APPENDIX I

ACTIVE WATERSHED EDUCATION PROGRAM

A Guide to Adapting the Curriculum to Your Watershed

This guide identifies activities in the *Active Watershed Education* (*AWE*some!) Curriculum Guide that will need to be adapted to fit other watersheds. Techniques and suggested contacts for additional information are included.

USGS Topographic Maps and Soil Surveys are available on-line for view to view or print. They are also available to view or photocopying at your local Natural Resources Conservation Service (NRCS) and United States Geological Survey (USGS) offices. A free copy of the Soil Survey may be available. There are also many good websites with useful maps available to download. Check out topozone.com as one example. Some states will have websites which contain ortho photos. These are digital photographs taken from the air and show natural and manmade features. See list of on-line resources at the end of this introduction.

INTRODUCTIONS

Each Unit contains an Introduction, which includes both generic information about the Unit and how it relates to a specific watershed. This is an excellent way to personalize the *AWEsome!* Curriculum for your watershed. The introductions included with each chapter were written for the Narrow River Watershed in RI. The generic portions are in normal type; information dealing specifically with the Narrow River Watershed are in italics. Use these examples to help determine what is unique, interesting, or important about your watershed that you want included in the curriculum.

UNIT I: WHAT IS A WATERSHED?

ACTIVITY II: What is a Watershed?

Contact your local NRCS, Soil and Water Conservation District, Cooperative Extension or watershed association office for information about the watershed you live or work in. If personnel are not able to assist you, try researching the watershed through your local library or the Environmental Protection Agency Surf Your Watershed website (http://www.epa.gov/surf). Bring the *AWE*some! Curriculum Guide with you so the NRCS or library personnel will understand the type of information you need to gather.

Materials Needed: 3-D Watershed Model

Have students construct their own watershed model using aluminum foil or paper mache, or solicit help from a local Boy Scout or Girl Scout group to help construct one for your school district. They might be able to do this to earn a merit badge in conservation. Models can be constructed with a wood base and paper mache, with the relief generally molded to represent the topography found in the watershed (see USGS topographic map for your watershed). The paper mache can then be painted to depict the major stream channels in the watershed (the final product should be waterproof). A hole can be placed at the bottom of the watershed model representing the outlet of the watershed to a lake, stream, ocean, etc.

ACTIVITY IV: (Watershed specific to your curriculum)

See above contacts for information on your local watershed. Specific statistics pertaining to your watershed may not be available, but may be available for a watershed near you. If you cannot obtain local information, try contacting the Town Planner of the nearest large town or city to gather information about an area that the students are familiar with, even if it isn't the exact watershed in which they live or go to school.

Materials Needed:

Geographical Information Systems (GIS) maps may be available through the NRCS. They should be able to help you locate a source of GIS maps if they do not have access to them. Most GIS maps are available for purchase or loan only – free copies are generally not available. In some locations, GIS maps may not be available at all. If not, try using USGS topographic maps for the activity. Your local NRCS or USGS office or public library can help you locate a supplier of topo maps. Many outdoor stores carry them.

UNIT II: WETLAND ECOLOGY

ACTIVITY I: The Mystery of Missy Mite's Murder

Materials Needed:

Pond Life Golden Guides are available from Museum Products in Mystic, CT (address is in Curriculum). They can also be ordered from a bookstore. Other guides for older students are listed in the Additional References section of this curriculum. A good resource for macroinvertebrate identification is from River Watch Network called "*Living Waters – Using Benthic Macroinvertebrates and Habitat to Assess Your River's Health"* by Geoff Dates and James Byrne.

UNIT IV: WATER RESOURCES

ACTIVITY V: Water Resources in the (watershed specific to your curriculum) Watershed

Consult contacts listed above or research information specific to your watershed. Determine the significance of groundwater in your watershed. Determine the source of drinking water (ground or surface water, public or private supply) and the overall quality of the drinking water before it is treated (if a public supply). Compare your source of drinking water to that in other areas, either more or less metropolitan than the watershed you live in. Discuss basic geologic formation of the area that effects the quantity and location of ground and surface water in the area.

UNIT V: SOIL RESOURCES

ALL ACTIVITIES:

Contact NRCS for assistance in gathering information about soils in your area. NRCS or your local Conservation District may be able to help teach these activities in your classroom. At the very least, you should be able to obtain a copy of the soil survey for your area that will fully identify and describe local soils.

UNIT VI: EFFECTS OF LAND USE ON THE WATERSHED

Consult a local historian for trends in land use over the past 200 years. Relate these changes in your area to those in Rhode Island. This exercise can be introduced with a quick review of American History, migration to western states, industrial revolution, etc.

ACTIVITY II: How Does Development Effect Runoff?

WARNING: This exercise should only be attempted with students that understand basic algebra and are capable of reading complex graphs.

Materials Needed:

Rainfall data and local curve numbers are available from USGS and NRCS.

ACTIVITY III: Land Use Planning

Soil Surveys are available from your local NRCS office. Ask for assistance in locating an area represented on one sheet that has soils suitable for the four land use planning activities. Determine which tables in the Soil Survey will provide the information needed to complete the exercise.

UNIT VII: CULTURAL RESOURCES IN THE WATERSHED

Contact a local historian or historical society for information about Indian tribes, arrival of Europeans in your area, and dependence on water and how that has affected settlement of the area. Most towns and cities were settled near major streams or river and/or transportation centers. Have students research the information in libraries and museums if local input is not available.

UNIT IX: POINT SOURCES OF POLLUTION: A FIELD TRIP

Contact your local or state regulatory agency in charge of monitoring sewage and industrial discharges for more information on the Clean Water Act and how it is administered in your area. If you are unsure of who is responsible, call your local Town Planner, Public Works Director, or sewage treatment plant operator. Arrange a field trip with your local sewage treatment plant, to focus on how the facility works, what are major potential sources of pollution, a track record for their pollution history, and how they are affected by the Clean Water Act. You may also want to look into tours of local mills and factories located on a river. Usually these have permitted discharge into the water. Students can get an idea of the importance of the factory in relationship to their community and some of the difficulties businesses have in complying with the Clean Water Act.

UNIT XI: NON-POINT SOURCES OF POLLUTION: A Field Trip

If most of the watershed is rural, then contact your local Natural Resources Conservation Service to discuss potential farm field trip sites, and for help in arranging the field trip. Likely problems in rural areas are: sediment erosion, leaking septic systems, and nutrients. Contact your City/Town Hall, Planning Department or local watershed association to assist in arranging a field trip investigating urban related non-point sources of pollution in the watershed. Likely problems in urban areas are: stormwater runoff, and sediment erosion from construction sites. New housing or industrial developments still under construction can offer demonstrations of Best Management Practices (BMP's) in dealing with run-off and septic waste disposal. In both circumstances, focus on problem areas as well as areas where adequate controls/BMP's are used.

UNIT XII: PUBLIC HEARING AND CITIZEN ACTION: A FINAL LOOK

This chapter incorporates all of the information learned previously, allowing the student to apply all of their skills to a real life issue. Depending on the grade level of the students, this chapter offers a lot of flexibility, and can be the most educational and rewarding. You want to investigate an issue that encompasses environmental, social, and economic concerns. In choosing an issue/topic, follow "big news" stories in the media; older kids should be encouraged to do their own research and select an appropriate issue. For assistance, contact local watershed associations, Town Planners, Cooperative Extension, land trusts, etc. Controversial issues will represent the opinions of many different individuals and interest groups. You will want to pull together a list of position statements representing all sides of the issue. Groups to contact include the ones listed above, as well as the local Chamber of Commerce, state agencies, private citizens' organization, non-profit groups, and any other groups with a stake in the issue.

This chapter is not limited to debating a local issue. Students can get involved in local community service, or take action on a local issue. The students can research local events and concerns to decide what they want to do. The idea is for the student to learn that the

material they learned in class relates to actual events that happen in real life, right in their community, and to give students an opportunity to get involved in local issues. Some examples of what other students have done: stenciled storm drains, conducted streamside clean ups, water quality monitoring, etc. Contact your local watershed association for other ideas and projects.

SUGGESTED CONTACTS

If you do not know how to locate the contacts suggested in this adaptation guide, listed below are some helpful tips for finding a local contact:

NRCS – http://www.usda.gov

USGS – http://www.usgs.gov

Local Soil and Water Conservation District – http://www.nacdnet.org/

Cooperative Extension – contact your local state university, or check out their website

Watershed Associations and other local environmental groups – http://www.epa.gov/surf

APPENDIX II

EDUCATION BENCHMARK MATRIX*

The purpose of the following tables is to demonstrate how the *AWEsome!* Curriculum meets the standards set by the Rhode Island Science Frameworks (Rhode Island Department of Elementary and Secondary Education, 1996), as well as the Benchmarks for Science Literacy, Project 2061 (American Association for the Advancement of Science, 1993), the New Standards Performance Standards, Volume 2, Middle School, (National Center on Education and the Economy and University of Pittsburgh, 1997), and the Benchmarks on the Way to Environmental Literacy K-12, Massachusetts (Massachusetts Secretaries Group on Environmental Education, 1995). Most science standards and frameworks are categorized by age groups; these tables focus on middle school, grades 4 to 8, which is the primary age group that the *AWEsome!* Curriculum targets.

*Matrix by Denise J. Poyer from Non-thesis Masters Research Paper, *A Review of the Active Watershed Education (AWEsome!) Curriculum as it Relates to Rhode Island State Educational Standards for Middle School*, December 2004.

TABLE 1. Benchmark Matrix

AWESome! Activities	***Benchmarks for Science Literacy***	***RI Science Frameworks***	***New Standards Performance Standards***	***Benchmarks to Environmental Literacy***
1. What is a Watershed?				
i. All the water in the world	2B, 4B, 11B	4B	S3a, S4a	M9
ii. What is a watershed?	4B, 4C, 11B	4B, 4C	S3a, S3d, S4a	M3
iii. Watershed detectives	3A, 11B, 12A	3A	S3a, S3d, S5b, S8b	M3
iv. Specific watersheds	3A, 3C, 8C	3A, 3C	S3a, S3d, S4a, S6d	M3
v. Watershed delineation	2B, 9C		S3a, S5b, M2c	M3
2. Wetland Ecology				
i. For teachers, background information on wetlands	5D 5E	5D 5E	S2a, S2d, S3d, S4a	M3
ii. Brainstorming wetlands	4B	4B	S3d	M3
iii. Wetland functions and values	4B, 5E	4B, 5E	S2a, S2d, S3a, S3d, S4a	M3, M9
iv. What makes a wetland wet?	4B, 5D, 5E	4B, 5D, 5E	S2a, S3a, S3d, S5b	M1, M2, M3, M4
v. The mystery of Missy Mite's murder	5A, 5D, 5E,	5A, 5D, 5E,	S2a, S2d, S2e	
vi. Food webs	5A, 5D, 5E	5A, 5D, 5E	S2a, S2d, S2e	M1, M2, M3, M4
3. Wetland Exploration Field Trip				
i. Macro-invertebrate sampling	1B, 3A. 5A, 5D, 12A	3A. 5A, 5D	S2a, S2d, S2e, S3a, S3d, S4a, S5b, S5c, S6a, S6b, S8b, M4a, M6d, A3a	M1, M2, M3, M4, M14, M16
ii. Habitat characteristics	2B, 3A, 4C, 5D, 12A	3A, 4C, 5D	S2a, S2d, S3a, S3d, S5b, S5c, S6a, S6b, S8b, M4a, A3a	M1, M2, M3, M4, M6, M14, M16

AWESome! Activities	*Benchmarks for Science Literacy*	*RI Science Frameworks*	*New Standards Performance Standards*	*Benchmarks to Environmental Literacy*
4. Water Resources				
i. Global proportions of usable water	2B, 4B. 4C, 7D	4B, 4C	S3a, S4a	M3, M9, M18
ii. Home water inventory	2B, 3A, 3C, 4B, 6E, 7D	3A, 3C, 4B	M2h, M4a, A1b	M3, M9
iii. Water cycle	4B,	4B	S4a	M3, M5
iv. Aquifer model	4B, 4C, 11B	4B, 4C	S3a, S3d, S4a	M3, M15, M18, M9
5. Soil Resources				
i. Does it come from the soil?	5E	5E	S3a, S4a	M3, M6, M9
ii. What is soil made of?	4C,	4C	S3a	M3
iii. Five soil forming factors	4C	4C	S3a, S4a	M3
iv. Soil horizination	4C	4C	S3a	M3
v. Plant and soil relations	4C	4C	S2a, S3a, S4a	M3
6. Effects of Land Use on the Watershed				
i. Runoff model	2B, 3C, 4B, 4C	3C, 4B, 4C	S3d, S4a, S6a	M10, M15
ii. How does development affect runoff	2B, 3B, 3C, 4B, 4C, 7D, 12C	3B, 3C, 4B, 4C,	S3d, S4a, S4d, S4e, M1e, M1f, M2d, M3c, M6f	M10, M15, M19, M21
iii. Land use planning	2B, 3B, 3C, 4B, 4C, 7D	3B, 3C, 4B, 4C,	S3d, S4a, S4d, S4e, S5b, S5c, S5e, S6d, M8a, A1b, A3a	M10, M15, M19, M21
7. Cultural Resources in the Watershed				
i. Research into local history	1A, 1B, 1C, 4C, 7D, 10J	4C	S3a, S4d, S4e, S6d, E1c, E1d, E2a, E3a, A3a	M3
ii. Report methods	1C, 12D		S7e, E1c, E1d, E2b, E3b, E3c, A3a	

AWESome! Activities	*Benchmarks for Science Literacy*	*RI Science Frameworks*	*New Standards Performance Standards*	*Benchmarks to Environmental Literacy*
8. Introduction to Water Quality Issues				
i. Who dirtied the water?	3B, 3C, 4B, 4C, 7D 12A	3B, 3C, 4B, 4C	S3d, S4a, S4d, S4e	M3, M9, M10. M11, M19, M20, M21
ii. Classroom surveys	2B, 12A		E1c	M3, M9, M19
9. Point Sources of Pollution Field Trip	1B, 1C, 3A, 3B, 4B, 4C, 12E	3A, 3B, 4B, 4C	S3d, S4a, S4d, S4e, S5b, S5c, E1c, A3a	M11, M18, M20, M21
10. Non-point Sources of Pollution				
i. Erosion activity	2B, 4B, 4C, 7D	4B, 4C	S3d, S4d, S4e	M10, M9, M19
ii. Factors affecting erosion	4C	4C	S3d, S4d, S4e	M10, M18, M19
iii. Erosion control activities	2B, 4B, 4C, 7D	4B, 4C	S3d, S4d, S4e	M10, M19
iv. Composting	3A, 3B, 3C	3A, 3B, 3C	S3d, S4d, S4e	M7, M9, M19, M21
v. Storm water runoff	2B, 4B, 4C, 7D	4B, 4C	S3d, S4d, S4e	M10, M19
11. Non-Point Sources Field Trip	1B, 1C, 3A, 3B, 3C, 4B, 4C, 7D, 12E	3A, 3B, 3C, 4B, 4C	S3d, S4a, S4d, S4e, S5b, S5c, S5e, E1c, A3a	M9, M10, M11, M19, M20
12. Public Hearing	1A, 1B, 1C, 2B, 3B, 3C, 4B, 4C, 5D, 7D, 8C, 9E, 12D, 12E	3A, 3B, 3C, 4B, 4C. 5D	S3d, S4a, S4d, S4e, S5b, S5c, S5e, S6d, S7e, E1c, E1d, E2a, E3a, E3b, E3c, A2a, A2b, A2c A3a	M9, M10, M11, M18, M19, M20, M23, M25, M26, M27

TABLE 2. Benchmark explanation key

Benchmarks for Science Literacy
The list below shows the chapters and sections from Benchmarks for Science literacy. One or more benchmarks from each section corresponds to activities in the AWESome! Curriculum.

1. The Nature of Science
    - 1A The Scientific World View
    - 1B Scientific Inquiry
    - 1C The Scientific Enterprise
2. The Nature of Mathematics
    - 2B Mathematics, Science, and Technology
3. The Nature of Technology
    - 3A Technology and Science
    - 3B Design and Systems
    - 3C Issues in Technology
4. The Physical Setting
    - 4B The Earth
    - 4C Processes that Shape the Earth
5. The Living Environment
    - 5A Diversity of Life
    - 5D Interdependence of Life
    - 5E Flow of Matter and Energy
6. The Human Organism
    - 6A Human Identity
    - 6E Physical Health
7. Human Society
    - 7D Social Tradeoffs
8. The Designed World
    - 8C Energy Sources and Use
9. The Mathematical World
    - 9C Shapes
    - 9E Reasoning
10. Historical Perspective
    - 10J Harnessing Power
11. Common Themes
    - 11B Models
12. Habits of the Mind
    - 12A Values and Attitudes
    - 12C Manipulation and Observation
    - 12D Communication Skills
    - 12E Critical Response Skills

RI Science Frameworks

Rhode Island bases their frameworks on the Benchmarks for Science Literacy. They use only Chapters 3, 4, 5, and 6 from the document. Each chapter has several sections. RI Science Frameworks uses selected benchmarks from each section. Below is the list of chapters, sections, and benchmarks that correspond to activities in the AWESome! curriculum. Specific benchmarks are italicized. The benchmarks all begin with "By the end of (5^{th} or 8^{th}) grade all students will know that - "

3. The Nature of Technology
    - 3A Technology and Science
        - Grades 3-5 Benchmark (BM) 3 *Measuring instruments can be used to gather accurate information for making scientific comparisons of objects and events.*
        - Grades 6-8 BM 2 *Science and technology are essential to one another for such purposes as sample collection and measurement, data collection and storage, computation, and communication of information.*
    - 3B Design and Systems
        - Grades 3-5 BM 3 *The solution to one problem may create another one.*
        - Grades 6-8 BM 1 *Design usually requires taking constraints into account. Some are unavoidable. Other constraints limit design choices.*
    - 3C Issues in Technology
        - Grades 3-5 BM 4 *Scientific laws, engineering principles, properties of material, and construction techniques must be taken into account in designing engineering solutions to problems. Other factors, such as cost, and environmental impact, also must be considered.*
            - BM 6 *Because of their ability to invent tools and processes, people have an enormous effect on the lives of other living things.*
        - Grades 6-8 BM 2 *Technology cannot always provide successful solutions for problems or fulfill every human need.*
            - BM 4 *Technology has strongly influenced the course of history and continues to do so.*

4. The Physical Setting
    - 4B The Earth
        - Grades 3-5 BM 1 *Things on or near the earth are pulled towards it by the earth's gravity.*
        - Grades 6-8 BM 2 *Three fourths of the earth's surface is covered by a relatively thin layer of water.*
    - 4C Processes that Shape the Earth
        - Grades 6-8 BM 6 *Although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, and other organisms.*

BM 7 *Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the earth's land, oceans, and atmosphere. Some of these changes have decreased the capacity of the environment to support some forms of life.*

5. The Living Environment

5A Diversity of Life

Grades 3-5 BM 1 *A great variety of kinds of living things can be sorted into groups in many ways using various features to decide which things belong to which group.*

Grades 6-8 BM 2 *Animals and plants have a great variety of body plans and internal structures that contribute to their being able to make or find food and reproduce.*

BM 5 *All organisms, including the human species, are part of and depend on two main interconnected global food webs, one marine and the other terrestrial. The cycles continue indefinitely because organisms decompose after death to return food material to the environment.*

5D Interdependence of Life

Grades 3-5 BM 3 *Organisms interact with one another in various ways bedsides providing food. Many plants depend on animals for carrying their pollen to other plants or for dispersing their seed.*

Grades 6-8 BM 1 *In all environments organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter.*

BM 2 *Two types of organisms may interact with one another in several ways, including a producer/consumer, predator/prey, or parasite/host relationship or decompose another. Relationships may be competitive or mutually beneficial.*

5E Flow of Matter and Energy

Grades 6-8 BM 1 *Food provides the fuel and the building material for all organisms. Plants use the energy from light to make sugars from carbon dioxide and water. Organisms that eat plants break down the plant structures to produce the materials and energy they need to survive. Then they are consumed by other organisms.*

New Standards

New Standards uses performance based benchmarks. The benchmarks are italicized.

Science

S2 Life Sciences Concepts

The student demonstrates conceptual understanding by using concept accurately to explain observations and make predictions and by representing the concept in multiple ways. That is the student produces evidence that demonstrates understanding of:

S2a *Structure and function of living systems, such as ecosystem.*

S2d *Populations and ecosystem and the effects of resources and energy transfer.*

S2e *Evolution, diversity, and adaptation of organisms.*

S3 Earth and Space Science Concepts

The student demonstrates conceptual understanding by using concept accurately to explain observations and make predictions and by representing the concept in multiple ways. That is the student produces evidence that demonstrates understanding of:

S3a *Structure of earth systems.*

S3d *Natural resource management.*

S4 Scientific Connections and Applications

The student demonstrates conceptual understanding by using concept accurately to explain observations and make predictions and by representing the concept in multiple ways. That is the student produces evidence that demonstrates understanding of:

S4a *Big ideas and unifying concepts.*

S4d *Health such as environmental effects and toxicity.*

S4e *Impact of science and interaction between science and society.*

S5 Scientific Thinking

The student demonstrates scientific inquiry and problem solving by using thoughtful questioning and reasoning strategies, common sense and conceptual understanding from Science Standards, and appropriate methods to investigate the natural world; that is the student:

S5b *Uses concepts in Science Standards 1-4 to explain observations and phenomena.*

S5c *Uses evidence from reliable sources to develop descriptions, explanations, and models.*

S5e *Identifies problems, proposes and implements solutions, and evaluates for accuracy.*

S6 Scientific Tools and Technologies

The student demonstrates competence with the tools and technologies of science by using them to collect data, make observation, analyze results, and accomplish tasks effectively; that is the student:

S6a *Uses technology and tools to observe and measure objects and organisms.*

S6b *Records and stores data using a variety of formats.*

S6d *Acquires information from multiple sources.*

S7 Scientific Communication

The student demonstrates effective scientific communication by clearly describing aspects of the natural world using accurate data, graphs, or other appropriate media to convey depth of conceptual understand in science; that is the student:

S7e *Communicates in a form suited to the purpose and audience.*

S8 Scientific Investigation

The student demonstrates scientific competence by completing projects drawn from the following kinds of investigation:

S8b *Fieldwork*

<u>Mathematics</u>

The student produces evidence that demonstrates understanding of mathematical concepts; that is, the student:

M1 Number and Operation Concepts

M1e *Interprets percent as part of 100 and as a means of comparison.*

M1f *Uses ratios and rates to express relationships.*

M2 Geometry and Measurement Concepts

M2d *Determines and understands length, area, and volume.*

M2c *Identifies 3 dimensional shapes from 2 dimensional perspectives.*

M2h *Chooses appropriate units of measure and converts between like units.*

M3 Function and Algebra Concepts

M3c *Analyzes tables, graphs, and rules to determine functional relationships.*

M4 Statistics and Probability Concepts

M4a *Collects, organizes, and displays data in appropriate formats.*

M6 Mathematical Skills and Tools

M6d *Measures length, area, volume, weight, time, and temperature accurately.*

M6f *Uses equations, formulas, and simple algebraic notations appropriately.*

M8 Putting Mathematics to Work

M8a *Conducts a project that uses data based on civic, economic, or social issues.*

<u>English Language Arts</u>

The student demonstrates reading comprehension and responsible interpretation; that is the student:

E1 Reading

E1c *Reads and comprehends informational material.*

E1d *Demonstrates familiarity with public documents.*

E2 Writing

E2a *Produces a report.*

E3 Speaking, Listening, Viewing

E3a *Participates in conferences (interviews) with adults.*

E3b *Participates in group meetings.*
E3c *Prepares and delivers an individual presentation.*

Applied Learning

A1 Problem Solving
The student conducts a project that demonstrates he/she can:
A1b *Troubleshoots problems in the operation of a system.*
A2 Communication Tools and Techniques
Communicate information and ideas in ways that are appropriate to the purpose and the audience through spoken, written, and graphic means of expression. The student:
A2a *Makes oral presentations.*
A2b *Conducts formal written correspondence.*
A2c *Publishes information using several methods.*
A3 Information Tools and Technologies
Use information gathering techniques, analyze, and evaluate information, and use information technology to assist in collecting, analyzing, organizing, and presenting information. The student:
A3a *Gathers information to assist in completing project.*

Benchmarks on the Way to Environmental Literacy

Environmental Literacy Benchmarks are based very loosely on Benchmarks for Science Literacy. These benchmarks are performance based and all begin with "Learners can:"

M1 choose plants and animals from a list and explain how they adapted to their environment.
M2 demonstrate knowledge of basic concept of an ecosystem.
M3 identify and describe several interacting systems that make up their environment.
M4 select a system from a listing of systems and indicate component parts and roles.
M5 describe cyclic changes in the natural world and compare common characteristics.
M6 distinguish between renewable and non-renewable resources.
M7 cite numerous examples of how materials in the environment are used over and over again over time.
M9 state examples of materials in the environment that are resources to meet human needs.
M10 describe an environmental change and give consequences of that change.
M11 describe the possible effects on the survival of organisms and species brought on by changes in environmental conditions.
M14 use appropriate keys to identify organisms.
M15 cite examples of how to manage a system by changing the variables.
M16 choose and use appropriate technologies to gather and record observations regarding a complex system and use the observations to make predictions about the effects of changes made to system components.
M18 identify patterns of change in the natural and technical worlds as trends, cycles, or chaos.

M19 propose strategies to manage consumptive resources in the local community more efficiently and economically.
M20 explain the ways in which humans impact the environment.
M22 project likely consequences of alternative actions regarding the use of everyday technologies.
M23 identify a community environmental problem and propose a solution for that problem using information collected to support the proposal.
M25 create a listing of expected economic, social, and ecological costs and benefits of alternative proposals for resolving a local environmental issue.
M26 distinguish between various perspectives presented from observations of several witnesses to an environmental event or issue.
M27 collect information and observations and take action on a decision made regarding an important local issue.

APPENDIX III

FROM RIDOE WEBSITE JANUARY 2011 Selected GSE's relating to Watershed Science for Educators course material are highlighted

About the *Rhode Island K-12 Grade Span Expectations in Science*

The document, the *Rhode Island K-12 Grade Span Expectations in Science*, has been developed as a means to identify the science concepts and skills expected of all students. The RI science GSEs encompass the content eligible for inclusion on the large-scale assessment of science in grades 4, 8, and 11. They are not intended to represent the full science curriculum at each grade span, but are meant to capture the "major ideas" of science that can be assessed in an on-demand setting. The goal is that the science GSEs focus the curriculum, but do not restrict it.

The science GSEs are written for grade spans K-2, 3-4, 5-6, 7-8, and high school. They describe the science knowledge and abilities students should demonstrate at the end of each grade span. Since the large-scale high school science assessment is given near the end of grade 11, the GSEs for high school for all students are aligned with the content for the assessment. GSEs labeled "**Example Extensions"** are more challenging and provide direction for in-depth study of a particular topic in a course, class or individual student project. The RI science GSEs are extracted from the assessment targets developed as part of the framework for the common science assessment conducted in New Hampshire, Vermont and Rhode Island.

As you review the *Rhode Island K-12 Grade Span Expectations in Science*, the following information is important to understand, particularly the relationship between the science GSEs and the science assessment targets.

The science GSEs are organized into three **domains; Life Science, Earth and Space Science; and Physical Science.**

1. The three domains are further subdivided into ten **Statements of Enduring Knowledge** (EK) (listed in Table 1) that
    a. are intended to identify the fundamental knowledge/concepts for each domain of science.
    b. cut across grade levels, so that learning is developmental/built upon across grades (although not all aspects of the EK may be addressed at all grade levels)
    c. are of comparable grain size
    d. encompass, as a set, the *essential learning for each domain of science*
    e. imply topics of study (and therefore, lead to focused instruction, as identified in science standards/benchmarks/GSEs)

2. Each **Assessment Target** is linked to one Statement of Enduring Knowledge, as indicated with the target's coding (e.g., LS1 means Life Science and the first EK statement, LS2 means Life Science and the second EK, etc.)

3. Each Assessment Target incorporates one or more **Unifying Themes**, the broader universal principles that integrate the different scientific disciplines. Six Unifying Themes of Science were chosen after an extensive review of the literature and are further described in Table 2.

4. Assessment Targets for high school, middle school, and elementary school were developed by applying the Unifying Themes of science to the Statements of Enduring Knowledge for each of the science domains of Life Science, Earth and Space Science, and Physical Science. **Not every Unifying Theme has an "intersection" with**

every Statement of Enduring Knowledge. Development committees used prioritization strategies and field reviews to determine which assessment targets would provide the richest opportunities for large-scale assessment purposes.

TABLE 1 Statements of Enduring Knowledge (EK) by Domain	
Life Science	**LS 1** All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species).
	LS 2 Matter cycles and energy flows through an ecosystem.
	LS 3 Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).
	LS 4 Humans are similar to other species in many ways, and yet are unique among Earth's life forms.
Earth & Space Science	**ESS 1** The Earth and earth materials as we know them today have developed over long periods of time, through continual change processes.
	ESS 2 The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.
	ESS 3 The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time
Physical Science	**PS 1** All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another *(independent of size or amount of substance)*
	PS 2 Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.
	PS 3 The motion of an object is affected by forces.

TABLE 2

Unifying Themes of Science

(Subheadings under each Unifying Theme/Big Idea suggest but are not limited to what might be addressed)

Scientific Inquiry	Nature of Science	Systems & Energy	Models & Scale	Patterns of Change	Form & Function
• Collect data • Communicate understanding & ideas • Design, conduct, & critique investigations • Represent, analyze, & interpret data • Experimental design • Observe • Predict • Question and hypothesize • Use evidence to draw conclusions • Use tools, & techniques	• Accumulation of science knowledge (evidence & reasoning, looking at work of others) • Attitudes and dispositions of science (avoiding bias, divergent ideas, healthy skepticism) • History of Science • Science/Tech/ Society • Scientific Theories	• Cycles • Energy Transfer • Equilibrium • Interactions • Interdependence • Order & Organization	• Evidence provided through… • Explanations provided through… • Relative distance • Relative sizes *Models include - experimental models, simulations, & representations used to demonstrate abstract ideas*	• **Constancy and Change** • **Cycles** • **Evolutionary Change**	• Natural World

<table>
<tr><th colspan="5">ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.</th></tr>
<tr><td colspan="2">ESS1 (K-4) INQ –2
Use results from an experiment to draw conclusions about how water interacts with earth materials (e.g., percolation, erosion, frost heaves).</td><td colspan="2">ESS1 (5-8) SAE–2
Explain the processes that cause the cycling of water into and out of the atmosphere and their connections to our planet’s weather patterns.</td><td>ESS1 (9-11) NOS–2
Trace the development of the theory of plate tectonics or provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics.</td></tr>
<tr><td colspan="2">Grade Span Expectations (K-4)</td><td colspan="2">Grade Span Expectations (5-8)</td><td>Grade Span Expectations (HS)</td></tr>
<tr><td>ESS1 (K-2) –2
Students demonstrate an understanding of processes and change over time within earth systems by …

2a conducting tests on how different soils retain water (e.g., how fast does the water drain through?).</td><td>ESS1 (3-4)–2
Students demonstrate an understanding of processes and change over time within earth systems by …

2a conducting investigations and using observational data to describe how water moves rocks and soils.</td><td>ESS1 (5-6)–2
Students demonstrate an understanding of processes and change over time within earth systems by …

2a diagramming, labeling and explaining the processes of the water cycle including evaporation, precipitation, and run-off, condensation, transpiration, and groundwater.

2b explaining how condensation of water vapor forms clouds which affects climate and weather.

2c developing models to explain how humidity, temperature, and altitude affect air pressure and how this affects local weather.

2d identifying composition and layers of earth’s atmosphere.</td><td>ESS1 (7-8)–2
Students demonstrate an understanding of processes and change over time within earth systems by …

No GSEs for the ESS1 (5-8) SAE-2 Assessment Target</td><td>ESS1 (9-11)–2
Students demonstrate an understanding of processes and change over time within earth systems by …

2a using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how scientific knowledge regarding plate tectonics has changed over time.</td><td>Example Extension(s)</td></tr>
</table>

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.

ESS 1 (K-4) NOS –3	*ESS1 (5-8) POC –3*	**ESS1 (9-11) SAE+ POC–3**
Explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).	*Explain how earth events (abruptly and over time) can bring about changes in Earth's surface: landforms, ocean floor, rock features, or climate.*	*Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading).*

Grade Span Expectations (K-4)		Grade Span Expectations (5-8)		***Grade Span Expectations (HS)***	
ESS 1(K-2)–3 **Students demonstrate an understanding of how the use of scientific tools helps to extend senses and gather data by…** **3a** using scientific tools to extend senses and gather data about weather (e.g., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).	**ESS 1(3-4) –3** **Students demonstrate an understanding of how the use of scientific tools helps to extend senses and gather data by…** **3a** explaining how the use of scientific tools helps to extend senses and gather data about weather (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches). **3b** selecting appropriate tools for a given task and describing the information they will provide.	**ESS1 (5-6)–3** **Students demonstrate an understanding of processes and change over time within earth systems by …** **3a** describing events and the effect they may have on climate (e.g. El Nino, deforestation, glacial melting, and an increase in greenhouse gases).	**ESS1 (7-8)–3 Students demonstrate an understanding of processes and change over time within earth systems by …** **3a** evaluating slow processes (e.g. weathering, erosion, mountain building, sea floor spreading) to determine how the earth has changed and will continue to change over time. **3b** evaluating fast processes (e.g. erosion, volcanoes and earthquakes) to determine how the earth has changed and will continue to change over time. **3c** investigating the effect of flowing water on landforms (e.g. stream table, local environment).	**ESS1 (9-11)–3** Students demonstrate an understanding of processes and change over time within earth systems by … **3a** explaining how heat (produced by friction, radioactive decay and pressure) affects the Rock Cycle. **3b** explaining how convection circulations of the mantle initiate the movement of the crustal plates which then cause plate movement and seismic activity. **3c** investigating and using evidence to explain that conservation in the amount of earth materials occurs during the Rock Cycle. **3d** explaining how the physical and chemical processes of the Earth alter the crust (e.g. seafloor spreading, hydrologic cycle, weathering,	**Example Extension(s)** **ESS1 (Ext.)–3** **Students demonstrate an understanding of processes and change over time within earth systems by** **3aa** describe how interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts. **3bb** use computer modeling/ simulations to predict the effects of an increase in greenhouse gases on earth systems (e.g. earth temperature, sea level, atmosphere composition).

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.

ESS1 (K-4) INQ+SAE –4 ***Explain how wind, water, or ice shape and reshape the earth.***	***ESS1 (5-8) SAE+ POC –4*** *Explain the role of differential heating or convection in ocean currents, winds, weather and weather patterns, atmosphere, or climate.*	***ESS1 (9-11) INQ+POC+ MAS—4*** *Relate how geologic time is determined using various dating methods (e.g. radioactive decay, rock sequences, fossil records).*

Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		***Grade Span Expectations (HS)***	
ESS1 (K-2) –4 **Students demonstrate an understanding of processes and change over time within earth systems by …** **4a** observing and recording seasonal and weather changes throughout the school year.	**ESS1 (3-4) –4** **Students demonstrate an understanding of processes and change over time within earth systems by …** **4a** investigating local landforms and how wind, water, or ice have shaped and reshaped them (e.g. severe weather). **4b** using or building models to simulate the effects of how wind and water shape and reshape the land (e.g., erosion, sedimentation, deposition, glaciation). **4c** identifying sudden and gradual changes that affect the Earth (e.g. sudden change = flood; gradual change = erosion caused by oceans).	**ESS1 (5-6)–4** **Students demonstrate an understanding of processes and change over time within earth systems by …** **4a** explaining how differential heating and convection affect Earth's weather patterns. **4b** describing how differential heating of the oceans affects ocean currents which in turn influence weather and climate. **4c** explaining the relationship between differential heating/convection and the production of winds. **4d** analyzing global patterns of atmospheric movements to explain effects on weather.	**ESS1 (7-8)–4** **Students demonstrate an understanding of processes and change over time within earth systems by …** No GSEs for the ESS1 (5-8) SAE+POC=4 Assessment Target **4a** explaining cause and effect relationships between global climate and energy transfer. **4b** using evidence to make inferences or predictions about global climate issues.	**ESS1 (9-11)—4** **Students demonstrate an understanding of processes and change over time by …** **4a** describing various dating methods to determine the age of different rock structures.	**Example Extension(s)** Students demonstrate an understanding of processes and change over time by … **4aa** calculating the age of a rocks from various regions using radioactive half life (given its constituent elements, isotopes and rate of decay) and using those values to provide evidence for geologic relationships between/among the regions. **4bb** analyzing samples of rock to determine the relative age of the rock structure.

<table>
<tr><th colspan="5">ESS 1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.</th></tr>
<tr><td colspan="2">ESS1 (K-4) POC –5
Based on data collected from daily weather observations, describe weather changes or weather patterns.</td><td colspan="2">ESS1 (5-8) INQ+ POC –5
Using data about a rock’s physical characteristics make and support an inference about the rock’s history and connection to rock cycle.</td><td>No further targets for EK ESS1 at the High School Grade Span</td></tr>
<tr><td colspan="2">Grade Span Expectations (K-4)</td><td colspan="2">Grade Span Expectations (5-8)</td><td>Grade Span Expectations (HS)</td></tr>
<tr><td>ESS1 (K-2) –5
Students demonstrate an understanding of processes and change over time within earth systems by …

5a observing, recording, and summarizing local weather data.

5b observe how clouds are related to forms of precipitation (e.g., rain, sleet, snow).</td><td>ESS1 (3-4) –5
Students demonstrate an

understanding of processes and

change over time within earth

systems by …

5a observing, recording, comparing, and analyzing weather data to describe weather changes or weather patterns.

5b describing water as it changes into vapor in the air and reappears as a liquid when it’s cooled.

5c explaining how this cycle of water relates to weather and the formation of clouds.</td><td>ESS1 (5-6)-5 Students demonstrate an understanding of processes and change over time by …

5a representing the processes of the rock cycle in words, diagrams, or models.

5b citing evidence and developing a logical argument to explain the formation of a rock, given its characteristics and location. (e.g. classifying rock type using identification resources).</td><td>ESS1 (7-8)-5 Students demonstrate an
understanding of processes and change over time by …

No GSEs for the ESS1 (5-8) INQ+POC-5 Assessment Target</td><td colspan="2" rowspan="2"></td></tr>
<tr><td colspan="2">ESS1 (K-4) FAF -6
Given information about earth materials explain how their characteristics lend themselves to specific uses</td><td colspan="2">No further targets for EK ESS1 at the 5-8 Grade Span</td></tr>
</table>

LS1 - All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).				
LS1 (K-4) - INQ+POC –1 *Sort/classify different living things using similar and different characteristics. Describe why organisms belong to each group or cite evidence about how they are alike or not alike.*		***LS1 (5-8) – INQ+ SAE- 1*** **Using data and observations about the biodiversity of an ecosystem make predictions or draw conclusions about how the diversity contributes to the stability of the ecosystem.**	***LS1 (9-11) INQ+SAE+FAF -1*** *Use data and observation to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival (e.g., protein synthesis, DNA replication, nerve cells).*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**	***Grade Span Expectations (HS)***	
ESS1 (K-2) –6 **Students demonstrate an understanding of properties of earth materials by…** **6a** identifying which materials are best for different uses (e.g., soils for growing plants, sand for the sand box).	**ESS1 (3-4)-6** **Students demonstrate an understanding of properties of earth materials by…** **6a** determining and supporting explanations of their uses (e.g., best soils to grow plants, best building material for a specific purpose, determining which rock size will best prevent erosion).			

LS1 (K-2) –1 **Students demonstrate an understanding of classification of organisms by …**	LS1 (3-4) –1 **Students demonstrate an understanding of classification of organisms by …**	LS1 (5-6) – 1 *Students demonstrate understanding of biodiversity by…*	LS1 (7-8) – 1 **Students demonstrate understanding of biodiversity by…**	LS1 (9-11)-1 Students demonstrate understanding of structure and function-survival requirements by…	***Example Extension(s)***
1a distinguishing between living and non-living things. **1b** identifying and sorting based on a similar or different external features. **lc** observing and recording the external features that make up living things (e.g. roots, stems, leaves, flowers, legs, antennae, tail, shell).	**1a** citing evidence to distinguish between living and non-living things. **1b** identifying, sorting and comparing based on similar and/or different external features. **1c** recording and analyzing observations/data about external features (e.g., within a grouping, which characteristics are the same and which are different). **1d** citing evidence (e.g., prior knowledge, data) to draw conclusions explaining why organisms are grouped/not grouped together (e.g. mammal, bird, and fish).	**1a** recognizing that organisms have different features and behaviors for meeting their needs to survive (e.g., fish have gills for respiration, mammals have lungs, bears hibernate).	**1a** giving examples of adaptations or behaviors that are specific to a niche (role) within an ecosystem. **1b** explaining how organisms with different structures and behaviors have roles that contribute to each other's survival and the stability of the ecosystem.	1a **explaining the relationships between and amongst the specialized structures of the cell and their functions (e.g. transport of materials, energy transfer, protein building, waste disposal, information feedback, and even movement).** **1b** explaining that most multicellular organisms have specialized cells to survive, while unicellular organisms perform all survival functions. (e.g. nerve cells communicate with other cells, muscle cells contract, unicellular are not specialized). **Students demonstrate understanding of differentiation by…** 1c **comparing the role of various sub-cellular structures in unicellular organisms to comparable structures in multicellular organisms (e.g. oral groove, gullet, food vacuole in Paramecium compared to digestive systems in multicellular organisms).**	**LS1 (Ext)-1** **Students demonstrate understanding of structure and function-survival requirements by** **1aa** describing how the malfunction of cell organelles can lead to disease (e.g. "leaky" lysosomes and rheumatoid arthritis) **1bb** identify various specialized cells and common unicellular organisms in diagrams, photographs and/or microscopic slides. **Students demonstrate understanding of differentiation by…** **1cc** describing the origin and nature of stem cells and their potential for curing disease.

LS1 - All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).

LS1 (K-4) SAE -2	**LS1 (5-8) SAE+FAF –2**	**LS1 (9-11) FAF+ POC -2**
Identify the basic needs of plants and animals in order to stay alive. (i.e., water, air, food, space).	*Describe or compare how different organisms have mechanisms that work in a coordinated way to obtain energy, grow, move, respond, provide defense, enable reproduction, or maintain internal balance (e.g., cells, tissues, organs and systems).*	*Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations).*

Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		***Grade Span Expectations (HS)***	
LS1 (K-2)-2 **Students demonstrate understanding of structure and function-survival requirements by…** **2a** observing that plants need water, air, food, and light to grow; observing that animals need water, air, food and shelter to grow.	**LS1 (3-4)-2** **Students demonstrate understanding of structure and function-survival requirements by…** **2a** observing that plants need water, air, food, light and space to grow and reproduce; observing that animals need water, air, food, and shelter/space to grow and reproduce.	**LS1 (5-6) – 2** Students demonstrate understanding of structure and function-survival requirements by… **2a** describing structures or behaviors that help organisms survive in their environment (e.g., defense, obtaining nutrients, reproduction, and eliminating waste).	**LS1 (7-8) – 2** **Students demonstrate understanding of structure and function-survival requirements by…** **2a** explaining how the cell, as the basic unit of life, has the same survival needs as an organism (i.e., obtain energy, grow, eliminate waste, reproduce, provide for defense). **2b** observing and describing (e.g., drawing, labeling) individual cells as seen through a microscope targeting cell membrane, cell wall, nucleus, and chloroplasts. **2c** observing, describing and charting the growth, motion, responses of living organisms	**LS1 (9-11) –2** **Students demonstrate an understanding of the molecular basis for heredity by …** **2a** describing the DNA structure and relating the DNA sequence to the genetic code. **2b** explaining how DNA may be altered and how this affects genes/heredity (e.g. substitution, insertion, or deletion). **2c** describing how DNA contains the code for the production of specific proteins.	Example Extension(s) **LS1 (Ext) –2** **Students demonstrate an understanding of the molecular basis for heredity by …** **2aa** diagramming or modeling the relationship between chromosomes, genes and DNA, including histones and nucleosomes. **2bb** describing the how foods are genetically modified and the potential health, environmental and economic advantages and disadvantages of doing so. **2cc** tracing in a diagram or model the information flow - DNA to RNA to Protein - through transcription and translation.

LS1 - All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).

LS1 (K-4) FAF –4 *Identify and explain how the physical structures of an organism (plants or animals) allow it to survive in its habitat/environment (e.g., roots for water; nose to smell fire).*		*LS1 (5-8) FAF –4* *Explain relationships between or among the structure and function of the cells, tissues, organs, and organ systems in an organism.*		**No further targets for EK LS1 at the High School Grade Span**	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		***Grade Span Expectations (HS)***	
LS1 (K-2)–4 Students demonstrate understanding of structure and function-survival requirements by… **4a** identifying the specific functions of the physical structures of a plant or an animal (e.g. roots for water; webbed feet for swimming).	**LS1 (3-4)–4** **Students demonstrate understanding of structure and function-survival requirements by…** **4a** identifying and explaining how the physical structure/characteristic of an organism allows it to survive and defend itself (e.g. of a characteristic – the coloring of a fiddler crab allows it to camouflage itself in the sand and grasses of its environment so that it will be protected from predators). **4b** analyzing the structures needed for survival of populations of plants and animals in a particular habitat/environment (e.g. populations of desert plants and animals require structures that enable them to obtain/conserve/ retain water).	**LS1 (5-6) –4** **Students demonstrate understanding of differentiation by…** **4a** identifying cells as the building blocks of organisms. **4b** recognizing and illustrating (e.g. flow chart) the structural organization of an organism from a cell to tissue to organs to organ systems to organisms.	**LS1 (7-8)–4** **Students demonstrate understanding of differentiation by…** **4a** explaining that specialized cells perform specialized functions. (e.g., muscle cells contract, nerve cells transmit impulses, skin cells provide protection). **4b** comparing individual cells of tissues and recognizing the similarities of cells and how they work together to perform specific functions. **4c** explaining how each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole**.**		

LS2 - Matter cycles and energy flows through an ecosystem.

LS2 (K-4) SAE –5

Recognize that energy is needed for all organisms to stay alive and grow or identify where a plant or animal gets its energy.

LS2 (5-8) INQ+SAE -5

Using data and observations, predict outcomes when abiotic/biotic factors are changed in an ecosystem.

LS2 (9-11) INQ+SAE -3

Using data from a specific ecosystem, explain relationships or make predictions about how environmental disturbance (human impact or natural events) affects the flow of energy or cycling of matter in an ecosystem.

Grade Span Expectations (K-4)

LS2 (K-2)–5
Students demonstrate an understanding of energy flow in an ecosystem by …

5a caring for plants and/or animals by identifying and providing for their needs; experimenting with a plant's growth under different conditions, including light and no light.

LS2 (3-4) –5
Students demonstrate an understanding of energy flow in an ecosystem by …

5a identifying sources of energy for survival of organisms (i.e. light or food).

Grade Span Expectations (5-8)

LS2 (5-6) –5
Students demonstrate an understanding of equilibrium in an ecosystem by …

5a **identifying and defining an ecosystem and the variety of relationships within it (e.g., predator/prey, consumer/ producer/decomposer, host/parasite, catastrophic events).**

LS2 (7-8) –5

Students demonstrate an understanding of equilibrium in an ecosystem by …

5a identifying which biotic (e.g., bacteria, fungi, plants, animals) and abiotic (e.g., weather, climate, light, water, temperature, soil composition, catastrophic events) factors affect a given ecosystem.

5b analyzing how biotic and abiotic factors affect a given ecosystem.

5c predicting the outcome of a given change in biotic and abiotic factors in an ecosystem.

5d using a visual model (e.g., graph) to track population changes in an ecosystem.

Grade Span Expectations (HS)

LS2 (9-11)-3

Students demonstrate an understanding of equilibrium in an ecosystem by …

*3a **defining and giving an example of equilibrium in an ecosystem.***

3b describing ways in which humans can modify ecosystems and describe and predict the potential impact (e.g. human population growth; technology; destruction of habitats; agriculture; pollution; and atmospheric changes).

*3c **describing ways in which natural events (e.g. floods and fires) can modify ecosystems and describe and predict the potential effects.***

Example Extension(s)

LS2 (Ext)-3

Students demonstrate an understanding of equilibrium in an ecosystem by …

3bb researching and citing evidence of global warming to describe the potential impact on both the living and physical systems on Earth.

3cc investigating and reporting on a case study of ecosystem disruption caused by a natural event (e.g. Mississippi River delta region and hurricanes).

LS2 - Matter cycles and energy flows through an ecosystem.

LS2 (K-4) SAE –6

Describe ways plants and animals depend on each other (e.g., shelter, nesting, food).

LS2 (5-8) SAE– 6

Given a scenario trace the flow of energy through an ecosystem, beginning with the sun, through organisms in the food web, and into the environment (includes photosynthesis and respiration).

LS2 (9-11) POC+ SAE –4

Trace the cycling of matter (e.g., carbon cycle) and the flow of energy in a living system from its source through its transformation in cellular, biochemical processes (e.g., photosynthesis, cellular respiration, fermentation).

Grade Span Expectations (K-4)

LS2 (K-2)–6
Students demonstrate an

understanding of food webs in

an ecosystem by …

6a acting out or constructing simple diagrams (pictures or words) that shows a simple food web.

6b using information about a simple food web to determine how basic needs (e.g. shelter and water) are met by the habitat/environment.

LS2 (3-4)–6
Students demonstrate an understanding of food webs in an ecosystem by …

6a demonstrating in a food web that all animals' food begins with the sun.

6b using information about organisms to design a habitat and explain how the habitat provides for the needs of the organisms that live there

6c explaining the way that plants and animals in that habitat depend on each other.

Grade Span Expectations (5-8)

LS2 (5-6) –6
Students demonstrate an understanding of energy flow in an ecosystem by …

6a ***identifying the sun as the major source of energy for life on earth and sequencing the energy flow in an ecosystem.***

6b. ***describing the basic processes and recognizing the substances involved in photosynthesis and respiration.***

LS2 (7-8) –6
Students demonstrate an understanding of energy flow in an ecosystem by …

6a ***explaining the transfer of the sun's energy through living systems and its effect upon them.***

6b describing the basic processes and recognizing the names and chemical formulas of the substances involved in photosynthesis and respiration.

6c explaining the relationship between photosynthesis and respiration.

Students demonstrate an understanding of food webs in an ecosystem by …

6d creating or interpreting a model that traces the flow of energy in a food web.

Grade Span Expectations (HS)

LS2 (9-11)–4

Students demonstrate an understanding of matter and energy flow in an ecosystem by …

4a ***diagramming the energy flow in an ecosystem that compares the energy at different trophic levels. (e.g. What inferences can you make about energy "loss"& use?).***

4b ***explaining how the chemical elements and compounds that make up living things pass through food webs and are combined and recombined in different ways (e.g. nitrogen, carbon cycles, O_2, & H_2O cycles).***

Example Extension(s)
LS2 (Ext)–4

Students demonstrate an understanding of matter and energy flow in an ecosystem by …

4aa explaining the energy transfer with cells in photosynthesis and cellular respiration, tracking ATP production and consumption.

LS2 - Matter cycles and energy flows through an ecosystem

No further targets for EK LS 2 **at the K-4 Grade Span**		**LS2 (5-8) SAE-7** *Given an ecosystem, trace how matter cycles among and between organisms and the physical environment (includes water, oxygen, food web, decomposition, recycling but **not** carbon cycle or nitrogen cycle).*		***LS2 (9-11) NOS –5*** *Explain or evaluate potential bias in how evidence is interpreted in reports concerning a particular environmental factor that impacts the biology of humans.*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		***Grade Span Expectations (HS)***	
		LS2 (5-6)-7 **Students demonstrate an understanding of recycling in an ecosystem by …** **7a** explaining the processes of precipitation, evaporation, condensation as parts of the water cycle. **7b** completing a basic food web for a given ecosystem.	**LS2 (7-8)-7** *Students demonstrate an understanding of recycling in an ecosystem by …* **7a** diagramming or sequencing a series of steps showing how matter cycles among and between organisms and the physical environment. **7b** developing a model for a food web of local aquatic and local terrestrial environments. **7c** explaining the inverse nature or complementary aspects of photosynthesis/respiration in relation to carbon dioxide, water and oxygen exchange. **7d** conducting a controlled investigation that shows that the total amount of matter remains constant, even though its form and location change as matter is transferred among and between organisms and the physical environment (e.g., bottle biology, mass of a closed system over time).	**LS2 (9-11)–5** *Students will evaluate potential bias from a variety of media sources in how information is interpreted by…* **5a** analyzing claims from evidence and sources and evaluate based upon relevance, and validity. *5b* ***applying additional scientific data to develop logical arguments concerning environmental issues (e.g. tobacco company vs. cancer society articles on effects of smoking, government/big business vs. environmental perceptions of global climate change).***	**Example Extension(s)**

<table>
<tr><th colspan="5">LS3 - Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).</th></tr>
<tr><td colspan="2">LS3 (K-4) SAE –7
Using information (data or scenario), explain how changes in the environment can cause organisms to respond (e.g., survive there and reproduce, move away, die).</td><td colspan="2">LS3 (5-8) MAS+FAF – 8

Use a model, classification system, or dichotomous key to illustrate, compare, or interpret possible relationships among groups of organisms (e.g., internal and external structures, anatomical features).</td><td>LS3 (9-11) NOS -6

Explain how evidence from technological advances supports or refutes the genetic relationships among groups of organisms (e.g., DNA analysis, protein analysis.</td></tr>
<tr><td colspan="2">Grade Span Expectations (K-4)</td><td colspan="2">Grade Span Expectations (5-8)</td><td>Grade Span Expectations (HS)</td></tr>
<tr><td>LS3 (K-2)–7
Students demonstrate an understanding of equilibrium in an ecosystem by …

Currently no GSEs for this target at K-2 Grade Span</td><td>LS3 (3-4) –7
Students demonstrate an understanding of equilibrium in an ecosystem by …

7a explaining what plants or animals might do if their environment changes (e.g., changing food supply or habitat due to fire, human impact, sudden weather-related changes).

7b explaining how the balance of the ecosystem can be disturbed (e.g., how does overpopulation of a species affect the rest of the ecosystem).</td><td>LS3 (5-6) – 8

Students demonstrate an understanding of classification of organisms by …

8a stating the value of, or reasons for, classification systems.

8b following a taxonomic key to identify a given organism (e.g. flowering and non-flowering plants).</td><td>LS3 (7-8) – 8

Students demonstrate an understanding of classification of organisms by …

8a sorting organisms with similar characteristics into groups based on internal and external structures.

8b explaining how species with similar evolutionary histories/characteristics are classified more closely together with some organisms than others (e.g., a fish and human have more common with each other than a fish and jelly fish)

8c recognizing the classification system used in modern biology.</td><td>LS3 (9-11)-6

Students will demonstrate their understanding of the degree of genetic relationships among organisms by …

6a using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how our understanding of genetic variation has developed over time.</td><td>Example Extension(s)
LS3 (Ext) -6

Students will demonstrate their understanding of the degree of genetic relationships among organisms by …

6aa describing how the Human Genome Project has contributed to our understanding of both human heredity and the commonality of DNA sequences among organisms.</td></tr>
</table>

PHYSICAL SCIENCE

PS1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).

PS1 (K-4) INQ –1	PS1 (5-8) INQ-1	***PS1 (9-11) INQ –1***
Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).	**Investigate the relationships among mass, volume and density.**	*Use physical and chemical properties as determined through an investigation to identify a substance.*

Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		***Grade Span Expectations (HS)***	
PS1 (K-2)–1 **Students demonstrate an understanding of characteristic properties of matter by …** **1a** identifying, comparing, and sorting objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight). **1b** recording observations/data about physical properties. **1c** using attributes of properties to state why objects are grouped together (e.g., things that roll, things that are rough).	**PS1 (3-4)–1** **Students demonstrate an understanding of characteristic properties of matter by …** **1a** identifying, comparing, and sorting objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, flexibility). **1b** citing evidence (e.g., prior knowledge, data) to support conclusions about why objects are grouped/not grouped together. **Students demonstrate an understanding of physical changes by …** **1c** observing and describing physical changes (e.g. freezing, thawing, torn piece of paper).	**PS1 (5-6)-1** **Students demonstrate an understanding of characteristic properties of matter by …** **1a** comparing the masses of objects of equal volume made of different substances.	**PS1 (7-8) –1** **Students demonstrate an understanding of characteristic properties of matter by …** **1a** measuring mass and volume of both regular and irregular objects and using those values as well as the relationship D=m/v to calculate density.	**PS1 (9-11)–1** Students demonstrate an understanding of characteristic properties of matter by … **1a** utilizing appropriate data (related to chemical and physical properties), to distinguish one substance from another or identify an unknown substance. **1b** determining the degree of change in pressure of a given volume of gas when the temperature changes incrementally (doubles, triples, etc.).	**Example Extension(s)** ***PS1 (Ext)–1*** **Students demonstrate an understanding of characteristic properties of matter by …** **1aa** explaining the states of a substance in terms of the particulate nature of matter and the forces of interaction between particles. **1bb** quantitatively determining how volume, pressure, temperature and amount of gas affect each other (PV=nRT) in a system.

PS1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).

PS1 (K-4) POC –2 *Make a prediction about what might happen to the state of common materials when heated or cooled or categorize materials as solid, liquid, or gas.*	***PS1 (5-8) INQ+POC –2*** *Given data about characteristic properties of matter (e.g., melting and boiling points, density, solubility) identify, compare, or classify different substances.*	***PS1 (9-11) MAS+ NOS –2*** *Scientific thought about atoms has changed over time. Using information (narratives or models of atoms) provided, cite evidence that has changed our understanding of the atom and the development of atomic theory.*

Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		***Grade Span Expectations (HS)***	
PS1 (K-2) POC –2 **Students demonstrate an understanding of states of matter by …** **2a** describing properties of solids and liquids. **2b** identifying and comparing solids and liquids**.** **2c** making logical predictions about the changes in the state of matter when adding or taking away heat (e.g., ice melting, water freezing).	**PS1 (3-4) –2** **Students demonstrate an understanding of states of matter by …** **2a** describing properties of solids, liquids, and gases. **2b** identifying and comparing solids, liquids, and gases. **2c** making logical predictions about the changes in the state of matter when adding or taking away heat (e.g., ice melting, water boiling or freezing, condensation/evaporation).	**PS1 (5-6) –2** **Students demonstrate an understanding of characteristic properties of matter by …** **2a** recognizing that different substances have properties, which allow them to be identified regardless of the size of the sample. **2b** classifying and comparing substances using characteristic properties (e.g., solid, liquid, gas).	**PS1 (7-8) –2** **Students demonstrate an understanding of characteristic properties of matter by …** **2a** identifying an unknown substance given its characteristic properties. **2b** classifying and comparing substances using characteristic properties (e.g., solid, liquid, gas; metal, non-metal).	**PS1 (9-11)– 2** **Students demonstrate an understanding of characteristic properties of matter by …** **2a** using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how the understanding of atomic structure has changed over time.	**Example Extension(s)**
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		***Grade Span Expectations (HS)***	

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Civics & Government Strand Statements of Enduring Knowledge	**Stems for Each Statement of Enduring Knowledge** **Students demonstrate an understanding of:**	**Page**
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	C&G 1 -2: Sources of authority and use of power, and how they are/can be changed…	**5**
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	C&G 2 -2: The democratic values and principles underlying the U.S. government…	**7**
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C&G 5: As members of an interconnected world community, the choices we make impact others locally, nationally, and globally.					
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C&G 5 (K-2) -1 **Students demonstrate an understanding of the many ways earth's people are interconnected by…**	**C&G 5 (3-4) –1Students demonstrate an understanding of the many ways Earth's people are interconnected by…**	**C&G 5 (5-6)– 1** **Students demonstrate an understanding of the many ways Earth's people are interconnected by…**	**C&G 5 (7-8) – 1** **Students demonstrate an understanding of the many ways Earth's people are interconnected by…**	**C&G 5 (9-12) – 1** **Students demonstrate an understanding of the many ways Earth's people are interconnected by…**	**C&G 5 (Ext) – 1** **Students demonstrate an understanding of the many ways Earth's people are interconnected by…**
a. exploring and discussing ways we interact with others around the world (e.g., food, clothing, transportation, tourism, news)	a. explaining how current events around the world affect our lives (e.g., trade, war, conflict-resolution, global warming)	a. identifying, describing, and explaining how people are socially, technologically, geographically, economically, or culturally connected to others	a. tracing and explaining social, technological, geographical, economical, and cultural connections for a given society of people (e.g., trade, transportation, communication)	a. identifying the ways the world is organized: politically, socially, culturally, economically, environmentally (e.g., nation-state)	
	b. locating where different nations are in the world in relation to the United States (e.g., related to current events, literature, trade books)	b. locating where different nations are in the world in relation to the U.S.	b. identifying, describing, and explaining how people are politically, economically, environmentally, militarily, and (or) diplomatically connected (e.g., World Bank, UN, NATO, European Union)	b. organizing information to show relationships between and among various individuals, systems, and structures (e.g., politically, socially, culturally, economically, environmentally)	
C&G 5 (K-2) –2 **Students demonstrate an understanding of the benefits and challenges of an interconnected world by…**	**C&G 5 (3-4) –2** **Students demonstrate an understanding of the benefits and challenges of an interconnected world by…**	**C&G 5 (5-6) -2** **Students demonstrate an understanding of the benefits and challenges of an interconnected world by…**	**C&G 5 (7-8)-2** **Students demonstrate an understanding of the benefits and challenges of an interconnected world by…**	**C&G 5 (9-12)-2** **Students demonstrate an understanding of the benefits and challenges of an interconnected world by…**	**C&G 5-2 (Ext)** **Students demonstrate an understanding of the benefits and challenges of an interconnected world by…**
a. using a variety of print and non-print sources to explore other people and places	a. exploring current issues using a variety of print and non-print sources (e.g., *Where does our food come from and what happens if there is a drought?*)	a. identifying and discussing factors that lead to the breakdown of order among societies (e.g., natural disasters, wars, plagues, population shifts, natural resources)	a. identifying and discussing factors that lead to the breakdown of order among societies and the resulting consequences (e.g., abolition of slavery, terrorism, Fall of Roman Empire, civil war)	a. describing the interconnected nature of a contemporary or historical issue	
		b. citing a social, technological, geographical, economical, or cultural issue that provides an example of both benefits and challenges	b. considering competing interests on issues that benefit some people and cause other people to suffer (e.g., slavery, whaling, oil exploration)	b. analyzing and evaluating a contemporary or historical issue (e.g., free trade versus fair trade, access to medical care and terrorism)	

C&G 5 (K-2)-3 Students demonstrate an understanding of how the choices we make impact, and are impacted by an interconnected world, by…	C&G 5 (3-4) -3 Students demonstrate an understanding of how the choices we make impact, and are impacted by an interconnected world, by…	C&G 5 (5-6) -3 Students demonstrate an understanding of how the choices we make impact and are impacted by an interconnected world by…	C&G 5 (7-8) -3 Students demonstrate an understanding of how the choices we make impact and are impacted by an interconnected world by…	C&G 5 (9-12) -3 Students demonstrate an understanding of how the choices we make impact and are impacted by, an interconnected world by…	C&G 5 (Ext)-3 Students demonstrate an understanding of how the choices we make impact and are impacted by, an interconnected world by…
a. listing the pros and cons of personal decisions (e.g., littering, recycling)	a. listing and explaining the pros and cons of personal and organizational (e.g., businesses, governments, other groups) decisions (e.g., donations to global charities)	a. identifying and analyzing the effects of consumer choice (environmental, communication, political)	a. making predictions as to the effects of personal consumer, environmental, communication, and eventual political choices (e.g., hybrid cars, local v. imported)	a. predicting outcomes and possible consequences of a conflict, event, or course of action	
		b. explaining how actions taken or not taken impact societies (e.g., natural disasters, incidences of social injustice or genocide)	b. summarizing a significant situation; proposing and defending actions to be taken or not taken (e.g., pollution, consumption, conservation)	b. identifying and summarizing the intended and unintended consequences of a conflict, event, or course of action	
				c. using deliberation, negotiation, and compromise to plan and develop just solutions to problems (e.g., immigration, limited energy resources, nuclear threat) created when nations or groups act	

GSEs for Historical Perspectives/Rhode Island History Strand

HP 1: History is an account of human activities that is interpretive in nature.					
GSEs for Grades K-2	**GSEs for Grades 3-4**	**GSEs for Grades 5-6**	**GSEs for Grades 7-8**	**GSEs for HS Proficiency**	**GSEs for HS Extended Learning**
HP 1 (K-2) –1 **Students *act as historians,* using a variety of tools (e.g., artifacts and primary and secondary sources) by…**	**HP 1 (3-4) –1** **Students *act as historians,* using a variety of tools (e.g., artifacts and primary and secondary sources) by…**	**HP 1 (5-6) –1** *Students* act as historians, *using a variety of tools (e.g., artifacts and primary and secondary sources) by…*	**HP 1 (7-8) –1** *Students* act as historians, *using a variety of tools (e.g., artifacts and primary and secondary sources) by…*	**HP 1 (9-12) –1** **Students *act as historians,* using a variety of tools (e.g., artifacts and primary and secondary sources) by…**	**HP 1 (Ext) –1** **Students *act as historians,* using a variety of tools (e.g., artifacts and primary and secondary sources) by…**
a. identifying and categorizing the kinds of information obtained from a variety of artifacts and documents (e.g., *What would this artifact tell us about how people lived?*)	a. describing the difference between primary and secondary sources and interpreting information from each (e.g., asking and answering questions, making predictions)	a. identifying appropriate sources (e.g., historical maps, diaries, photographs) to answer historical questions	a. identifying appropriate sources and using evidence to substantiate specific accounts of human activity	a. formulating historical questions, obtaining, analyzing, evaluating historical primary and secondary print and non-print sources (e.g., *RI Constitution*, art, oral history, writings of Elizabeth Buffum Chace)	
b. distinguishing objects, artifacts, and symbols from long ago and today (e.g., passage of time documented through family photos, evolution of household appliances)	b. classifying objects, artifacts, and symbols from long ago and today and describing how they add to our understanding of the past	b. using sources to support the stories of history (*How do we know what we know?*)	b. drawing inferences from Rhode Island History about the larger context of history (e.g., Opening of Japan, Separation of Church and State, Industrialism)	b. explaining how historical facts and historical interpretations may be different, but are related (e.g., slavery in RI v. economic benefit to RI)	
	c. organizing information obtained to answer historical questions	c. asking and answering historical questions, organizing information, and evaluating information in terms of relevance	c. asking and answering historical questions, evaluating sources of information, organizing the information, and evaluating information in terms of relevance and comprehensiveness	c. identifying, describing, or analyzing multiple perspectives on an historical trend or event (e.g., mill worker v. mill owners during Industrial Revolution in RI; separation of powers in RI government)	
		d. identifying the point of view of a historical source (e.g., media sources)		d. using technological tools in historical research	d. using a variety of technological tools in historical research and interpretation (e.g., master database of graveyards; census records, online school reports, online state tax records)

HP 1 (K-2) –2 **Students interpret history as a series of connected events with multiple cause-effect relationships, by…**	**HP 1 (3-4) –2** **Students interpret history as a series of connected events with multiple cause-effect relationships, by…**	**HP 1 (5-6) –2** **Students interpret history as a series of connected events with multiple cause-effect relationships, by…**	**HP 1 (7-8) –2** **Students interpret history as a series of connected events with multiple cause-effect relationships, by…**	**HP 1 (9-12) –2** **Students interpret history as a series of connected events with multiple cause-effect relationships, by…**	**HP 1 (Ext) –2** **Students interpret history as a series of connected events with multiple cause-effect relationships, by…**
a. describing and organizing a sequence of various events in personal, classroom, or school life (e.g., organizing and interpreting data in timelines)	a. describing and organizing a sequence of significant events in Rhode Island history (e.g., interpreting and analyzing data in timelines)	a. investigating and summarizing historical data in order to draw connections between two events and to answer related historical questions	a. investigating and analyzing historical and visual data in order to draw connections between a series of events	a. explaining cause and effect relationships in order to sequence and summarize events, make connections between a series of events, or compare/contrast events	a. analyzing cause and effect relationships showing multiple causation (e.g., industrialization and immigration, King Philip's War; detribalization and retribalization)
b. explaining how a sequence of events affected people in home, classroom, or school (e.g., getting a new student in the classroom)	b. explaining and inferring how a sequence of events affected people of Rhode Island (e.g., settlement or changes in community/ Rhode Island, Hurricane Katrina)		b. developing, expanding, and supporting an historical thesis, based on a series of events	b. interpreting and constructing visual data (e.g., timelines, charts, graphs, flowchart, historical films, political cartoons) in order to explain historical continuity and change (e.g., timeline of Rhode Island's path to Revolution: Why is Rhode Island first to declare independence, but last colony to ratify the *Constitution*?)	b. analyzing visual data in order to explain historical continuity and change (e.g. timeline of Rhode Island's path to Revolution) (How did architectural changes in RI mirror historical trends? – Mills transformed into living and work spaces)

HP 2: History is a chronicle of human activities, diverse people, and the societies they form.					
GSEs for Grades K-2	**GSEs for Grades 3-4**	**GSEs for Grades 5-6**	**GSEs for Grades 7-8**	**GSEs for HS Proficiency**	**GSEs for HS Extended Learning**
HP 2 (K-2) – 1 **Students connect the past with the present by…**	**HP 2 (3-4) –1** **Students connect the past with the present by…**	**HP 2 (5-6) – 1** **Students connect the past with the present by…**	**HP 2 (7-8) –1** *Students connect the past with the present by…*	**HP 2 (9-12)– 1** **Students connect the past with the present by…**	**HP 2 (Ext)–1** **Students connect the past with the present by…**
a. recognizing the origin, name, or significance of local geographic and human-made features (e.g., school, street, park, city, river, monuments)	a. investigating and explaining the origin, name, or significance of local and Rhode Island geographic and human-made features	a. identifying sequential events, people, and societies that have shaped RI today	a. determining the cause(s) and effect(s) of specific historical events that impact RI today	a. explaining origins of major historical events (e.g., Industrial Revolution in Rhode Island)	a. tracing and analyzing how a present situation or problem has been constructed/affected by its historical roots (e.g., deindustrialization in Rhode Island)
		b. comparing and contrasting the development of RI ethnic history to the nation's history (e.g., *What historical factors makes RI unique?*; immigration, settlement patterns, religion, resources, geography)	b. analyzing the impact of RI's ethnic development on local, state, and national history	b. identifying and linking key ideas and concepts and their enduring implications (e.g., separation of church and state in Rhode Island)	
		c. identifying and describing how national and world events have impacted RI and how RI has impacted world events (e.g., China Trade, WWII, Industrial Revolution)	c. analyzing and evaluating how national and world events have impacted RI and how RI has impacted world events	c. analyzing and evaluating how national and world events have impacted Rhode Island and how Rhode Island has impacted national and world events (e.g., women's liberation movement; Commodore Matthew Perry of RI opens trade with Japan; Quonset Hut; slave trade)	c. researching a current state, national or world issue and predicting future implications for RI or propose a course of action

HP 2 (K-2) – 2 Students chronicle events and conditions by…	HP 2 (3-4) – 2 Students chronicle events and conditions by…	HP 2 (5-6) – 2 Students chronicle events and conditions by…	HP 2 (7-8) – 2 Students chronicle events and conditions by…	HP 2 (9-12) – 2 Students chronicle events and conditions by…	HP 2 (Ext) – 2 Students chronicle events and conditions by…
a. describing, defining, and illustrating a sequence of events from personal, classroom, school, or community life (e.g., timeline or self-made informational text showing key events)	a. describing, defining, and illustrating by example Rhode Island historical individuals, groups and events (e.g., Roger Williams, Native Americans, immigrant groups) and how they relate to the context (e.g., conditions of the time, events before and after)	a. placing key events and people of a particular historical era in chronological sequence	a. identifying key events and people of a particular historical era or time period (e.g., centuries, BCE, "The Sixties")	a. creating narratives based on a particular historical point of view (e.g., unemployed WWII vet, home front in WWII, oil refinery promoter, environmental activist in Rhode Island; slave or free black in Newport, slave holder, trader or investor)	a. critiquing historical narratives for historical accuracy or points of view
		b. summarizing key events and explaining the historical contexts of those events	b. correlating key events to develop an understanding of the historical perspective of the time period in which they occurred (e.g., Jacksonian Democracy and Dorr's Rebellion, water power and steam power, WWII and women at work)	b. synthesizing information from multiple sources to formulate an historical interpretation (e.g., document-based questions, quantitative data, material artifacts of RI)	
HP 2 (K-2) – 3 **Students show understanding of change over time by…**	**HP 2 (3-4) – 3** **Students show understanding of change over time by…**	**HP 2 (5-6) – 3** **Students show understanding of change over time by…**	**HP 2 (7-8) – 3** **Students show understanding of change over time by…**	**HP 2 (9-12)– 3** **Students show understanding of change over time by…**	**HP 2 (Ext)– 3** **Students show understanding of change over time by…**
a. exploring and describing similarities and differences in objects, artifacts, and technologies from the past and present (e.g., transportation, communication, school and home life)	a. interpreting and explaining similarities and differences in objects, artifacts, technologies, ideas, or beliefs (e.g., religious, economic, education, self-government) from the past and present (e.g., transportation or communication in the community, RI, U.S.)	a. establishing a chronological order by working backward from some issue, problem, or event to explain its origins and its development over time	a. establishing a chronological order by working backward from some issue, problem, or event to explain its origins and its development over time; and to construct an historical narrative	a. tracing patterns chronologically in history to describe changes on domestic, social, or economic life (e.g., immigration trends, land use patterns, naval military history)	a. tracing patterns chronologically in history to describe changes on domestic, social, or economic life and predicting events that might occur in the future, based on those patterns

				b. documenting various groups (e.g., formal: non-government organizations, religious; informal: family, clan) and their traditions that have remained constant over time (e.g., religious denomination, fishing industry, formal and informal design, town financial meeting, lotteries)	b. documenting various groups and their ideas that have remained constant over time and analyzing why they have or have not endured

HP 3: The study of history helps us understand the present and shape the future.					
GSEs for Grades K-2	**GSEs for Grades 3-4**	**GSEs for Grades 5-6**	**GSEs for Grades 7-8**	**GSEs for HS Proficiency**	**GSEs for HS Extended Learning**
HP 3 (K-2) – 1 **Students demonstrate an understanding of how the past frames the present by…**	**HP 3 (3-4) –1** **Students demonstrate an understanding of how the past frames the present by…**	**HP 3 (5-6) – 1** **Students demonstrate an understanding of how the past frames the present by…**	**HP 3 (7-8) –1** *Students demonstrate an understanding of how the past frames the present by…*	**HP 3 (9-12) – 1** **Students demonstrate an understanding of how the past frames the present by…**	**HP 3 (Ext) – 1** **Students demonstrate an understanding of how the past frames the present by…**
a. identifying how events and people shape family and school life (e.g., *How would your life change if you moved to another place? What would happen if your school closed? What would happen if there were no school buses?*)	a. recognizing and interpreting how events, people, problems, and ideas shape life in the community and in Rhode Island	a. identifying historical conditions and events that relate to contemporary issues (e.g., separation of church state, treatment of Native Americans, immigration, gender issues)	a. analyzing and reporting on a social movement from its inception (including historical causes), its impacts on us today, and its implications for the future	a. gathering evidence of circumstances and factors contributing to contemporary problems (e.g., civil rights movement, sexual revolution)	a. tracking implementation of a decision; analyzing the interests it served; estimating the position, power, and priority of each stakeholder; and predicting continuing costs and benefits from a variety of perspectives (e.g., public school funding in RI or U.S.)
		b. answering "what if" questions and using evidence to explain how history might have been different (e.g., *How might history be different if Anne Hutchinson hadn't dissented?*)	b. evaluating alternative courses of action, (keeping in mind the context of the time), ethical considerations, and the interest of those affected by the decision, and determining the long- and short-term consequences (e.g., Post WWII use of Narragansett Bay - tourism vs. oil refinery)	b. formulating a position or course of action on a current issue from a choice of carefully evaluated options, taking into account the historical underpinnings (e.g., casino issue and American Indian sovereignty; current national border debate and RI historical perspective)	b. formulating and presenting a position or course of action on a current issue in a public forum

HP 3 (K-2) – 2 Students make personal connections in an historical context (e.g., source-to-source, source-to-self, source-to-world) by…	HP 3 (3-4) – 2 Students make personal connections in an historical context (e.g., source-to-source, source-to-self, source-to-world) by…	HP 3 (5-6) – 2 Students make personal connections in an historical context (e.g., source-to-source, source-to-self, source-to-world) by…	HP 3 (7-8) – 2 Students make personal connections in an historical context (e.g., source-to-source, source-to-self, source-to-world) by…	HP 3 (9-12) – 2 Students make personal connections in an historical context (e.g., source-to-source, source-to-self, source-to-world) by…	HP 3 (Ext)– 2 Students make personal connections in an historical context (e.g., source-to-source, source-to-self, source-to-world) by…
a. using a variety of sources (e.g., photographs, written text, clothing, oral history) to reconstruct their past and understand the present.	a. using a variety of sources (e.g., photographs, written text, clothing, oral history) to reconstruct the past, understand the present, and make predictions for the future	**a. explaining how the similarities of human issues across time periods influence their own personal histories (e.g., so what? *How does this relate to me?)***	a. recognizing and reflecting on how the similarities of human issues across time periods influence their own personal histories (e.g., so what? *How does this relate to me?)*	a. articulating an understanding of the meaning, implications, and impact of historical events on their lives today (e.g., closing of the Navy in Rhode Island at Quonset Point; volunteer army; ratification of RI Constitution; whaling industry, access to the shore, declining birth rates)	a. using knowledge of historical ideas and concepts and their enduring implications, to formulate a philosophy statement based on personal values
		b. explaining how the differences of human issues across time periods influence their own personal histories (e.g., so what? *How does this relate to me?)*	b. recognizing and reflecting on how the differences of human issues across time periods influence their own personal histories (e.g., so what? *How does this relate to me?)*	b. analyzing how an historical development (e.g., cycle of poverty or prosperity, low educational attainment, "Independent Man") has contributed to current social, economic, or political patterns	b. presenting an analysis of an historical development to a public forum
		c. identifying the cultural influences that shape individuals and historical events	c. comparing and contrasting the cultural influences that shape individuals and historical events (e.g., Conversion of Quakers from slave holders to abolitionists, emergence of mill villages, Gordon Trial)		

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Suggested Resources**

Suggested National/Global Resources**

Key for Grade Level: ES = grades K-5; MS = grades 6-8; HS = grades 9-12

** *Suggested* resources listed are *not* meant to be exhaustive; these are only a *sample* of resources that are available free of charge and may be of use to you. The Rhode Island Department of Education is *not* responsible for the veracity of the content.

Topic	Name, source	Description	Website	Grade level(s)
Civics, Government	Bill of Rights Institute	Online lesson resources: topics, discussion questions, informational links	http://www.billofrightsinstitute.org/instructional/resources/Lessons/Lessons_List.asp	HS
Civics, History, Government	Center for Civic Education	Online lesson plans aligned to national standards	http://www.civiced.org/index.php?page=lesson_plans	ES, MS, HS
Civics, History, Government	National Endowment for the Humanities	Online lesson plans aligned to national standards	http://edsitement.neh.gov/special_features_view.asp?id=1	HS
Civics, History, U.S. Presidents	United States Mint	Online lesson plans aligned to national standards and games	http://www.usmint.gov/kids/teachers/lessonPlans/presidential/download.cfm	ES, MS, HS
Civil Rights	The National Archives, U.S. Government	Online information and documents and suggested (unaligned) lesson plans	http://www.archives.gov/education/lessons/civil-rights-act/activities.html#standards http://www.archives.gov/education/lessons/memphis-v-mlk/activities.html#standards	MS, HS
Civil War	The National Archives, U.S. Government	Online information and documents and suggested (unaligned) lesson plans	http://www.archives.gov/education/lessons/civil-war-docs/activities.html#standards	MS, HS
Electoral College Vote	The National Archives, U.S. Government	Online information and documents and suggested (unaligned) lesson plans	http://www.archives.gov/education/lessons/electoral-tally/activities.html#standards	MS, HS
Geography	National Geographic	Online materials/games/activities/ quizzes	http://www.mywonderfulworld.org	ES, MS, HS
Geography, maps	National Geographic	Printable maps	http://www.nationalgeographic.com/xpeditions/atlas/	ES, MS, HS
Government	Ben's Guide, Government	Links to student-oriented websites on	http://bensguide.gpo.gov/subject.html#govern	ES, MS, HS

	Publications Office	government/law topics	ment	
Primary Sources	American Memory Collection, Library of Congress	Online materials and unaligned lesson plans	http://memory.loc.gov/learn/lessons/psources/pshome.html	MS, HS
Social studies, U.S./world history	Federal Resources for Educational Excellence (FREE)	Online materials on a variety of topics	http://www.free.ed.gov/HandSS.cfm	ES, MS, HS
U.S. History	American Memory Collection, Library of Congress	"Learning Page" – Starting point for collections with associated lessons/materials	http://memory.loc.gov/learn/start/index.html	ES, MS, HS
U.S. History	American Memory Collection, Library of Congress	Online text and images of documents; suggestions for lessons and projects	http://memory.loc.gov/ammem/ndlpedu/collections/	ES, MS, HS
U.S. History	Best of History Web Sites	Online lesson plans, teacher guides, activities, games, quizzes, and links to history web sites	http://www.besthistorysites.net/	ES, MS, HS
U.S. History	Teach US History	Online primary source documents and some unaligned lesson plans	http://www.teachushistory.org	ES, MS, HS
U.S. History	We the People	Online information regarding aligned lesson plans and curriculum units	http://www.civiced-ri.org/const.htm	ES, MS, HS
WWII Japanese internment in U.S.	Smithsonian Institute – American History	Online flash presentation detailing the period of Japanese internment from start to finish	http://americanhistory.si.edu/perfectunion/experience/index.html	HS

Suggested Rhode Island Resources**

Key for Grade Level: ES = grades K-5; MS = grades 6-8; HS = grades 9-12

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Topic	Name, source	Description of site	Website	Grade level(s)
Beginnings to present	Blackstone Valley Tourism Council	Contact information for local area historical societies; also offerings of educational programs and partnership with the Museum of Work and Culture	http://www.tourblackstone.com/historic.htm	ES, MS, HS
Beginnings to present	Burrillville Historical and Preservation Society	Online historical information, facilities for field trips	http://www.bhps.org/	ES, MS, HS
Beginnings to present	Heritage Harbor Museum	Forthcoming museum exhibits on RI history, lesson plans, and online materials/activities	http://www.heritageharbor.org/	ES, MS, HS
Beginnings to present	Rhode Island General Assembly	Online text descriptions of time periods in RI history	http://www.rilin.state.ri.us/RhodeIslandHistory/	MS, HS
Beginnings to present, Historical Records	Rhode Island Historical Society	Online information regarding historical resources, events, properties, museums, and the library	http://www.rihs.org	ES, MS, HS
Beginnings to present	RI.gov	Facts and history of Rhode Island	http://www.ri.gov/facts/	MS, HS
Civic Engagement	We the People / Project Citizen / Foundations of Democracy	Online information regarding aligned lesson plans and curriculum units. This site also demonstrates alignment to the NECAP literacy standards.	http://www.civiced-ri.org/projcit.htm	ES, MS, HS
Colonial and Civil War Eras	Cranston Historical Society	Online historical information, facilities for field trips	http://www.cranstonhistoricalsociety.org/	ES, MS, HS
Colonial era to present	East Greenwich Historic Preservation Society	Online contact information and local historical information on the Old Kent County Jail, Varnum House and the Town Hall	http://www.eghistoricpreservation.org/	ES, MS, HS
Colonial era to present	East Providence Historical Society	Online information and photos and visiting information	http://www.ephist.org	ES, MS, HS
Colonial era to	Fort Adams	Online information and photos and visiting	http://www.fortadams.org/	MS, HS

present		information		
Colonial era to present	Museum of Newport History	Online information on the museum and tours	http://www.newporthistorical.org/museum_newhist.htm	ES, MS, HS
Colonial era to present	Newport Historical Society	Online information regarding field trips, resources, and contact information	http://www.newporthistorical.org	ES, MS, HS
Colonial era to present	Newport Restoration Foundation	Online historical information and photos, information on school field trips, outreach programs, and visiting	http://www.newportrestoration.com/	ES, MS, HS
Colonial era to present	Providence Preservation Society	Online information regarding historical buildings, educational programs, and Children's Heritage Education Tours for grades 3-10	http://www.ppsri.org/	ES, MS, HS
Colonial era to present	Rhode Island Historical Records Repository Board	List of and contact information for historical and preservation societies in RI	http://www.state.ri.us/rihrab/HistSoc.html	MS, HS
17th-18th century	Gilbert Stuart Birthplace and Museum	Online information on visiting, on the history of the property, and on guided tours tailored to specific age groups and grade level expectations	http://www.gilbertstuartmuseum.com/	ES, MS, HS
17th-20th century	South County Museum	Online information and photos on the museum, exhibits, and educational resources offered	http://www.southcountymuseum.org/	ES, MS, HS
18th century	Governor Stephen Hopkins House	Online contact information and history of the historic site	http://www.stephenhopkins.org	ES, MS, HS
18th century	The Maxwell House	Online information and photos of the house and exhibits, and visiting information	http://www.massasoithistorical.org/	ES, MS, HS
18th century	Whitehall Museum House	Online contact information and history of the property; open by appointment	http://www.whitehallmuseumhouse.org/	ES, MS, HS
18th-19th century	Preservation Society of Newport County – Newport Mansions	Online information and photos, educational programs, teacher resource guides (aligned to RI GSEs), and visiting information	http://www.newportmansions.org/	MS, HS
18th-19th century	Sprague Mansion	Online information on the mansion and tours	http://www.cranstonhistoricalsociety.org/mansion.html	MS, HS
18th-20th century	John Brown House	Online information on exhibits and educational resources	http://www.rihs.org/Museums.html	ES, MS, HS
18th-20th century	John Hunt House Museum	Online historical information and photos	http://ephist.org/hunt.htm	MS, HS

		and visiting information		
18th-10th century	Smith's Castle	Online information and photos on the history of the property and school tours/programs	http://www.smithscastle.org	ES, MS, HS
19th-20th century	Blithewold	Online information and photos and visiting information	http://www.blithewold.org/	MS, HS
19th-20th century	Mapleville School & Coronet Worsted Company	Online historical information and photos	http://www.bhps.org/mapleville_school_coronet_co.php	ES, MS, HS
19th-20th century	The Museum of Work and Culture	Online information regarding museum exhibits	http://www.woonsocket.org/workandculture.htm	ES, MS, HS
Historical Records	Rhode Island State Archives	Directory for finding state and local historical documents	http://www.state.ri.us/rihrab/direct.html	MS, HS
Industrial Revolution, Post-American Revolution, 18th-20th century	Slater Mill	Online information regarding Slater Mill	http://www.slatermill.org	ES, MS, HS
Judiciary	Justice Rules, Judiciary of Rhode Island	Online information regarding program and free materials	http://www.courts.state.ri.us/outreach/default-justice-rules.htm	ES, MS, HS
Judiciary	Rhode Island Court System	Online and print materials for curriculum/lessons, venue for field trips, speakers	http://www.courts.ri.gov	ES, MS, HS
Maritime history	Herreshoff Marine Museum	Online information and photos, library, and visiting information	http://www.herreshoff.org/frames/mmframe.htm	MS, HS
Post-American Revolution	Old Sturbridge Village	Online historical information, curriculum materials, lesson plans, and information regarding visits and educational programs	http://www.osv.org	ES, MS, HS
Revolutionary War Era	Newport Colony House & Wanton-Lyman-Hazard House	Online information regarding standards-based field trips to historic buildings	http://www.newporthistorical.org/junior.htm	ES, MS, HS

** Grade 11-12 GSEs are for all students. Advanced Mathematics GSEs are for students preparing to major in Mathematics, Science or Engineering in post-secondary schools.*

Data, Statistics, and Probability		
Grade 9–10 GSEs	**Grade 11-12 GSEs**	**Advanced Mathematics**
M(DSP)–10–1 **Interprets a given representation** (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts) to make observations, to answer questions, to analyze the data to formulate or justify conclusions, critique conclusions, make predictions, or to solve problems within mathematics or across disciplines or contexts (e.g. media, workplace, social and environmental situations). (State) (IMPORTANT: *Analyzes data consistent with concepts and skills in M(DSP)–10–2*.)	M(DSP)-12-1 **Interprets a given representation(s)** (e.g., regression function including linear, quadratic, and exponential) to analyze the data to make inferences and to formulate, justify, and critique conclusions. (Local) (IMPORTANT: Analyze data consistent with concepts and skills in M(DSP)-11-2).	M(DSP)–AM-1 No GSE at this grade.
M(DSP)–10–2 **Analyzes patterns, trends, or distributions in data in a variety of contexts** by determining, using, or analyzing measures of central tendency (mean, median, or mode), dispersion (range or variation), outliers, quartile values, estimated line of best fit, regression line, or correlation (strong positive, strong negative, or no correlation) to solve problems; and solve problems involving conceptual understanding of **the sample** from which the statistics were developed. (State)	M(DSP)-12-2 **Analyzes patterns, trends, or distributions in data in a variety of contexts by calculating and analyzing** measures of dispersion (standard deviation, variance, and percentiles). (Local)	M(DSP)-AM-2 **Analyzes and interprets measures of dispersion** (standard deviation, variance, and percentiles) and **central tendency** for the normal distribution; and **interprets** the correlation coefficient and the coefficient of determination in the context of data. (Local)
M(DSP)–10–3 **Identifies or describes representations or elements of representations that best display a given set of data or situation**, consistent with the representations required in M(DSP)–10–1. (State)	M(DSP)-12-3 **Organizes and displays one- and two-variable data using a variety of representations** (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts, linear, quadratic, and exponential regression functions) to analyze the data to formulate or justify conclusions, make predictions, or to solve problems with or without using technology. (Local)	M(DSP)-AM-3 **Uses technology to explore** the method of least squares and median-median for linear regression. (Local)

M(DSP)–10–4 **Uses counting techniques to solve contextualized problems** involving combinations or permutations (e.g., organized lists, tables, tree diagrams, models, Fundamental Counting Principle, or[sc] others). (State)	M(DSP)-12-4 **Uses counting techniques to solve problems** in context involving combination or permutations using a variety of strategies (e.g., nCr, nPr, or n!); and finds unions, intersections, and complements of sets. (Local)	***M(DSP)- AM-4 No GSE at this grade.***

Data, Statistics, and Probability

Grade 9–10 GSEs	Grade 11-12 GSEs	Advanced Mathematics
M(DSP)–10–5 **Solves problems involving experimental or theoretical probability. (State)**	M(DSP)-12-5 **For a probability event in which the sample space may or may not contain equally likely outcomes, predicts** the theoretical probability of an event and tests the prediction through experiments and simulations; compares and contrasts theoretical and experimental probabilities; finds the odds of an event and understands the relationship between probability and odds. (Local)	M(DSP)-AM-5 **Solves probability problems** (e.g., by applying concepts of counting, random variables, independence/dependence of events, and conditional probability). (Local)
M(DSP)–10–6 **In response to a teacher or student generated question or hypothesis** decides the most effective method (e.g., survey, observation, research, experimentation) and sampling techniques (e.g., random sample, stratified random sample) to collect the data necessary to answer the question; collects, organizes, and appropriately displays the data; analyzes the data to draw conclusions about the questions or hypotheses being tested while considering the limitations of the data that could effect interpretations; and when appropriate makes predications, asks new questions, or makes connections to real-world situations. (Local) (IMPORTANT: *Analyzes data consistent with concepts and skills in M(DSP)–10–2.*)	M(DSP)-12-6 **In response to a teacher or student generated question or hypothesis** decides the most effective method (e.g., survey, observation, research, experimentation) and sampling techniques (e.g., random sample, stratified random sample) to collect the data necessary to answer the question; collects, organizes, and appropriately displays the data; analyzes the data to draw conclusions about the questions or hypotheses being tested while considering the limitations of the data that could effect interpretations; and when appropriate makes predications, asks new questions, or makes connections to real-world situations. (Local) (IMPORTANT: *Analyzes data consistent with concepts and skills in M(DSP)–10–2.*)	M(DSP)-AM-6 No GSE at this grade.

APPENIDX IV

Active Watershed Education
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