships.</p> <p>Strand 2.2.C.ii. Identify organisms that are scavengers or decomposers. Describe the roles they play within particular systems focusing on their relationship to other organisms and physical elements of the system.</p> <p>Standard 2.2.D.i. Trace the flow of energy through food webs that identify relationships among organisms in natural systems.</p> <p>Standard 2.2.D.ii. Explain how matter is transferred among organisms and between organisms and their environment in these food webs.</p>
	GLE 0507.2.2 Explain how organisms interact through symbiotic, commensal, and parasitic relationships.	<p>Strand 2.2 Learners understand major kinds of interactions among organisms or populations of organisms.</p> <p>Strand 2.2.C.i. Describe and give examples of producer/consumer, predator/prey, and parasite/host relationships.</p>
	GLE 0507.2.3 Establish the connections between human activities and natural disasters and their impact on the environment.	Strand 2.4 Learners understand that human-caused changes have consequences for the immediate environment as well as for other places and future times.
6	GLE 0607.2.1 Examine the roles of consumers, producers, and decomposers in a biological community.	<p>Strand 2.2 Learners understand that biotic communities are made up of plants and animals that are adapted to live in particular environments.</p> <p>Strand 2.2 Learners understand major kinds of interactions among organisms or populations of organisms.</p>
	GLE 0607.2.2 Describe how matter and energy are transferred through an ecosystem.	Strand 2.2 Learners understand how energy and matter flow among the abiotic and biotic components of the environment.
	GLE 0607.2.3 Draw conclusions from data about interactions between the biotic and abiotic elements of a particular environment.	Strand 2.2 Learners understand how energy and matter flow among the abiotic and biotic components of the environment.
	GLE 0607.2.4 Analyze the environments and the interdependence among organisms found in the world's major biomes.	Strand 2.2 Learners understand that biotic communities are made up of plants and animals that are adapted to live in particular environments.
7-8	Not addressed at this grade level	

9 (Biology)	CLE 3210.2.1 Investigate how the dynamic equilibrium of an ecological community is associated with interactions among its organisms.	Strand 2.2.A Learners understand basic population’s dynamics and the importance of diversity in living systems.
	CLE 3210.2.2 Analyze and interpret population data, graphs, or diagrams.	Strand 1.F Learners are able to create, use, and evaluate models to understand environmental phenomena. Strand 2.2.A Learners understand basic population’s dynamics and the importance of diversity in living systems.
	CLE 3210.2.3 Predict how global climate change, human activity, geologic events, and the introduction of non-native species impact an ecosystem.	Strand 2.2.C Learners understand the living environment to be comprised of interrelated, dynamic systems. Strand 2.3.B Learners understand cultural perspectives and dynamics and apply their understanding in context. Strand 2.3.C Learners understand how different political and economic systems account for, manage, and affect natural resources and environmental quality. Strand 2.3.D Learners are able to analyze global, social, cultural, political, economic, and environmental linkages. Strand 2.4.A Learners understand that humans are able to alter the physical environment to meet their needs and that there are limits to the ability of the environment to absorb impacts or meet human needs.
	CLE 3210.2.4 Describe the sequence of events associated with biological succession.	Strand 2.2.B Learners understand the basic ideas and genetic mechanics behind biological evolution. Strand 2.2.D Learners are able to account for environmental characteristics based on their knowledge of how matter and energy interacts in living systems.

Life Science Standard 3.0: Flow of Matter and Energy

Conceptual Strand 3

Matter and energy flow through the biosphere.

Guiding Question 3

What scientific information explains how matter and energy flow through the biosphere?

Grade Level Expectations		NAAEE
K	GLE 0007.3.1 Recognize that living things require water, food, and air.	Strand 2.2.A.iii Describe the basic needs of all living things and explain how organisms meet their needs in different types of environments such as deserts, lakes, or forests.
1	GLE 0107.3.1 Recognize that plants and animals are living things that grow and change over time.	Strand 2.2.D.iii Explain the process of life, growth, death, and decay of living organisms as a form of recycling.
2	GLE 0207.3.1 Recognize that animals eat plants or other animals for food.	Strand 2.2.B.iii Identify ways in which organisms are interdependent.
3	GLE 0307.3.1 Describe how animals use food to obtain energy and materials for growth and repair.	Strand 2.2.D.i Explain how most living organisms depend on the sun as the source of their life energy. Give examples that illustrate the understanding that animals ultimately depend on plants for this energy and that plants depend on the sun.

4	GLE 0407.3.1 Demonstrate that plants require light energy to grow and survive.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2.D Learners know that living things are made of cells and need some source of energy to live and grow. Explain how most living organisms depend on the sun as a source of their life energy.</p>
	GLE 0407.3.2 Investigate different ways that organisms meet their energy needs.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2 C.i & ii Describe and give examples of producer/consumer, predator/prey, and parasite/host relationships. Identify organisms that are scavengers or decomposers.</p> <p>Strand 2.2 D.i Trace The flow of energy through food webs that identify relationships among organisms in natural systems.</p>
5	GLE 0507.3.1 Demonstrate how all living things rely on the process of photosynthesis to obtain energy.	<p>Strand 2.2.Diii Describe how energy, which enters ecosystems as sunlight, changes form and is transferred in the exchanges (production, consumption, and decomposition) that comprises food webs.</p> <p>Strand 2.2 Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p> <p>Strand 2.2 Learners understand how energy and matter flow among the abiotic and biotic components of the environment.</p>

6	Not addressed at this grade level	
7	GLE 0707.3.1 Distinguish between the basic features of photosynthesis and respiration.	<p>Strand 2.1.B Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena.</p> <p>Learners understand the properties of substances that make up objects or materials found in the environment.</p>
	GLE 0707.3.2 Investigate the exchange of oxygen and carbon dioxide between living things and the environment.	<p>Strand 2.1.B Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena.</p> <p>Learners understand the properties of substances that make up objects or materials found in the environment.</p>
8	Not addressed at this grade level	
9 (Biology)	CLE 3210.3.1 Analyze energy flow through an ecosystem.	<p>Strand 2.1.C Learners apply their knowledge of energy and matter to understand phenomena in the world around them.</p> <p>Strand 2.2.D Learners are able to account for environmental characteristics based on their knowledge of how matter and energy interact in living systems.</p>
	CLE 3210.3.2 Distinguish between aerobic and anaerobic respiration.	Strand 2.1.B Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena.
	CLE 3210.3.3 Investigate the relationship between the processes of photosynthesis and cellular respiration.	<p>Strand 2.1.B Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena.</p> <p>Strand 2.2.C Learners understand the living environment to be comprised of interrelated, dynamic systems.</p>
	CLE 3210.3.4 Describe the events which occur during the major biogeochemical cycles.	<p>Strand 2.1.B Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena</p> <p>Strand 2.2.D Learners are able to account for environmental characteristics based on their knowledge of how matter and energy interact in living systems.</p>

Life Science Standard 4.0: Heredity

Conceptual Strand 4

Plants and animals reproduce and transmit hereditary information between generations.

Guiding Question 4

What are the principal mechanisms by which living things reproduce and transmit information between parents and offspring?

Grade Level Expectations		NAAEE
K	GLE 0007.4.1 Observe how plants and animals change as they grow.	Strand 1.C.i Observe and record characteristics, differences, and change in objects, organisms, events, places, and relationships in the environment.
	GLE 0007.4.2 Observe that offspring resemble their parents.	Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations. Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics. Strand 2.2.B.ii Identify some similarities among offspring and parents as being inherited and others as resulting from the organism's interactions with its environment.
1	GLE 0107.4.1 Observe and illustrate the life cycle of animals.	Strand 1.C.i Observe and record characteristics, differences, and change in objects, organisms, events, places, and relationships in the environment. Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences. Strand 2.2.D.iii Explain the process of life, growth, death, and decay of living organisms as a form of recycling.
	GLE 0107.4.2 Describe ways in which animals closely resemble their parents.	Strand 2.2 B Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.
2	GLE 0207.4.1 Compare the life cycles of various organisms.	Strand 1.C.i Observe and record characteristics, differences, and change in objects, organisms, events, places, and relationships in the environment. Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics. Strand 2.2.D.iii Explain the process of life, growth, death, and decay of living organisms as a form of recycling.
	GLE 0207.4.2 Realize that parents pass along physical characteristics to their offspring.	Strand 2.2 B Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.

3	GLE 0307.4.1 Identify the different life stages through which plants and animals pass.	Strand 2.2.D.iii Explain the process of life, growth, death, and decay of living organisms as a form of recycling.
	GLE 0307.4.2 Recognize common human characteristics that are transmitted from parents to offspring.	Strand 2.2 B Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.
4	GLE 0407.4.1 Recognize the relationship between reproduction and the continuation of a species.	Strand 2.2 B Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.
	GLE 0407.4.2 Differentiate between complete and incomplete metamorphosis.	Strand 2.2.A.ii Classify or group organisms using categories.
5	GLE 0507.4.1 Describe how genetic information is passed from parents to offspring during reproduction.	Strand 2.2 Learners have a basic understanding of the importance of genetic heritage. Strand 2.2.B.ii Identify some similarities among offspring and parents as being inherited and others as resulting from the organism's interactions with its environment.
	GLE 0507.4.2 Recognize that some characteristics are inherited while others result from interactions with the environment.	Strand 2.2 Learners have a basic understanding of the importance of genetic heritage.
6	Not addressed at this grade level	
7	GLE 0707.4.1 Compare and contrast the fundamental features of sexual and asexual reproduction.	Strand 2.2.B Learners have a basic understanding of the importance of genetic heritage.
	GLE 0707.4.2 Demonstrate an understanding of sexual reproduction in flowering plants.	Strand 2.2.B Learners have a basic understanding of the importance of genetic heritage.
	GLE 0707.4.3 Explain the relationship among genes, chromosomes, and inherited traits.	Strand 2.2.B Learners have a basic understanding of the importance of genetic heritage.
	GLE 0707.4.4 Predict the probable appearance of offspring based on the genetic characteristics of the parents.	Strand 2.2.B Learners have a basic understanding of the importance of genetic heritage.

8	Not addressed at this grade level	
9 (Biology)	CLE 3210.4.1 Investigate how genetic information is encoded in nucleic acids.	Strand 2.2.B Learners understand the basic ideas and genetic mechanisms behind biological evolution.
	CLE 3210.4.2 Describe the relationships among genes, chromosomes, proteins, and hereditary traits.	Strand 2.2.B Learners understand the basic ideas and genetic mechanisms behind biological evolution.
	CLE 3210.4.3 Predict the outcome of monohybrid and di-hybrid crosses.	Strand 2.2.B Learners understand the basic ideas and genetic mechanisms behind biological evolution.
	CLE 3210.4.4 Compare different modes of inheritance: sex linkage, co-dominance, incomplete dominance, multiple alleles, and polygenic traits.	Strand 2.2.B Learners understand the basic ideas and genetic mechanisms behind biological evolution.
	CLE 3210.4.5 Recognize how meiosis and sexual reproduction contribute to genetic variation in a population.	Strand 2.2.A Learners understand basic population dynamics and the importance of diversity in living systems.
	CLE 3210.4.6 Describe the connection between mutations and human genetic disorders.	Strand 3.1.A Learners apply their research and analytical skills to investigate environmental issues ranging from local issues to those that are regional or global in scope.
	CLE 3210.4.7 Assess the scientific and ethical ramifications of emerging genetic technologies.	Strand 2.4.D Learners are able to examine the social and environmental impacts of various technologies and technological systems. Strand 3.1.B Learners are able to evaluate the consequences of specific environmental changes, conditions, and issues for human and ecological systems.

Life Science Standard 5.0: Biodiversity and Change

Conceptual Strand 5

A rich variety of complex organisms have developed in response to a continually changing environment.

Guiding Question 5

How does natural selection explain how organisms have changed over time?

Grade Level Expectations		NAAEE
K	GLE 0007.5.1 Compare the basic features of plants and animals.	<p>Strand 2.2.A.i Identify similarities and differences among living organisms ranging from single-celled organisms they can observe under microscopes to plants and animals they encounter through direct observations, videos, books, or other media.</p> <p>Strand 2.2.B.i Identify some basic traits of plants and animals</p>
1	GLE 0107.5.1 Investigate how plants and animals can be grouped according to their habitats.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2.A.ii Classify or group organisms using categories such as how animals bear their young, anatomical features, or habitats.</p>
	GLE 0107.5.2 Recognize that some organisms which formerly lived are no longer found on earth.	Strand 2.2.B.iii Compare fossil life forms and living organisms to identify similarities and differences between organisms that lived long ago and those alive today.

2	GLE 0207.5.1 Investigate the relationship between an animal's characteristics and the features of the environment where it lives.	<p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 2.2.B.ii Identify some similarities among offspring and parents as being inherited and others as resulting from the organism's interactions with its environment.</p>
	GLE 0207.5.2 Draw conclusions from fossils about organisms that lived in the past.	<p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2.B.iii Compare fossil life forms and living organisms to identify similarities and differences between organisms that lived long ago and those alive today.</p>

3	GLE 0307.5.1 Explore the relationship between an organism's characteristics and its ability to survive in a particular environment.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2.B.ii Identify some similarities among offspring and parents as being inherited and others as resulting from the organism's interactions with its environment</p>
	GLE 0307.5.2 Classify organisms as thriving, threatened, endangered, or extinct.	<p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 2.2.A.ii Classify or group organisms using categories such as how animals bear their young, anatomical features, or habitats.</p> <p>Strand 2.4.A.ii Identify ways in which human actions change the environment.</p> <p>Strand 2.4.E Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.</p> <p>Strand 3.1.A Learners are able to identify and investigate issues in their local environments and communities.</p> <p>Strand 3.1.B As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.</p>

4	GLE 0407.5.1 Analyze physical and behavioral adaptations that enable organisms to survive in their environment.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2.B.ii Identify some similarities among offspring and parents as being inherited and others as resulting from the organism’s interactions with its environment.</p> <p>Strand 2.2.A.iii Describe the basic needs of all living things and explain how organisms adapt to meet their needs in different types of environments such as deserts, lakes, or forests. Strand 2.2.C.i Describe ways in which an organism’s behavior patterns are related to its environment.</p>
	GLE 0407.5.2 Describe how environmental changes caused the extinction of various plant and animal species.	<p>Strand 2.2.C.i Describe ways in which an organism’s behavior patterns are related to its environment. Identify examples of environmental change and discuss how these changes may be helpful or harmful to particular organisms (environmental change causing extinction).</p> <p>Strand 2.4.A.ii Identify ways in which human actions change the environment.</p> <p>Strand 2.4.E Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.</p> <p>Strand 3.1.A Learners are able to identify and investigate issues in their local environments and communities.</p> <p>Strand 3.1.B As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.</p>

5	GLE 0507.5.1 Investigate physical characteristics associated with different groups of animals.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2.A.ii Classify or group organisms using categories such as how animals bear their young, anatomical features, or habitats.</p>
	GLE 0507.5.2 Analyze fossils to demonstrate the connection between organisms and environments that existed in the past and those that currently exist.	Strand 2.2.B.iii. Compare fossil life forms and living organisms to identify similarities and differences between organisms that lived a long ago and those alive today.
6-7	Not addressed at this grade level	
8	GLE 0807.5.1 Identify various criteria used to classify organisms into groups.	<p>Strand 2.2.A.i Identify similarities and differences among living organisms ranging from single-celled organisms they can observe under microscopes to plants and animals they encounter through direct observation, videos, books, or other media.</p> <p>Strand 2.2 Learners understand that biotic communities are made up of plants and animals that are adapted to live in particular environments.</p>
	GLE 0807.5.2 Use a simple classification key to identify a specific organism.	Strand 2.2 Learners understand that biotic communities are made up of plants and animals that are adapted to live in particular environments.

	GLE 0807.5.3 Analyze how structural, behavioral, and physiological adaptations affect an organism’s ability to survive in a particular environment.	Strand 2.2.A.ii Classify or group organisms using categories such as how animals bear their young, anatomical features, or habitats. Strand 2.2.A iii Describe the basic needs of all living things and explain how organisms adapt to meet their needs in different types of environments such as deserts, lakes, or forests. Strand 2.2 Learners understand that biotic communities are made up of plants and animals that are adapted to live in particular environments.
	GLE 0807.5.4 Explain why variation within a population can enhance the chances for group survival.	Strand 2.2.B.i Identify some basic traits of plants and animals. Give examples of how those traits may vary among individuals of the same species. Strand 2.2 Learners have a basic understanding of the importance of genetic heritage.
	GLE 0807.5.5 Describe the importance of maintaining the earth’s biodiversity.	Strand 2.2.C. i. Identify examples of environmental change and discuss how these changes may be helpful or harmful to particular organisms (environmental change causes extinction).
	GLE 0807.5.6 Investigate fossils in sedimentary rock layers to gather evidence of changing life forms.	Strand 2.2.B.iii Compare fossil life forms and living organisms to identify similarities and differences between organisms that lived long ago and those alive today.
9 (Biology)	CLE 3210.5.1 Associate structural, functional, and behavioral adaptations with the ability of organisms to survive under various environmental conditions.	Strand 2.2.C Learners understand the living environment to be comprised of interrelated, dynamic systems.
	CLE 3210.5.4 Summarize the supporting evidence for the theory of evolution.	Strand 1.C Learners are able to locate and collect reliable information for environmental investigations of many types. They know how to use sophisticated technology to collect information, including computer programs that access, gather, store, and display data.
	CLE 3210.5.5 Explain how evolution contributes to the amount of biodiversity.	Strand 2.2.A Learners understand basic population dynamics and the importance of diversity in living systems.
	CLE 3210.5.6 Explore the evolutionary basis of modern classification systems.	Strand 1.E Learners are able to organize and display information in ways appropriate to different types of environmental investigations and purposes.

Earth & Space Science Standard 6.0: The Universe

Conceptual Strand 6

The cosmos is vast and explored well enough to know its basic structure and operational principles.

Guiding Question 6

What big ideas guide human understanding about the origin and structure of the universe, Earth's place in the cosmos, and observable motions and patterns in the sky?

Grade Level Expectations		NAAEE
K-3	Not addressed at this grade level.	
4	GLE 0407.6.1 Analyze patterns, relative movements, and relationships among the sun, moon, and earth.	Strand 2.1.A.iv Observe and record seasonal differences. For example, draw a series of pictures or compile photographs that illustrate differences such as day length, migration of specific bird species, lunar cycles and when specific tree species lose their leaves.
5	Not addressed at this grade level.	
6	GLE 0607.6.3 Explain how the positional relationships among the earth, moon, and sun control the length of the day, lunar cycle, and year.	Strand 2.1.A Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth. Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.
	GLE 0607.6.4 Describe the different stages in the lunar cycle.	Strand 2.1.A Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth. Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in Physical patterns.
	GLE 0607.6.5 Produce a model to demonstrate how the moon produces tides.	Strand 2.1.A Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth. Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.

	GLE 0607.6.6 Illustrate the relationship between the seasons and the earth-sun system.	Strand 2.2.A.iii Relate physical processes and patterns (such as climate, weather phenomena, and seasonal change) to the Earth/Sun relationship. For example, create a model that shows how seasonal change is affected by the Earth/Sun relationship.
7-9	Not addressed at this grade level.	

Earth and Space Science Standard 7.0: The Earth

Conceptual Strand 7

Major geologic events that occur over eons or brief moments in time continually shape and reshape the surface of the Earth, resulting in continuous global change.

Guiding Question 7

How is the earth affected by long-term and short term geological cycles and the influence of man?

Grade Level Expectations		NAAEE
K	GLE 0007.7.1 Identify non-living materials found on the surface of the Earth.	Strand 2.1.B. Learners are able to identify basic characteristics of and changes in matter.
	GLE 0007.7.2 Recognize that some objects are man-made and that some occur naturally.	Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter.
1	GLE 0107.7.1 Realize that water, rocks, soil, living organisms, and man-made objects make up the earth's surface.	Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter.
	GLE 0107.7.2 Classify earth materials according to their physical properties.	Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter. Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics. Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics. Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.

2	GLE 0207.7.1 Compare and record the components of a variety of soil types.	<p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 2.1.A.i Identify some of the forces that cause erosion within their own region, pointing out factors such as freezing and thawing, wind, waves, and gravity.</p> <p>Strand 2.1.B.i Describe objects in terms of the materials they are made of and their observable properties.</p> <p>Strand 2.1.b.ii Identify the effects of factors such as heating, cooling and moisture on the properties of materials.</p>
	GLE 0207.7.2 Describe rocks according to their origin, size, shape, texture, and color.	<p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 2.1.A.i Identify some of the forces that cause erosion within their own region, pointing out factors such as freezing and thawing, wind, waves, and gravity.</p> <p>Strand 2.1.B.i Describe objects in terms of the materials they are made of and their observable properties.</p> <p>Strand 2.1.b.ii Identify the effects of factors such as heating, cooling and moisture on the properties of materials.</p>

	GLE 0207.7.3 Differentiate between renewable and non-renewable resources.	<p>Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter.</p> <p>Strand 2.2.A.ii Identify ways in which human actions change the environment.</p> <p>Strand 2.2.D.iii Explain the process of life, growth, death, and decay of living organisms as a form of recycling.</p> <p>Strand 2.4.C.ii and ii. Explain what a natural resource is and give examples. Distinguish among resources that are renewable and nonrenewable.</p>
3	GLE 0307.7.1 Use information and illustrations to identify the earth's major landforms and water bodies.	<p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 2.1.A – Identify some distinctive landforms within their region and, using maps and images, in other areas of the world.</p>
	GLE 0307.7.2 Recognize that rocks can be composed of one or more minerals.	Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter.
	GLE 0307.7.3 Distinguish between natural and manmade objects.	Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter.
	GLE 0307.7.4 Design a simple investigation to demonstrate how earth materials can be conserved or recycled.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.2.D.ii – Describe how matter can be recycled, sometimes in a changed form from the original material.</p>

4	GLE 0407.7.1 Investigate how the Earth’s geological features change as a result of erosion (weathering and transportation) and deposition.	Strand 2.1.A.i Identify some of the forces that cause erosion within their own region, pointing out factors such as freezing and thawing, wind, waves and gravity. Identify sources of erosion and deposition and resulting landforms. Strand 2.1.B.iii Describe the basic elements of the hydrologic cycle and geologic processes (including weathering, erosion, and deposition). Locate examples of these in the local environment.
	GLE 0407.7.2 Evaluate how some earth materials can be used to solve human problems and enhance the quality of life.	<p>Strand 2.4.C.ii, iii, & iv Explain what a natural resource is and give examples. Distinguish among resources that are renewable and nonrenewable, and resources (like running water or wind) that are available only in certain places at certain times. Identify ways they use resources in their daily lives. Locate sources of various resources on a map. For example, trace the origins of the local water supply or map the region’s natural resources.</p> <p>Strand 2.3.C.ii List jobs in their community that are linked to processing natural resources.</p> <p>Strand 2.3.D.ii Describe how trade connects people around the world and enables them to have things they might not be able or willing to produce themselves. For example, create a map that shows where a learner’s food, clothing and household items are produced, where the raw materials come from, products that are traded into and out from their region, and so forth.</p> <p>Strand 2.4.A.i Identify ways in which people depend upon the environment.</p> <p>Strand 2.4.A.iii Describe how the environment affects human activities in their community of region.</p>
5	GLE 0507.7.1 Compare geologic events responsible for the earth’s major geological features.	Strand 2.2 Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.
6	Not addressed at this grade level	
7	GLE 0707.7.1 Describe the physical properties of minerals.	<p>Strand 2.1.A Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth.</p> <p>Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.</p>

	GLE 0707.7.2 Summarize the basic events that occur during the rock cycle.	<p>Strand 2.1.A Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth.</p> <p>Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.</p>
	GLE 0707.7.3 Analyze the characteristics of the earth's layers and the location of the major plates.	<p>Strand 2.1.A Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth.</p> <p>Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.</p>
	GLE 0707.7.4 Explain how earthquakes, mountain building, volcanoes, and sea floor spreading are associated with movements of the earth's major plates.	<p>Strand 2.1.A Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth.</p> <p>Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.</p>
	GLE 0707.7.5 Differentiate between renewable and nonrenewable resources in terms of their use by man.	<p>Strand 2.4.C Learners understand that the importance and use of resources change over time and vary under different economic and technological systems.</p> <p>Standard 2.4.C.i. Map and discuss distribution and consumption patterns for specific resources, such as metals, fresh water, or certain types of forests. Note resources that are being rapidly depleted.</p> <p>Standard 2.4.C.ii. Explain why certain resources (such as oil, coal, or natural gas) are key to the development of human societies, and identify resources that were critical to development at different times in history.</p> <p>Standard 2.4.C.iii. Explain conflicts between individuals, states, regions, or nations noting factors such as differing attitudes about the use of specific resources and scarcity of natural resources. Illustrate with local or regional examples such as conflicts over water rights and use of habitat for local endangered species.</p>

7 (cont.)	GLE 0707.7.6 Evaluate how human activities affect the earth's land, oceans, and atmosphere.	<p>Strand 2.4.A Learners understand that human-caused changes have consequences for the immediate environment as well as for other places and future times.</p> <p>Strand 2.4.A.i. Describe intended and unintended environmental and social consequences associated with the changing use of technologies. Consider consequences that may be positive as well as negative. For example, discuss particular irrigation methods, different ways of generating electrical power, or the use of synthetic pesticides.</p> <p>Strand 2.4.A.ii. Explain how human-caused environmental changes cause changes in other places. For example, discuss the effects of building a dam on downstream plant and animal communities as well as on human communities.</p> <p>Strand 2.4.A.iii. Describe the effects of a local environmental restoration effort, such as wetland creation. Predict the long-term consequences of such efforts, or a particular restoration project.</p> <p>2.4.D.ii. Analyze how the ability to develop and use technology gives humans great influence over the environment and other living things. Use example from their region, such as the ability to construct levees to protect areas from flooding or create wildlife refuges, build machines that produce or reduce air or water pollution, or domesticate plants or animals for food production.</p>
8 – 9 (Biology)	Not addressed at this grade level	

Earth and Space Science Standard 8.0: The Atmosphere

Conceptual Strand 8

The earth is surrounded by an active atmosphere and an energy system that controls the distribution of life, local weather, climate, and global temperature.

Guiding Question 8

How do the physical characteristics and the chemical makeup of the atmosphere influence the surface processes and life on earth?

Grade Level Expectations		NAAEE
K	0007.8.2 Collect daily weather data at different times of the year.	<p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 2.1.A.iv Observe and record seasonal differences.</p>
1	GLE 0107.8.1 Gather and interpret daily weather data.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.1.A.iii, iv Differentiate among climates. Observe and record seasonal differences.</p>

2	GLE 0207.8.1 Associate temperature patterns with seasonal changes.	<p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.1.A Observe and record season differences.</p>
3	GLE 0307.8.1 Recognize that there are a variety of atmospheric conditions that can be measured.	Strand 2.1.A Differentiate among climates, considering factors such as precipitation, temperature, and resident plants and animals and how they form the different biomes.
	GLE 0307.8.2 Use tools such as the barometer, thermometer, anemometer, and rain gauge to measure atmospheric conditions.	Strand 1.C Use tools, such as rulers, thermometers, watches, scales, magnifiers and microscopes, to make observations and measurements.
	GLE 0307.8.3 Identify cloud types associated with particular atmospheric conditions.	Strand 2.1.B.ii Identify the effects of factors such as heating, cooling, and moisture on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.
	GLE 0307.8.4 Predict the weather based on cloud observations.	Strand 2.1.B.ii Identify the effects of factors such as heating, cooling, and moisture on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment
4	GLE 0407.8.1 Recognize the major components of the water cycle.	Strand 2.1.B.iii Describe the basic elements of the hydrologic cycle and geological processes (including weathering, erosion, and deposition). Locate examples of these in the local environment.
	GLE 0407.8.2 Differentiate between weather and climate.	Strand 2.1A Learners are able to identify changes and differences in the physical environment.
5	GLE 0507.8.1 Analyze and predict how major landforms and bodies of water affect atmospheric conditions.	Strand 2.1A Learners are able to identify changes and differences in the physical environment. Strand 2.2 Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.

6	GLE 0607.8.1 Design and conduct an investigation to determine how the sun drives atmospheric convection.	<p>Strand 2.1.C Learners apply their knowledge of energy and matter to understand phenomena in the world around them.</p> <p>Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p> <p>Strand 2.2.C.ii. Explain how solar energy contributes to the movement of global air masses, the hydrological cycle and ocean currents.</p>
	GLE 0607.8.2 Describe how the sun’s energy produces the wind.	<p>Strand 2.1.C Learners apply their knowledge of energy and matter to understand phenomena in the world around them.</p> <p>Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p>
	GLE 0607.8.3 Investigate the relationship between currents and oceanic temperature differences.	<p>Strand 2.1.C Learners apply their knowledge of energy and matter to understand phenomena in the world around them.</p> <p>Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p> <p>Strand 2.2.C.ii. Explain how solar energy contributes to the movement of global air masses, the hydrological cycle and ocean currents.</p>
	GLE 0607.8.4 Analyze meteorological data to predict weather conditions.	Strand 2.2.A.iii. Relate physical processes and patterns (such as climate, weather phenomena, and seasonal change) to the Earth/sun relationship.
7-8-9 (Biology)	Not addressed at grade level	

Physical Science Standard 9.0: Matter

Conceptual Strand 9

The composition and structure of matter is known, and it behaves according to principles that are generally understood.

Guiding Question 9

How does the structure of matter influence its physical and chemical behavior?

Grade Level Expectations		NAAEE
K	GLE 0007.9.1 Describe an object by its observable properties such as color, shape, or size.	Strand 1.C.i. Observe and record characteristics, differences, and change in objects, organisms, events, places, and relationships in the environment.
	GLE 0007.9.2 Identify objects and materials as solids or liquids.	Strand 2.1.B Identify the effects of factors, such as heating, cooling, and moisture, on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.
1	GLE 0107.9.1 Classify objects according to their physical properties.	Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics. Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences. Strand 2.1.B Learners are able to identify basic characteristics of and changes in matter.
	GLE 0107.9.2 Distinguish between the properties of solids and liquids.	Strand 2.1.B Identify the effects of factors, such as heating, cooling, and moisture, on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.
2	GLE 0207.9.1 Use tools to observe the physical properties of objects.	Strand 1.C.4 Use tools such as rulers, thermometers, watches, scales, magnifiers, and microscopes to make observations and measurements.
	GLE 0207.9.2 Investigate how temperature changes affect the state of matter.	Strand 2.1.B Identify the effects of factors, such as heating, cooling, and moisture, on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.
	GLE 0207.9.3 Recognize that air takes up space.	Strand 2.1.B Identify the effects of factors, such as heating, cooling, and moisture, on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.

3	GLE 0307.9.1 Design a simple experiment to determine how the physical properties of matter can change over time and under different conditions.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 2.1.A Identify some of the forces that cause erosion within their own region, pointing out factors, such as freezing and thawing, wind, waves, and gravity.</p> <p>Strand 2.1.B Identify the effects of factors, such as heating, cooling, and moisture, on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.</p>
4	GLE 0407.9.1 Collect data to illustrate that the physical properties of matter can be described with tools that measure weight, mass, length, and volume.	Strand 1.C.4 Use tools such as rulers, thermometers, watches, scales, magnifiers, and microscopes to make observations and measurements.
	GLE 0407.9.2 Explore different types of physical changes in matter.	Strand 2.1.B.ii Identify the effects of factors such as heating, cooling, and moisture on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.
5	GLE 0507.9.1 Observe and measure the simple chemical properties of common substances.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv, v Learners are able to locate and collect information about the environment and environmental topics.</p>

	<p>GLE 0507.9.2 Design and conduct an experiment to demonstrate how various types of matter freeze, melt, or evaporate.</p>	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.1.B.ii Identify the effects of factors such as heating, cooling, and moisture on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.</p> <p>Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.</p>
	<p>GLE 0507.9.3 Investigate factors that affect the rate at which various materials freeze, melt, or evaporate.</p>	<p>Strand 2.1.B.i Describe a variety of chemical reactions and offer examples from daily life and the local environment.</p>
<p>6-7</p>	<p>Not addressed at this level</p>	

8	GLE 0807.9.1 Understand that all matter is made up of atoms.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
	GLE 0807.9.3 Interpret data from an investigation to differentiate between physical and chemical changes.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
	GLE 0807.9.4 Distinguish among elements, compounds, and mixtures.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
	GLE 0807.9.5 Apply the chemical properties of the atmosphere to illustrate a mixture of gases.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
	GLE 0807.9.6 Use the periodic table to determine the characteristics of an element.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
	GLE 0807.9.7 Explain the Law of Conservation of Mass.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
	GLE 0807.9.8 Interpret the events represented by a chemical equation.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
	GLE 0807.9.9 Explain the basic difference between acids and bases.	Strand 2.2 Learners understand the properties of substances that make up objects or materials found in the environment.
9 (Biology)	Not addressed at this level	

Physical Science Standard 10.0: Energy

Conceptual Strand 10

Various forms of energy are constantly being transformed into other types without any net loss of energy from the system.

Guiding Question 10

What basic energy related ideas are essential for understanding the dependency of the natural and man-made worlds on energy?

Grade Level Expectations		NAAEE
K	GLE 0007.10.1 Identify the sun as the source of heat and light.	Strand 2.1.C.i Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community, and natural environment.
	GLE 0007.10.2 Investigate the effect of the sun on a variety of materials.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 2.1.B.ii Identify the effects of factors such as heating, cooling, and moisture on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.</p> <p>Strand 2.1.C.ii Explain some of the ways in which heat, light, or electricity are produced, travel, stored and used. Use examples such as the sun, power generators, batteries, and so forth.</p> <p>Strand 2.2.D.i Explain how most living organisms depend on the sun as the source of their life energy.</p>

1	GLE 0107.10.1 Investigate the effect of the sun on land, water, and air.	<p>Strand 1.A.i, ii, iii Learners are able to develop questions that help them learn about the environment and do simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 2.1.A.i Identify some of the forces that cause erosion within their own region, pointing out factors such as freezing and thawing, wind, waves, and gravity.</p> <p>Strand 2.1.B.ii Identify the effects of factors such as heating, cooling, and moisture on the properties of materials and how quickly change happens. For example, describe the change of water from solid to liquid to gas in the environment.</p> <p>Strand 2.1.C.ii Explain some of the ways in which heat, light, or electricity are produced, travel, stored and used. Use examples such as the sun, power generators, batteries, and so forth.</p> <p>Strand 2.2.D.i Explain how most living organisms depend on the sun as the source of their life energy.</p>
2	GLE 0207.10.1 Explain why the sun is the primary source of the earth's energy.	<p>Strand 2.1.C.i, ii Identify different forms of energy and give examples. Explain some of the ways in which heat, light, or electricity are produced, travel, stored and used. Use examples such as the sun, power generators, batteries, and so forth.</p> <p>Strand 2.2.D.i Explain how most living organisms depend on the sun as the source of their life energy.</p>

3	GLE 0307.10.1 Investigate phenomena that produce heat.	Strand 2.1.C.ii Explain some of the ways in which heat, light, or electricity are produced, travel, stored and used. Use examples such as the sun, power generators, batteries, and so forth.
	GLE 0307.10.2 Design and conduct an experiment to investigate the ability of different materials to conduct heat.	<p>Strand 1.B.i, ii, iii Learners are able to design simple investigations.</p> <p>Strand 1.C.i, ii, iii, iv,v Learners are able to locate and collect information about the environment and environmental topics.</p> <p>Strand 1.E.i, ii, iii Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>Strand 1.F.I Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.</p> <p>Strand 1.G Learners can develop simple explanations that address their questions about the environment.</p> <p>Strand 2.1.B.i Describe objects in terms of the materials they are made of and their observable properties. For example, describe buildings constructed with different materials and discuss why these materials may have been selected based upon such properties as rigidity, ability to reflect or gather heat, and transparency.</p> <p>Strand 2.1.C.ii Explain some of the ways in which heat, light, or electricity are produced, travel, stored and used. Use examples such as the sun, power generators, batteries, and so forth.</p>
4	GLE 0407.10.1 Distinguish among heat, radiant, and chemical forms of energy.	Strand 2.1.C Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community, and natural environment.
	GLE 0407.10.2 Explain how energy is transferred in a simple electrical circuit.	Strand 2.1.C Explain some of the ways in which heat, light, or electricity are produced, travel, stored, and used. Use examples such as the sun, power generation, batteries, and so forth.
	GLE 0407.10.3 Investigate how light travels and is influenced by different types of materials and surfaces.	Strand 2.1.C Explain some of the ways in which heat, light, or electricity are produced, travel, stored, and used. Use examples such as the sun, power generation, batteries, and so forth.

5	GLE 0507.10.1 Design an experiment to illustrate the difference between potential and kinetic energy.	<p>Strand 2.1.C.i Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community, and natural environment.</p> <p>Strand 2.2 Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p>
	GLE 0507.10.2 Conduct experiments on the transfer of heat energy through conduction, convection, and radiation.	<p>Strand 2.1.C.i Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community, and natural environment.</p> <p>Strand 2.2 Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p>
6	GLE 0607.10.1 Compare and contrast the three forms of potential energy.	<p>Strand 2.1.C Learners apply their knowledge of energy and matter to understand phenomena in the world around them.</p> <p>Strand 2.2 Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p>
	GLE 0607.10.2 Analyze various types of energy transformations.	<p>Strand 2.1.C Learners apply their knowledge of energy and matter to understand phenomena in the world around them.</p> <p>Strand 2.2 Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p>
	GLE 0607.10.3 Explain the principles underlying the Law of Conservation of Energy.	<p>Strand 2.1.C Learners apply their knowledge of energy and matter to understand phenomena in the world around them.</p> <p>Strand 2.2 Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.</p>
7-8, 9 (Biology)	Not addressed at this grade level	

Physical Science Standard 12.0: Forces in Nature

Conceptual Strand 12

Everything in the universe exerts a gravitational force on everything else;
there is an interplay between magnetic fields and electrical currents.

Guiding Question 12

What are the scientific principles that explain gravity and electromagnetism?

Grade Level Expectations		NAAEE
1	GLE 0107.12.1 Investigate materials that are attracted to magnets.	Strand 2.1.C. Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community and natural environments.
2	GLE 0207.12.1 Experiment with magnets to determine that objects can move without being touched.	Strand 2.1.C. Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community and natural environments.
	GLE 0207.12.2 Realize that things fall toward the ground unless something holds them up.	Strand 2.1.C. Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community and natural environments.
3	GLE 0307.12.1 Explore how magnets attract objects made of certain metals.	Strand 2.1.C. Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community and natural environments.
4	GLE 0407.12.1 Explore the interactions between magnets.	Strand 2.1.C. Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community and natural environments.
	GLE 0407.12.2 Observe that electrically charged objects exert a pull on other materials.	Strand 2.1.C. Identify different forms of energy including radiant light, geothermal, electrical, and magnetic energy. Identify examples of these different forms in their homes, school, community and natural environments.
5	GLE 0507.12.1 Recognize that the earth attracts objects without directly touching them.	Strand 2.1.C. Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.

6	GLE 0607.12.1 Describe how simple circuits are associated with the transfer of electrical energy.	Strand 2.1.C. Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.
	GLE 0607.12.2 Explain how simple electrical circuits can be used to determine which materials conduct electricity.	Strand 2.1.C. Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.
7-8	Not addressed at this grade level	
9 (Biology)	CLE 3210.Inq.1 Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.	Strand 3.1.D.i Question, offer alternative explanations, and defend interpretations in group discussions.

Science Standard: Embedded Inquiry

Conceptual Strand:

Understandings about scientific inquiry and the ability to conduct inquiry are essential for living in the 21st century.

Guiding Question:

What tools, skills, knowledge, and dispositions are needed to conduct scientific inquiry?

All Grades	CLE 3210.Inq.1 Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.	Strand 3.1.D.i Question, offer alternative explanations, and defend interpretations in group discussions.
	CLE 3210.Inq.2 Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.	Strand 1.A Learners are able to develop questions that help them learn about the environment and do simple investigations Strand 1.B Learners are able to design simple investigations. Strand 1.C Learners are able to locate and collect information about the environment and environmental topics.
	CLE 3210.Inq.3 Use appropriate tools and technology to collect precise and accurate data.	Strand 1.C Learners are able to locate and collect information about the environment and environmental topics. Strand 1.C.iii. Use basic field skills, such as observing, interviewing and measuring to collect information. Strand 1.C. iv. Use tools such as rulers, thermometers, watches, scales, magnifiers, and microscopes to make observations and measurements. Strand 1.C.v. Use computers, calculators and other devices to conduct investigations and manipulate information.

All Grades	CLE 3210.Inq.4 Apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias.	<p>Strand 1.D Evaluating accuracy and reliability – Learners can apply basic logic and reasoning skills to evaluate completeness and reliability in a variety of information sources.</p> <p>Strand 3.1.A Identifying and investigating issues – Learners apply their research and analytical skills to investigate environmental issues ranging from local issues to those that are regional or global in scope.</p>
	CLE 3210.Inq.5 Compare experimental evidence and conclusions with those drawn by others about the same testable question.	<p>Strand 1.G Drawing conclusions and developing explanations – Learners are able to use evidence and logic in developing proposed explanations that address their initial questions and hypotheses.</p> <p>Strand 3.1.D Working with flexibility, creativity and openness – While Environmental issues investigations can bring to the surface deeply held views, learners are able to engage each other in peer review conducted in the spirit of open inquiry.</p>
	CLE 3210.Inq.6 Communicate and defend scientific findings.	<p>Strand 1.E Learners are able to organize and display information in ways appropriate to different types of environmental investigations and purposes.</p> <p>Strand 1.F Learners are able to create, use and evaluate models to understand environmental phenomena.</p> <p>Strand 3.2.A Learners are able to communicate, evaluate, and justify their own views on environmental issues and alternative ways to address them.</p>

Science Standard: Embedded Technology & Engineering

Conceptual Strand

Society benefits when engineers apply scientific discoveries to design materials and processes that develop into enabling technologies.

Guiding Question

How do science concepts, engineering skills, and applications of technology improve the quality of life?

All grades	CLE 3210.T/E.1 Explore the impact of technology on social, political, and economic systems.	<p>Strand 2.4.A Learners understand that humans are able to alter the physical environment to meet their needs and that there are limits to the ability of the environment to absorb impacts or meet human needs.</p> <p>Strand 2.4.D Learners are able to examine the social and environmental impacts of various technologies and technological systems.</p> <p>Strand 2.4.D.i. Explain how social and economic forces influence the direction of technological development, and how technologies shape societal values and beliefs. For example, consider the ability to build large dams for water storage or hydropower, or the social impact of the first photos of the Earth from space.</p> <p>Strand 2.4.D.ii. Using examples of particular technologies (such as genetic manipulation or cyanide heap leach gold mining) or technological systems (such as modern agriculture or energy production and use), discuss the social and environmental costs, benefits, risks, and possibilities associated with technologies through which humans shape and control their environment.</p>
	CLE 3210.T/E.4 Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.	<p>Strand 2.4.D Learners are able to examine the social and environmental impacts of various technologies and technological systems.</p> <p>Strand 3.1.C Learners are able to identify and propose action strategies that are likely to be effective in particular situations and for particular purposes.</p>

Science Standard: Embedded Mathematics

Conceptual Strand:

Science applies mathematics to investigate questions, solve problems, and communicate findings.

Guiding Question:

What mathematical skills and understandings are needed to successfully investigate biological topics?

9 (Biology)	CLE 3210.Math.1 Understand the mathematical principles associated with the science of biology.	<p>Strand 1.C.i. Use basic sampling techniques such as spatial sampling and random sampling. Evaluate when these techniques are appropriate.</p> <p>Strand 1.C.v. Perform basic statistical analyses to describe data using quantitative measures such as mean, median, and mode.</p>
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APPENDIX C:

Tennessee Social Studies – Embedded Environmental Literacy

The new Common State Standards will be implemented in 2014. The ties to existing Social Studies standards are deliberately vague due to this expected change. Correlations will be revised when the new standards come out.

Grades PreK-2: Embedded Environmental Literacy		
<p>Conceptual Strand <i>Environmentally literate citizens have the knowledge and skills essential for living in the 21st century.</i></p>		
<p>Guiding Question <i>How has the physical environment influenced human culture, history, civics, and economics over time?</i></p>		
Grade Level Expectations	Checks for Understanding	State Performance Indicators
<p>GLE .EL.1 Recognize changes and differences in the physical environment.</p> <p>GLE .EL.2 Understand that rules are created to protect an environment.</p> <p>GLE .EL.3 Identify basic human needs.</p> <p>GLE .EL.4 Demonstrate how to identify and locate major physical and political features on globes and maps.</p> <p>GLE .EL.5 Understand that people act as individuals and as group members and that groups can influence individual actions.</p>	<p>✓ .EL.1 Describe the effects of weather.</p> <p>✓ .EL.2 Design a set of rules or laws for a home, classroom, or community.</p> <p>✓ .EL.3 Explain how basic human needs of food, clothing, shelter, and transportation are met by natural resources.</p> <p>✓ .EL.4 Describe how landforms and bodies of water influence where and how people live in Tennessee.</p> <p>✓ .EL.5 Define cooperation.</p>	<p>SPI .EL.1</p>

Grades 3-5: Embedded Environmental Literacy

Conceptual Strand

Environmentally literate citizens have the knowledge and skills essential for living in the 21st century.

Guiding Question

How has the physical environment influenced human culture, history, civics, and economics over time?

Grade Level Expectations	Checks for Understanding	State Performance Indicators
<p>GLE .EL.1 Understand that experiences and places may be interpreted differently by people with different cultural backgrounds, at different times, or with other frames of reference.</p> <p>GLE .EL.2 Explain how government and economic systems exist because people need to provide for needs and wants, maintain order, and manage conflict.</p> <p>GLE .EL.3 Identify how people depend on, change, and are affected by the environment.</p> <p>GLE .EL.4 Describe a current or historical environmental issue in the local community.</p> <p>GLE .EL.5 Understand there are many approaches to resolving issues.</p> <p>GLE .EL.6 Recognize individual effectiveness as a citizen.</p>	<p>✓ .EL.1 Role-play the reactions of different people to a place or historical event – especially one with local significance.</p> <p>✓ .EL.2 Discuss what might happen if there were no laws to protect the environment in the local watershed.</p> <p>✓ .EL.3 Create a map to show products that are traded into and out of the local region.</p> <p>✓ .EL.4 Determine different individuals and groups involved in a local environmental issue.</p> <p>✓ .EL.5 Identify proposed solutions to an issue and discuss arguments for and against them.</p> <p>✓ .EL.6 Give an example of a case where citizen action affected an environmental decision or action.</p>	<p>SPI .EL.1</p>

Grades 6-8: Embedded Environmental Literacy

Conceptual Strand

Environmentally literate citizens have the knowledge and skills essential for living in the 21st century.

Guiding Question

How has the physical environment influenced human culture, history, civics, and economics over time?

Grade Level Expectations	Checks for Understanding	State Performance Indicators
<p>GLE .EL.1 Understand human systems change over time and conflicts sometimes arise over differing and changing viewpoints about the environment.</p> <p>GLE .EL.2 Describe how human-caused changes have consequences for the immediate environment as well as for other places and future times.</p> <p>GLE .EL.3 Analyze how the uneven distribution of resources influences their use and perceived value.</p> <p>GLE .EL.4 Recognize the scales of environmental issues range from local to national to global.</p> <p>GLE .EL.5 Identify and develop action strategies for addressing particular issues.</p> <p>GLE .EL.6 Recognize rights and responsibilities associated with citizenship.</p>	<p>✓ .EL.1 Explain how change affects individuals and groups differently and give examples of the trade-offs involved in decisions and actions ranging from the individual to the societal levels.</p> <p>✓ .EL.2 Identify intended and unintended consequences associated with changing use of technologies.</p> <p>✓ .EL.3 Map and discuss historical distribution and consumption patterns for specific resources, such as fresh water.</p> <p>✓ .EL.4 Identify other places, contemporary or historical, experiencing issues similar to those in local region.</p> <p>✓ .EL.5 Role-play different solutions for resolving an environmental issue.</p> <p>✓ .EL.6 Describe ways citizen action and public opinion have influenced environmental policy decisions.</p>	<p>SPI .EL.1</p>

Grades 9-12: Embedded Environmental Literacy

Conceptual Strand

Environmentally literate citizens have the knowledge and skills essential for living in the 21st century.

Guiding Question

How has the physical environment influenced human culture, history, civics, and economics over time?

Grade Level Expectations	Checks for Understanding	State Performance Indicators
<p>GLE .EL.1 Apply research and analytical skills to investigate environmental issues ranging from local issues to those global in scope.</p> <p>GLE .EL.2 Identify and propose action strategies that are likely to be effective in particular situations and for particular purposes.</p> <p>GLE .EL.3 Understand the importance of exercising citizen rights and responsibilities.</p> <p>GLE .EL.4 Understand how different political and economic systems account for, manage, and affect natural resources and environmental quality.</p> <p>GLE .EL.5 Recognize that humans are able to alter the physical environment to meet their needs and that there are limits to the ability of the environment to absorb impacts or meet human needs.</p>	<p>✓ .EL.1 Discuss the social, political, economic, and ethical implications of environmental issues.</p> <p>✓ .EL.2 Synthesize different perspectives, types of data, and means of analysis to propose solutions to environmental issues.</p> <p>✓ .EL.3 Evaluate conflicts between individual rights and other societal interests such as a healthy environment.</p> <p>✓ .EL.4 Compare the U.S. political and economic systems with other systems, focusing on how the systems govern the use of natural resources, control production and consumption, and protect environmental quality.</p> <p>✓ .EL.5 Evaluate the cumulative effects of human actions on a specific species or environmental system, such as a watershed.</p>	<p>SPI .EL.1</p>

APPENDIX D:

Best Practices of Environmental Literacy Instruction

Best practices for teaching environmental literacy, with an emphasis on place-based education, overlap with best practices for many other curricular areas. The primary difference is purpose – programs focus on environmental systems, sustainability, and stewardship. The following represents proposed best practices for integrating environmental literacy into the school:

- Focus is on the local or place-based education within the school's watershed:
 - The ultimate goal is environmental literacy and fostering participatory citizenship.
 - The whole school, including its infrastructure (e.g., buildings and grounds, energy, water and material resource management, food systems, transportation,) is integral to the teaching of environmental literacy.
 - Practice is applied to the whole school and school district culture.
- Instruction and learning takes place in a variety of settings, making appropriate use of the classroom, school, school grounds, outdoor classrooms and settings, the community and state as appropriate.
- Learning is interdisciplinary – integrated across science, math, reading, writing, social studies and art, and incorporates initiatives such as STEM and career pathways.
- Curriculum/activities are tied directly to educational standards and diploma requirements – especially the essential skills.
- Instruction supports evidence-based exploration and investigation:
 - Emphasis is on the inquiry process.
 - Learning is student driven.
 - Uses the natural world and home community to identify, address and solve problems.
 - Encourages hands-on interactions with the natural world.
- Partnerships with local agencies, non-profit organizations, businesses, resource professionals and others are forged and sustained.
- Instruction fosters a respectful, supportive learning environment that nurtures:
 - An understanding of multiple perspectives.
 - 'Caring' relationships – students-to-students, teachers-to-students, etc.
 - An understanding of personal stages of change in teaching practice.
 - An appreciation of differing world views and global and cultural perspectives.
- Education extends beyond school - students share learning with families, partners and other community members.

APPENDIX E:

Tennessee Environmental Literacy Pilot Test

Instructions for Part One: Fill in the circle on your answer sheet for the letter of the answer that best indicates your response to each of the following questions.

1. What is your gender?
 - a) female
 - b) male
2. Compared to other subjects you study, how do you feel about studying environmental topics?
 - a) less interested
 - b) about the same
 - c) more interested
3. Compared with other students your age, how well do you think you understand issues related to the environment?
 - a) above average
 - b) average
 - c) below average
4. What one thing has contributed most to your understanding of the environment and environmental issues?
 - a) school
 - b) books, newspapers, or magazines I have read on my own.
 - c) friends or family members (including parents)
 - d) field trips, special programs or activities such as clubs, scouting or 4H
 - e) television programs
5. What are your educational plans after high school?
 - a) no future educational plans at the present time
 - b) vocational/technical school
 - c) college or university
 - d) military
 - e) undecided

Part Two: For each of the following questions, choose the best answer. Fill in the circle for the letter of the answer on your answer sheet.

6. A food web consists of:
- a) the animals that eat other animals in a community.
 - b) all the herbivores and carnivores in an ecosystem.
 - c) many interconnected food chains.
 - d) all the consumers in an ecosystem.
7. When two or more species attempt to use the same limited resources in an ecosystem, their interaction is called
- a) mutualism.
 - b) competition.
 - c) predation.
 - d) commensalism.
8. Having sharp thorns can help a plant by keeping animals from eating it. This is an example of
- a) mutualism
 - b) adaptation
 - c) competition
 - d) commensalism
9. All of the individual organisms that live on the ground in a particular forest share the same
- a) niche.
 - b) habitat.
 - c) life-style.
 - d) food source.
10. The reason dead leaves and twigs don't build up in the forest from year to year is because
- a) non-living elements such as rain and wind remove them.
 - b) decomposers break them down into soil.
 - c) animals eat them or use them to build nests.
 - d) none of the above
11. Wolves often eat deer. Does this interaction have any benefits on the deer population as a whole?
- a) Yes, the wolves help keep the deer population controlled.
 - b) No. The deer population is usually only harmed.
 - c) Yes, the wolves help keep the deer population strong since the fastest, most alert deer survive.
 - d) both (a) and (c)

12. The energy currently present
- a) is all the energy we will ever have.
 - b) can change form but is never destroyed.
 - c) can only be used once.
 - d) is mostly in the form of fossil fuel energy.
13. Based upon major ecological principles, we should conclude that
- a) humans are a climax species that will last indefinitely.
 - b) the human species will soon become extinct; nothing we can do will prevent this.
 - c) the human species will last as long as there is a balanced ecosystem that will support human life.
 - d) there is no way of predicting what will happen to the human species; ecological principles do not apply to humans.
14. The process of photosynthesis in green plants
- a) uses sunlight to burn energy in plants.
 - b) changes light energy into chemical energy.
 - c) changes chlorophyll into sugar.
 - d) is a process used to burn sugar stored in plants so the plants can grow.
15. Which of the following terms is used to describe all of the natural living and nonliving interacting features of a given area?
- a) habitat
 - b) community
 - c) biodiversity
 - d) ecosystem
16. Humans grow crops for food. Many species of these plants need a certain species of insects (such as bees) to pollinate them. The pollinating insects often rely on the nectar they obtain from the plants for food. This is a good example of
- a) how organisms, including humans, are interdependent.
 - b) commensalism between humans and other species.
 - c) how humans manipulate their environment.
 - d) a food web that includes humans.
17. A particular aquatic ecosystem is contaminated by a chemical which tends to remain stored in body fat. The highest concentration of this chemical would most likely be found in which group of organisms in the ecosystem?
- a) plant life
 - b) minnows
 - c) fish that eat insects and plants
 - d) fish-eating birds

18. Which of the following phrases refers to the potential ability of a system to support population growth without harming the environment?

- a) carrying capacity
- b) species loading
- c) non-sustainable growth
- d) all of the above

19. In a small lake, a food chain was as follows:



After many months of heavy snow covering the ice, most of the small crustaceans died. What is the best explanation for this?

- a) The algae population was cut off from its source of energy.
- b) It was too cold for the crustaceans to survive.
- c) The fish ate most of the crustaceans.
- d) A disease killed most of the algae.

20. If carbon dioxide (CO₂) disappeared from the atmosphere, which of the following would be affected first?

- a) plants
- b) animals that eat plants
- c) animals that eat other animals
- d) decomposers

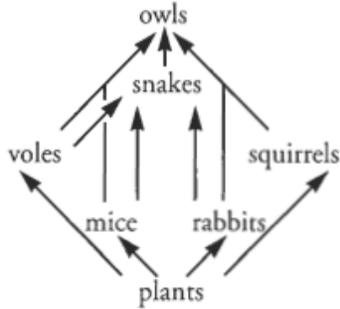
21. Each of the following food chains starts with the same amount of green plants. Assuming that the green plants are digestible by humans, which of the food chains would supply the most energy to humans?

- a) green plants to humans
- b) green plants to cattle to humans
- c) green plants to insects to fish to humans
- d) green plants to insects to small fish to larger fish to humans

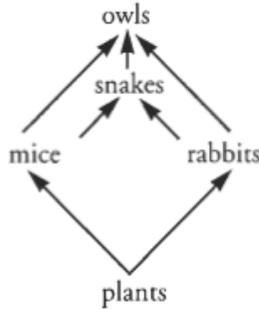
22. Some insecticides that were once very effective in killing insects no longer work very well. This is because

- a) new insect species develop every day.
- b) the wrong kind of insecticides were used.
- c) insects with natural resistance survived and multiplied.
- d) the insects produced many more offspring than the insecticide could kill.

23. Which of the food webs below would be affected the most if all the mice were removed? (Note: the arrows point to the consumer of the organism in the food web.)



Food Web (A)



Food Web (B)

- a) food web (A)
- b) food web (B)
- c) Neither would be affected.
- d) They would both be affected to the same degree.

24. Which of the following contributes to air pollution at the surface of the earth, and acts as a shield against ultraviolet rays in the upper atmosphere?

- a) nitrous oxide
- b) methane
- c) ozone
- d) sulfur dioxide

25. The main source(s) of emissions that have been identified as contributing to acid deposition (acid rain) in the United States are

- a) volcanoes and forest fires.
- b) petroleum refineries.
- c) automobiles and coal burning power plants.
- d) aerosol sprays and refrigerant leakage.

26. Which of the following is not true of the world's human population?

- a) It is expected to double within your lifetime.
- b) It is declining in developed areas such as the United States and Canada.
- c) Its increase has led to the extinction of many plant and animal species.
- d) The greatest rate of population growth is occurring in developing areas such as South America and Africa.

27. The future of food production as it is currently practiced in this country is in question because
- a) soil is being depleted by erosion.
 - b) the use of synthetic chemical additives has become an issue.
 - c) agricultural land is being lost to development.
 - d) all of the above.
28. Which of the following would be most likely to cause groundwater pollution?
- a) organic farming practices
 - b) municipal composting of yard wastes
 - c) adding too much fertilizer to fields
 - d) wastewater treatment plants
29. The rate of species' extinction is higher now than at any time since the period of the dinosaurs' extinction. The main cause of this rapid decline of biodiversity is
- a) habitat alteration by humans.
 - b) the illegal poaching or collecting of animals and plants.
 - c) changes in the Earth's atmosphere due to human activities.
 - d) hunting by humans for food or sport.
30. Which of the following do scientists feel is the least important contributor to the greenhouse effect?
- a) destruction of the earth's rainforests
 - b) burning of fossil fuels, such as gasoline and oil
 - c) increased use of hydroelectric power
 - d) production of methane gas by cattle and rice paddies
31. Most municipal solid waste in the United States is presently disposed of by what method?
- a) burning it in closed incinerators
 - b) recycling
 - c) shipping it out to sea and dumping it
 - d) burying it in landfills
32. Which of the following is NOT a major water pollutant?
- a) bacteria
 - b) pesticides
 - c) heat
 - d) All of the above are major water pollutants.

33. One suggested advantage of using nuclear power plants for energy production is that
- a) nuclear power plants are not expensive to build.
 - b) the waste products are fairly easy to store.
 - c) there is less air pollution.
 - d) they are totally safe.
34. Which of the following results in the most serious waste or loss of our usable water?
- a) contamination by bacteria
 - b) uncontrolled drainage
 - c) careless usage
 - d) improper storage
35. Which of the following would be most likely to result in soil erosion?
- a) an increase in nutrients added to the soil
 - b) the removal of vegetation
 - c) contour plowing of hillsides
 - d) aeration of the soil by bacteria
36. Which of the following is considered to be a non-renewable energy source?
- a) oil
 - b) wood
 - c) biomass
 - d) none of the above
37. Which of the following is a naturally occurring, invisible gas which can seep out of the ground into people's homes and cause serious health problems?
- a) ethane
 - b) krypton
 - c) radon
 - d) chlorofluorocarbon
38. Which of the following offers the most potential for reducing our immediate energy problems?
- a) geothermal power
 - b) energy conservation
 - c) biomass conversion
 - d) tidal power

39. Which of the following is most likely to help endangered species?
- a) Outlaw the sale or possession of endangered species or products made from them (skins, fur, ivory, etc.).
 - b) Create breeding programs in zoos for endangered animals.
 - c) Use farming methods which do not endanger habitat.
 - d) Maintain large protected natural areas where they live.
40. In the long term, which of the following would be the best way to lessen the problem of solid waste?
- a) Incinerate waste materials.
 - b) Reduce the amount of materials being consumed.
 - c) Reuse materials for other purposes rather than throwing them out.
 - d) Recycle materials that can be used again.

This is the end of the survey. Thank you for your participation!

APPENDIX F:

Results of Tennessee Environmental Literacy Pilot Test

	Gender		% Male	% Female
	Male	Female		
Riverdale	8	15	35%	65%
Maplewood	10	16	38%	62%
Bearden	29	45	39%	61%
Chuckey-Doak	14	21	40%	60%
Baylor	16	9	64%	36%
Rossvie	9	10	47%	53%
Total	86	116	44%	56%

	Compared to other subjects you study, how do you feel about studying environmental topics?		
	Less interested	About the same	More interested
Riverdale	9	8	8
Maplewood	7	16	3
Bearden	12	32	30
Chuckey-Doak	10	18	7
Baylor	9	10	6
Rossvie	5	11	3
Total	52	95	57
Total as %	26%	47%	28%

	Compared with other students your age, how well do you think you understand issues related to the environment?		
	Above average	Average	Below average
Riverdale	4	18	3
Maplewood	10	14	1
Bearden	22	48	4
Chuckey-Doak	7	23	5
Baylor	15	9	1
Rossvie	10	8	1
Total	68	120	15
Total as %	34%	59%	7%

	What one thing has contributed most to your understanding of the environment and environmental issues?				
	School	Books, newspapers, or magazines I've read on my own	Friends or family members (including parents)	Field trips, special programs or activities such as clubs, scouting or 4H	Television Programs
Riverdale	10	3	3	3	5
Maplewood	7	5	2	3	8
Bearden	44	8	8	5	9
Chuckey-Doak	7	6	4	5	13
Baylor	9	3	5	1	6
Rossvie	9	2	1	2	5
Total	86	27	23	19	46
Total as %	43%	13%	11%	9%	23%

	Murfreesboro		Maplewood		Knoxville		Chuckey-Doak		Chattanooga
	# Correct	% Correct	# Correct	% Correct	# Correct	% Correct	# Correct	% Correct	# Correct
Question 6	8	35%	10	38%	36	49%	16	46%	14
Question 7	13	57%	14	54%	57	77%	23	66%	17
Question 8	11	48%	13	50%	62	84%	23	66%	16
Question 9	14	61%	17	65%	57	77%	22	63%	17
Question 10	11	48%	12	46%	64	86%	26	74%	21
Question 11	10	43%	15	58%	37	50%	16	46%	18
Question 12	14	61%	14	54%	41	55%	17	49%	17
Question 13	17	74%	14	54%	57	77%	27	77%	22
Question 14	13	57%	6	23%	32	43%	15	43%	20
Question 15	11	48%	14	54%	50	68%	17	49%	20
Question 16	10	43%	6	23%	23	31%	13	37%	13
Question 17	4	17%	5	19%	42	57%	11	31%	11
Question 18	9	39%	7	27%	43	58%	13	37%	14
Question 19	11	48%	14	54%	46	62%	21	60%	18
Question 20	12	52%	14	54%	57	77%	30	86%	23
Question 21	10	43%	12	46%	32	43%	10	29%	7
Question 22	11	48%	13	50%	55	74%	20	57%	19
Question 23	5	22%	9	35%	31	42%	7	20%	9
Question 24	13	57%	15	58%	40	54%	24	69%	16
Question 25	13	57%	6	23%	40	54%	20	57%	14
Question 26	5	22%	3	12%	22	30%	9	26%	12
Question 27	13	57%	13	50%	43	58%	22	63%	19
Question 28	6	26%	5	19%	31	42%	13	37%	16
Question 29	5	22%	3	12%	45	61%	15	43%	18
Question 30	12	52%	12	46%	38	51%	21	60%	14
Question 31	9	39%	7	27%	40	54%	18	51%	13
Question 32	4	17%	6	23%	22	30%	9	26%	9
Question 33	9	39%	9	35%	37	50%	20	57%	14
Question 34	10	43%	7	27%	31	42%	12	34%	12
Question 35	8	35%	7	27%	34	46%	10	29%	12
Question 36	9	39%	11	42%	33	45%	15	43%	14
Question 37	8	35%	8	31%	34	46%	8	23%	6
Question 38	9	39%	6	23%	34	46%	18	51%	13
Question 39	6	26%	6	23%	40	54%	13	37%	14
Question 40	5	22%	6	23%	20	27%	10	29%	9
	23	42%	26	37%	74	54%	35	48%	25

	Clarksville		State Totals	
	% Correct	# Correct	% Correct	% Correct
Question 6	56%	8	42%	44%
Question 7	68%	17	89%	68%
Question 8	64%	14	74%	64%
Question 9	68%	8	32%	61%
Question 10	84%	10	53%	65%
Question 11	72%	11	58%	54%
Question 12	68%	13	68%	59%
Question 13	88%	14	74%	74%
Question 14	80%	9	47%	49%
Question 15	80%	10	53%	58%
Question 16	52%	6	32%	36%
Question 17	44%	5	26%	33%
Question 18	56%	10	53%	45%
Question 19	72%	12	63%	60%
Question 20	92%	13	68%	72%
Question 21	28%	9	47%	39%
Question 22	76%	15	79%	64%
Question 23	36%	6	32%	31%
Question 24	64%	10	53%	59%
Question 25	56%	16	84%	55%
Question 26	48%	6	32%	28%
Question 27	76%	17	89%	65%
Question 28	64%	7	37%	38%
Question 29	72%	7	37%	41%
Question 30	56%	10	53%	53%
Question 31	52%	13	68%	49%
Question 32	36%	9	47%	30%
Question 33	56%	8	42%	46%
Question 34	48%	2	11%	34%
Question 35	48%	5	26%	35%
Question 36	56%	8	42%	44%
Question 37	24%	3	16%	29%
Question 38	52%	8	42%	42%
Question 39	56%	6	32%	38%
Question 40	36%	3	16%	25%
	60%	19	49%	48%

APPENDIX G:

TELP Coordinator Job Description

Tennessee Departments of Education & Environment and Conservation, Nashville, TN

For the Tennessee Environmental Literacy Program (TELP) to attain its full potential, a state coordinator is needed. This coordinator will occupy the former Project CENTS (Conservation Education Now for Tennessee Students) position within the Department of Education, to be funded by Tennessee Department of Environment and Conservation.

Description:

- Facilitate implementation of the Tennessee Environmental Literacy Plan (TELP).
- Write and submit grant applications to fund implementation of the TELP.
- Coordinate and deliver educator training in the following environmental education curricula: Project Learning Tree, Project WET and Project WILD (including Wild Aquatic and Flying WILD).
- Develop and oversee communication plan to present TELP goals to the public in the Three Grand Divisions of the State.
- Synchronize with Green Schools and STEM Hubs to provide regional EL resources.
- Inventory existing professional development programs for environmental literacy within the state, identify gaps, and create & provide professional development training based on gaps.
- Convene and secure funding for a meeting of state environmental educators who provide professional development to create a common pedagogy for environmental literacy.
- Develop environmental education training for all pre-service teachers.
- Participate in revising state standards of education, with specific regard to EL.
- Have an active role in including EL measurements in state standardized tests.
- Oversee the identification of research topics, internships, and EE programs for high school students.
- With partners, identify and define the environmental literacy (EL) roles for each level of the state school system.
- Manage EEinTN website (www.eeintennessee.org).

Qualifications: Bachelor's, preferably Master's Degree, in Natural Resources, Environmental Education, or a related field with 3-5 cumulative years experience with both classroom and non-formal educational settings. Ability to plan and implement environmental education workshops. Ability to work with a variety of people and to build support among agencies and educators. Grant writing experience desirable. Applicants must be enthusiastic, energetic, and committed.