Unit Title: Land and Water	**Content Area:** Earth Science	**Grade Level:** 4

Unit Summary: In this unit, students investigate the interactions between land and water. Using a stream table as a model, they create hills, build dams, and grow vegetation to develop an understanding of the effects of weathering and the rate of erosion by water, ice, wind, and vegetation. Miniature valleys, waterfalls, and canyons form in the stream table as water flows over and through the soil. From these firsthand observations, students discover how water changes the shape of land and how features in the land, in turn, affect the flow of water. They apply their knowledge of these natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. Each lesson of the unit builds on the previous one; by the end,
students have both a practical and an intuitive understanding of some of the complex interactions between land and water. Earth materials have unique properties and are parts of living and nonliving systems. Interactions within and among these systems cause changes in matter and energy.
The Science and Engineering practices evident in this unit include but not limited to asking questions, developing and using models, planning and carrying out investigations, analyzing
and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.
The cross cutting concepts to this unit include Patterns and Cause and Effect relationships. Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Unit Essential Questions:

- How can the impact of weather-related hazards be reduced?
- How does human interaction affect changes in the landscape?
- How can we use a model to predict nature?
- How would land shape and soil composition affect how the land can be used?

Unit Enduring Understandings:

- The merit of a design solution reduces the impacts of weather-related hazards.
- Soil is a product of the interactions of the Earth Systems.
- The Earth System includes a variety of materials in solid, liquid and gaseous form.
- The Earth is a system, continuously moving resources from one part of the system to another.
- Earth’s components continually interact at different rates of time, affecting the Earth locally and globally.
- Technology enables us to better understand Earth’s systems. It also allows us to analyze the impact of human activities on Earth’s systems and the impact of Earth’s systems on human activity.
- Models can be used to investigate and predict larger interactions (erosion, deposition, and water cycle).
- Humans must take into account natural interactions between land and water when designing landscapes.
- The water cycle causes changes to the land.

Possible Student Misconceptions:

- Catastrophic changes on the Earth's surface, like volcanic eruptions and earthquakes, only affect the lithosphere.
- The atmosphere, hydrosphere, lithosphere, and biosphere do not cause changes in one another; these systems operate independently on Earth.
- The 'Ice Ages' happened in the past and are now over.
- All clouds are rain clouds.
- The Earth has always been pretty much the way it is now.
- Rivers do not carve valleys, but only passively flow down them.
- Life exists on Earth because the Earth is the right distance from the Sun for water to exist in liquid form.
- Rain falls when the clouds are too full of water and it drips down.
- The atmosphere is made up solely of air.
- All rivers in northern hemisphere flow south.
- All natural disasters have only local effects.
- Flooding only occurs after a heavy rainfall.

NJCCCS: 5.4.4.C1, 5.4.4.C2, 5.4.4.F1, 5.4.4.G1, 5.4.4.G2, 5.4.4.G3, 5.4.4.G4

NGSS Performance Expectations: *Students who demonstrate understanding can…*

- 4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
- 4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- -ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land
- K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

Primary ELA/ Literacy Connections: RI.4.1, RI.4.7, RI.4.9, W.4.7, W.4.8, W.4.9

Primary CCSS Mathematics Connections: 4.MD.A.1, 4.MD.A.2,MP.2,MP.4,MP.5

Lesson Pace & Sequence

Lesson Title/Number: 1- Thinking about Land and Water

Learning Objective: Students discuss what they know and would like to know about land and water.

Lesson Duration: 60 Minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Thinking about Land & Water Students observe photo cards showing the effects of land and water interactions on Earth. Students generate at least two questions about their card. They discuss their questions in their groups. They independently read and respond to questions on the back of cards and write in their science notebooks indicating what they know and would like to know about land and water. (TG, Section 4, pg. 6, Figure 1-2) SL.4.1	• Teacher Guide (TG) • Notebooks	Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) .Ask Asking Questions: Ask questions that can be investigated and predict reasonable outcomes based on patterns. Analyzing and Interpreting Data Constructing explanations. Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) (4-ESS2-2) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get	Guiding Questions: What do you know about land on	• Photo cards • TG	**Analyze and interpret data to make sense of phenomena**	ESS2.A: Earth Materials and Systems § Rainfall helps to	

students' minds focused on the concept/topic?	Earth? What do you know about water on Earth? What is the relationship between land and water? In what ways does land affect the flow of water (such as "sloped land causes water to move more quickly")? In what ways does water affect land (such as "water erodes land") Use KWL Chart to record ideas		**using logical reasoning. (4-ESS2**	shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	
Explore: What hands-on/minds-on common experience(s) will you provide for students?	STC Land and Water Photo Cards, TG, Section 4, pgs. 5–7 Using the photo cards, what evidence can you cite to support your ideas about interactions between land and water? Categorize your photo cards based on similarities of your ideas or explanations of what is represented. Write a description of your grouped ideas/explanations for each category of photo cards. W.4.8	• Photo cards	Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data Engaging in argument from evidence. Constructing explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	STC Literacy Series™, Land and Water, Part 3, "Painter of the Land" pgs. 45–46 The author states that "Members of the group were surveying the land." Based on your understanding of the meaning of survey, explain why they needed to survey the land. Students discuss the jobs of surveyors and why that is encouraged before developing a piece of land.	• STC Literacy series-Land and Water, Part 3 pgs. 45-46	Constructing Explanations Use of evidence in constructing explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1) §	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the	Why would Hayden say that it was important for Moran to paint Yellowstone Park? Use details from the text to	• STC Literacy series-Land and Water, Part 3 pgs. 45-46	Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect §

concept/topic?	support your answer. RI. 4.1			region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Thinking about Land & Water Students can complete a 3.2.1 activity (i.e. 3 things I know about land and water , 2 things I want to know and 1 question my partner has about land and water). They can also respond to questions on the back of their cards and independently write in their science notebooks indicating what they know and would like to know about land and water. (TG, Section 4, pg. 6, Figure 1-2) SL.4.1	• 3.2.1.activity sheet • Photo cards	Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data. (4-ESS2-2) Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1) "	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) (4-ESS2-2) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Extend: How will students deepen their conceptual understanding through use in new context?	Draw and Describe your surroundings (Backyard or front Lawn). Explain why you think it was designed that way	• Notebooks	Constructing Explanations	" ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) (4-ESS2-2) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

				ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)"	
Lesson Pace & Sequence					
Lesson Title/Number: 2 -The Water Cycle		**Learning Objective: Build a model and trace a path a drop of water might follow through the water cycle.**		**Lesson Duration: 90 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students discuss the concept of modeling. They discuss what happens to water spilled on the floor overnight. Students write and discuss their thoughts on whether the Earth can run out of water and why.	• Notebooks	Constructing Explanations Asking questions	" ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	http://www.classzone.com/books/earth_science/terc/content/visualizations/es0105/es0105page01.cfm?chapter_no=visualization	• The Water Cycle: Modeling Land and water TG pp. 29-39 • Reading Selection: Tapping into the Water Cycle TG pp. 40-43	" Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Identify the evidence that	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

			supports particular points in an explanation. (4-ESS1-1) "		
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students construct a model of land and water and use the model to investigate the water cycle. Students are introduced to the concept that water changes, moves, and returns to earth as precipitation. (TG, Section.	• Visualization of water cycle. http://www.classzone.com/books/earth_science/terc/content/visualizations/es0105/es0105page01.cfm?chapter_no=visualization	"""" Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Planning and carrying out investigation. Analyzing and Interpreting Data (4-ESS2-2) Constructing Explanations and Designing Solutions Developing and Using Models	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students record and discuss their observations. Students read to learn more about the water cycle Students record responses to questions provided in the Teacher's Guide (e.g., After what you observed in this lesson, what do you know about rain? What do you know about how water meets land?) (TG Section 4, pg. 20, Final Activities. Students revisit and their entries on whether water on earth can run out. They revise their thoughts using evidence from their water cycle model.	• STC™ Land and Water Interactive Whiteboard Activity	Obtaining, Evaluating and Communicating Information Analyzing and Interpreting Data (4-ESS2-2) Constructing Explanations .Identify the evidence that supports particular points in an explanation. (4-ESS1-1) "	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Finding evidence of water cycle in students environment• Students draw and describe their evidence of water cycle.	• Water Cycle Resource: http://www.harcourtschool.com/activity/science_up_close/308/deploy/308_HR_WaterCycle.swf	Constructing Explanations. Use of evidence in constructing explanations.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	•Science notebook entries organizing and examining information• Completion of "Daily Water Usage" sheet• Participation in investigation and class discussion• Appropriate use of vocabulary related to water cycle. Formal Assessments can be found in TG, Section	• Water Cycle Resource: http://www.epa.gov/safewater/kids/flash/flash_watercycle.html	"""" Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data (4-ESS2-2) Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Extend: How will students deepen their conceptual understanding through use in new context?	"Joseph Henry: The Father of Weather Forecasting Why do they call Joseph Henry "The Father of Weather Forecasting"? Using information from the text, write a step by step description of Henry's executed plan to solve the problem of American storms. Did it work? Cite examples from the text. How did Henry's work inspire the need for a national weather service? Using the text, explain how the Civil War prevented Henry from setting up a storm warning system? RI. 4.1, RI.4.3"	• STC Literacy Series™, Land and Water, Part 3, "Joseph Henry: The Father of Weather Forecasting" pgs. 57-58,	-Constructing Explanations -Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 3 Rain on Land	**Learning Objective: Students model the effects of rain on land and observe soil erosion**	**Lesson Duration: 60 minutes**

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students predict what a sprinkler head could model in this lesson. Students predict how the land will change when it "rains	• Land and Water TG • Stream Table	Asking questions.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	.Allow students to illustrate and describe prediction		-Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students model rain on land. They discuss changes they observed while it was raining on their land. Questions to guide the discussion are included in TG section 4 PG 3	• Stream table • Notebooks	-Making Observations. (4-ESS2-1) -Analyzing and Interpreting Data (4-ESS2-2) -Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1) -Developing and using models.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students discuss changes they observed while it was raining on their land, they construct explanations using evidence gathered from rain on land. Teacher guides the discussion.SL4.1. Students more closely investigate the effects of rain on land. Students collect runoff water and begin gathering evidence that supports the concept of water carrying soil.(TG, Section 4,pg. 39, Figure 3	• Stream Table • Notebooks.	-Make observations (4-ESS2-1) -Analyzing and Interpreting Data (4-ESS2-2) -Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students focus on where the rainwater goes and how it changes the land : (TG, Section 4, pg. 40)• Using runoff for observation of water cycle• Observing effect of large rock in stream table on runoff		-Constructing Explanations. Use of evidence in constructing explanations that specify variables that describe and predict phenomena. -§ Identify the evidence that supports particular points in an explanation. (4-ESS1-1) §	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science notebook entries on investigation and answers to questions• Participation in investigation and class discussion• Appropriate use of vocabulary on erosion. Formal Assessments can be found in TG, Section 5	• Notebooks	-Analyzing and Interpreting Data (4-ESS2-2) -Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	What's the Forecast? How does the weather map on page 61, identify areas experiencing precipitation? RI. 4.1 How has weather forecasting changed over the past 130 years? Has the quality of weather forecasts changed as well? Support your answer with evidence from this article and the Joseph Henry story. RI. 4.1, RI.4.3 Note booking: Students collect information and draw conclusions based on evidence (lab results/claims and evidence.) W.4.2, W.4.4 Students can also research why some basements gat damp and use the process to explain forecast. They may be asked to design solutions for damp Basement.	• Weather map • Notebooks • TG	-Constructing Explanations	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Lesson Pace & Sequence					
Lesson Title/Number: 4 - Investigating Streams		**Learning Objective : Model and use streams to discover one way in which runoff changes the land**		**Lesson Duration: 90 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Students predict how changes in the land as water flows from their stream source cups might be different from or similar to changes that occurred during their rainwater experiments	• TG, Section 4, pgs. 42–43, 45–47 *Advance preparation one day ahead for Lesson 6 and Lesson 10 • TG, Section 4, pg. 4	-Asking Questions -Constructing Explanations and Designing Solutions .	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students discuss responses in groups.	• Reading in STC Literacy Series Land and Water, Part 2, "Where Does Our Drinking Water Come From?" pgs. 21–25	Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students transform their land models into stream tables by adding a stream source to the model .Students investigate what happens when water from a stream source is added to the model.• Students investigate water eroding and depositing soil	• STC™ Land and Water Stream Tables.	-Planning and Carrying Out Investigations (4-ESS2-1) -Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) -Analyzing and Interpreting Data -Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Practicing measurements of volume and length in metric system (TG, Section 4, pg. 49• Students practice measuring with a graduated cylinder.• Students use the graduated cylinder to collect, view, and record sediment from runoff.• Students take stream measurements using a string and metric ruler. Students use evidence from measurements to explain how streams and Rivers slowly reshape the earth's surface by eroding and washing away soil. Students explore how streams erode land using the link provided.	• Resources for Geology/ Rivers for kids: http://www.onegeology.org/extra/kids/earthprocesses/rivers.html	-Use mathematical and Computational thinking. Make measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) -Analyzing and Interpreting Data -Constructing Explanations and Designing Solutions Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students observe four types of soil and discuss how soil properties affect the ways in which soil is eroded and deposited by water in their stream tables.	• Nature Works – Rivers and Streams: http://www.nhptv.org/natureworks/nwep7j.htm	-Constructing Explanations. . -Obtaining, Evaluating and Communicating Information	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Completion of student Record Sheet 4-A: Comparing Streams • Science notebook entries on streams• Participation in investigation and class discussion• Appropriate use of vocabulary on stream properties and volume measurement. Formal Assessments can be found in TG, Section 5	• Student Record sheet 4A - Comparing Streams. • Teacher Guide.	-Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) -Analyzing and Interpreting Data -Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	Students can research the impact of Mississippi Flood of 1993 and report findings to class.	• Case study on Mississippi Flood of 1993: http://www.sln.org.uk/geography/schools/blythebridge/GCSEMississippi.htm	-Constructing Explanations. Use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. § Identify the evidence that supports particular points in an explanation. (4-ESS1-1) § - Obtaining, evaluating and Communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 5- Examining Earth Materials		**Learning Objective : Students analyze four soil components and describe their properties**		**Lesson Duration: 60 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Write what they know about the earth materials and predict how they are formed.	• Different Types of soil. • Notebooks • Teacher Guide	Making observations and asking questions.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explore: What hands-on/minds-on common experience(s) will you provide for students?	-Students use hand lenses to closely examine the four soil samples. (TG, Section 4, pg. 59, Procedure #5 -Students describe, write, and illustrate the properties of the four soil components in the stream table.•	• Colored pencils • Hand lens • Science Notebooks • Soil sample • Record Sheet 5-A: Examining Earth Materials. (TG, Section 4, pgs. 63–64)	-Make observations a (4-ESS2-1) -Obtaining, evaluating and Communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students use evidence from their investigation of the components of soil to support their ideas about how water affects soil in their stream table. They explain which earth materials are easily eroded and why. They will read “Our Moving Planet. “to expand their knowledge.	• Stream Table. • STC Literacy Series™, Land and Water, Part 1: “Our Moving Planet” pgs. 7–9,	Analyzing and Interpreting Data Constructing Explanations Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students use research to write a report on soil to as a natural resource. Students can write a story about a time when they mixed water with soil components(TG Section 4 ,PG. 60	• Activities on soil: http://www.soils4teachers.org/lessons-and-activities	-Constructing Explanations and Designing Solutions (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Completion of Record Sheet 5-A: “Examining Earth Materials”• Science notebook entries on observations of soils• Use of evidence from this investigation to support results from previous investigations (Lesson 4)• Participation in investigation and class discussion• Appropriate use of vocabulary on soil properties Formal Assessments can be found in TG, Section 5	• Record Sheet 5-A	"""" -Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) -Analyzing and Interpreting Data -Constructing Explanations -Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	

Extend: How will students deepen their conceptual understanding through use in new context?	Students can write soil stories. e.g. which soil would they be if given a chance. Students can also debate which soil is most useful on earth based on their characteristics and use.	• Activities on soil: http://www.soils4teachers.org/lessons-and-activities	Engaging in Argument from Evidence:	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Lesson Pace & Sequence					
Lesson Title/Number: 6 Where Does the Water Go? Looking at Ground Water and Runoff		**Learning Objective : Students will explore and discover that different types of soil have different capacities to retain water**		**Lesson Duration:90 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students make predictions about where the rain that falls go to and how it gets there.	• Science Notebooks • Record Sheet 6-A: Testing Pore Space in Earth Materials. (TG, Section 4, pgs. 77–78)	Asking questions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students begin to explore a new property of soil—pore space (the air space between soil particles).• Students examine more closely where water goes when it meets land and how soil holds water (e.g., observing water as it seeps into and runs off of different soil components).• Students continue to build connections among ground water runoff, and stream formation	• STC™ Land and Water Interactive Whiteboard Activity • Stream table	-Planning and Carrying Out Investigations (4-ESS2-1) -Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) -Analyzing and Interpreting Data -Constructing Explanations a -Developing and using models Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students will Calculate and compare the water-holding capacities of different soils (TG, Section 4, pg. 71.(TG, Section 4, pg. 70)• Relate the holding capacities to flooding	• Record sheet information	-Use mathematical and computational thinking. -Analyzing and Interpreting Data -Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students can research ground water in local community and describe how to prevent pollution of ground water. •	• Computer with internet access	Constructing Explanations and Designing Solutions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science Notebook: • Record Sheet 6-A: Testing Pore Space in Earth Materials. (TG, Section 4, pgs. 77–78 Formal assessment can be found on TG Section 5	• Notebooks • Record sheet 6-A	-Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) -Analyzing and Interpreting Data -Constructing Explanations and Designing Solutions -Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Extend: How will students deepen their conceptual understanding through use in new context?	"Drilling for Water, Where Does Our Drinking Water Come From?, Writing to local water utility company Where does your local water supply come from? How does it get to your house and school? Where does the wastewater go? Research and write to your water utility company and find out. Present your findings to the class. W.4.8, W.4.9, SL.4.1"	• Computer with internet access • Reading in STC Literacy Series™, Land and Water, Part 2, “Drilling for Water” pgs. 26–29 • Reading in SI, “Where Does Our Drinking Water Come From?” pgs. 34–37 • Writing to local water utility company (TG, Section 4, pg. 71)	-Obtaining, evaluating and communicating information'. -Asking questions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 7- Erosion and Deposition		**Learning Objective : Students observe and describe the factors that affect how water erodes and deposits sediment**		**Lesson Duration: 90 minutes**	
Learning Cycle ***What lesson elements will support students’ progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students’ progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students’ application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Students rotate around the room to observe other teams' stream tables. (TG, Section 4, pg. 82) Allow students to discuss their observations and write questions they may have.	• TG, Section 4, pgs. 81–82. • Stream Table	-Asking Questions. -Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1)	" ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students discuss observations of stream tables, focusing on what happened with the soil after it was washed away, which types of soil were deposited first, last and why. Discuss types of weathering and Erosion.	• Moving Water Shapes Land: http://www.classzone.com/science_book/mls_grade7_FL/266_271.pdf	Constructing Explanations. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students explore how runoff wears away and moves earth material. (TG, Section 4, and pg. 82, Procedure) • Students make a connection between fast-moving water and erosion, and slow-moving water and deposition. Students explore more carefully how water wears away and deposits soil. Science Notebook: • Students record/draw where they put the flags, and record the results of the investigation.	• Erosion and Deposition: http://science-class.net/archive/science-class/Geology/weathering_erosion.htm	-Planning and Carrying Out Investigations (4-ESS2-1). -Developing and using models	ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students work in groups to research and present information on types of erosion and their impact on earth's surfaces. Discuss types of erosion. Water, wind, Glacier. Allow students to include their thoughts about how this erosion could be prevented.	• Stream Table • Notebooks • Computer	Constructing Explanations and Designing Solutions. (4-ESS1-1) §	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students can create a Model and explain the effects of glaciers on land. They can research current glacial retreat (TG, Section 4, pg. 84. Discuss practices that can prevent erosion. Research a specific weathering feature (such as a sinkhole or cave). Evaluate the risk of collapse and methods of prevention of collapse (using actual data) and recommend one solution based on the scientific data. Create a model (virtual, graphic or 3-D) of the actual cave or sinkhole and demonstrate the risk of collapse and how the suggested preventative measure or solution impacts that risk.	• Erosion and Deposition: http://education-portal.com/academy/lesson/effect-of-erosion-and-deposition-on-landforms.html#lesson	-Constructing Explanations and Designing Solutions. (4-ESS1-1) -Developing and using models.	ESS2.A: Earth Materials and Systems •Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science notebook diagram of stream runoff speeds• Placement of speed markers on stream table• Notebook entries on evaluation of slope on runoff• Participation in class inquiry, discussion, and cleanup• Appropriate use of science vocabulary on runoff. Formal Assessments can be found in TG, Section	• Notebooks • Speed markers	Constructing Explanations and Designing Solutions. (4-ESS1-1)	ESS2.E: Biogeology •Living things affect the physical characteristics of their regions. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	Glaciers: Rivers of Ice How does understanding glaciers and their movement help us to understand and make predictions about natural phenomena and the environment? Where Go the Boats? Using what you know about land and water, create a poem that follows the pattern of "Where Go the Boats?" by Robert Louis Stevenson. W.4.4, W.4.7 Writing a skit about erosion and deposition (TG, Section 4, pg. 84) Get together with other students. Write a skit or play in which you act out the ways in which water erodes, moves, and deposits soil. W.4.2, W.4.4, SL.4.1 Mathematics: Solve word problems involving distances and intervals of time: Calculating the Speed of a Local Stream (TG, Section 4, pg. 84) 4.MD.2	• Reading in STC Literacy Series™, Land and Water, Part 3,"Glaciers: Rivers of Ice" pgs. 50–52 • KIDS DISCOVER Reader, Earth: "Earth Today, Gone Tomorrow" pg. 19 • Reading and analyzing Louis Stevenson's poem, "Where Go the Boats?" (TG, section 4, pg. 84) • Writing a skit about erosion and deposition (TG, Section 4, pg. 84)	-Constructing Explanations and Designing Solutions. -Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Lesson Pace & Sequence					
Lesson Title/Number: 8 .Bird's Eye view- Parts of a Stream		**Learning Objective : Students identify the common parts of a stream**		**Lesson Duration:60 minutes**	

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Guide students to discuss life experiences. Sketch what the ground/objects looks like from an airplane window.	• TG, Section 4, pgs. 93–96.	Constructing explanations.		obstructing explanations
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students make an aerial drawing of their stream table. (TG, Section 4, pg. 98, Figure 8-2. Investigate stages of stream and Rivers.	• Stream tables	Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students use aerial drawings and common elements for comparisons of streams. Students explore the concept of "birds-eye view" and look at parts of a stream. • Students look at an aerial photo (Student Investigations book, Figure 8-1) and discuss the questions provided in the Teacher's Guide (e.g., What do you see in the photo? How do you think the photo was taken? How do you think this kind of photo could be used? How is this photo different from the drawing you made of your stream table? Similar?) (TG, Section 4, pg. 95,	• STC™ Land and Water Interactive Whiteboard Activity • Researching flight of an eagle (TG, Section 4, pg. 99) • Aerial maps	Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	-Mathematics: Using a scale on a standard map to measure distances (TG, Section 4, pg. 99Art: -Making aerial drawing of route to school (TG, Section 4, pg. 100)Social Studies:• -Inviting mapmaker or surveyor into classroom (TG, Section 4, pg. 100)• -Researching aerial mapping techniques (TG, Section 4, pg. 10	• Copies of maps • Computer with internet access • Construction paper	-Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1. -Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Aerial map of stream with labeled parts• Notes and responses to questions on photo cards in science notebook• Appropriate use of science vocabulary from aerial drawings• Participation in investigation and class discussion Formal Assessments can be found in TG, Section 5	• Notebooks	-Make observations and/or measurements. (4-ESS2-1 -Constructing Explanations.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Extend: How will students deepen their conceptual understanding through use in new context?	-Research/Read about Satellites: New Tools for New Explorations How can new advances in technology help to explore the unknown? How has current technologies helped us to advance? After reading the article, write a letter to the author arguing for or against the information written in the text. Cite specific textual information that supports your argument. W.4.2, W.4.4. -Students can research types of maps and information they provide.	• TG, Section 4, pgs. 93–96 • Reading in STC Literacy Series™, Land and Water, Part 3, “Satellites: New Tools for New Explorations” pgs. 53–56	Constructing Explanations and Designing Solutions. Use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. § Identify the evidence that supports particular points in an explanation. (4-ESS1-1) § Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 9 When Streams Join: Modeling Tributaries.		**Learning Objective : Students model the formation of a larger stream or river that has multiple sources**		**Lesson Duration: 60 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students predict how the stream flow may change with the three-hole source cup	• TG, Section 4, pgs. 106–107 *Advance preparation one day before next lesson • TG, Section 4, pg. 11	Asking questions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Science Notebook:•Students record their predictions with words and drawings	• Notebooks	-Asking Questions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students model the simultaneous formation of three streams. • Students model how streams join to form larger streams or a river and compare with their predictions. Students investigate the use of a stream source cup with three holes. •.	• Streams and Rivers formation for kids: http://easysciencefor kids.com/all-about-rivers-and-streams/	Planning and Carrying Out Investigations Developing and using models.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students compare/contrast the streams that were formed using the three-hole source cup and those with the original source cup. • Students compare/contrast the soil and soil deposits at the end of the stream.	• Resources for geographic education: http://www.cgeducation.ca/resources/learning_centre/classroom_activities/river_system.asp	Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Have one member of your group write a few sentences on loose-leaf paper describing the stream in your aerial drawing. Discuss as a group what you want to write. Record how your land changed, how the stream formed, and the parts of the stream you observed. W.4.2, W.4.4, SL.4.1.Use information from link to explain concept of tributaries.	• STC™ Land and Water Interactive Whiteboard Activity	Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science notebook entries on Photo Card 5 and Lesson 9• Completeness and accuracy of aerial drawing• Participation in investigation and class discussion• Completion of self-assessment sheet• Appropriate use of science vocabulary on stream beds. Formal Assessments can be found in TG, Section 5	• Photo Card 5 and Lesson 9 • Self-assessment sheet • Formal Assessments can be found in TG, Section 5	Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	TG, Section 4, pg. 109) • Investigating stream systems in school area after hard rain• Locating major river systems on US maps .Write about the relevance of rivers in our lives.	• Teacher Guide • Notebooks • US Map	Constructing Explanations and Designing Solutions. (4-ESS1-1) § Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 10 - Rushing Rivers: Exploring Flow		**Learning Objective : Students use their models to compare the effects of fast- and slow-flowing water**		**Lesson Duration 90 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students predict how the faster-flowing water will change the stream table.• Students predict the load each stream will carry	• TG, Section 4, pgs. 116–118 *Advance preparation one day before next lesson • TG, Section 4, pg. 121	Asking Questions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students interpret photographs of fast-moving and slow-moving water and identify patterns based on the concepts of land and water presented in this unit. They write and discuss questions they have about the rate of flow of water.	• Photo cards	Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students vary the flow of water from their stream source cup.• Students model the formation of canyons	• Stream Table • TG, Section 4, pgs. 116–118	"Planning and Carrying Out Investigations (4-ESS2-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students build on their understanding of sediment, deposition, and erosion as they explore fast-flowing rivers. Writing a story about a journey in a fast-moving stream (TG, Section 4, and pg. 119) Imagine that you are a leaf caught in a fast-growing stream after a rainstorm. What journey would you take? Suppose you are an ant caught on a leaf. Would you want to be caught in a slow-moving stream or a fast-moving one? Use your vocabulary and concepts from this unit's lessons to write a story that explains why. W.4.2, W.4.4	• Reading in STC Literacy Series Land and Water, Part 2, "Water Scientist" pgs. 32–35 • Writing a story about a journey in a fast-moving stream (TG, Section 4, pg. 119)	Constructing Explanations (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students record the effects of fast-flowing water on land using words and drawing By increasing the rate at which water flows over land, students model the formation of canyons. Students will compare the load of sediment carried by a faster-flowing river and begin to understand the relationship between the flow of water and erosion and deposition.	• Stream Table • Notebooks	-Constructing Explanations. -Analyzing and Interpreting data	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science notebook entries including predictions on impact of flow rates on land• Completion of student sheet on runoff • Answers to question on photo cards• Appropriate use of vocabulary• Participating in investigation and class discussion Formal Assessments can be found in TG, Section 5	• Explore Divides: http://www.classzone.com/science_book/mls_grade7_FL/266_271.pdf	Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Extend: How will students deepen their conceptual understanding through use in new context?	Modeling impact of materials moved by fast-moving stream (TG, Section 4, pg. 120)Art: Researching visual representations of slow and fast water (TG, Section 4, pg. 120)Social Studies: Researching the flooding of Huang He River in China (TG, Section 4, pg. 120	• Videos on geographic phenomena: Geologic Phenomena Websites and Videos: http://streaming.discoveryeducation.com	-Constructing Explanations. - Using Models. -Obtaining Information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 11 How Nature Changes the Direction and Flow of Water		**Learning Objective : Students investigate how the shape of the land affects the direction and flow of water**		**Lesson Duration60 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Students make and draw predictions of how the water will flow on different landforms.	• Stream Table • Notebooks	Asking Questions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Reading in STC Literacy Series™, Land and Water, Part 1, "Rocks in Our World", pgs. 15–1	• STC Literacy Series™, Land and Water, Part 1, "Rocks in Our World", pgs. 15–1	Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students use stream table models to investigate how the shape and size of the soil mounds or rocks affect the flow of water. •	• Weathering/ Erosion activities: http://www.pbs.org/wnet/nature/lessons/breaking-it-down/activities/1700/	-Planning and Carrying Out Investigations (4-ESS2-1) -Analyzing and Interpreting Data. (4-ESS2-2) -Constructing Explanations and Designing Solutions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explain: How will you help students connect their exploration to the concept/topic under investigation?	After investigating how the shape of the land affects the direction and flow of water, they draw describe the actual path. Students discuss and compare the results of their investigation	• STC™ Land and Water Interactive Whiteboard Activity	Constructing Explanations (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students research how natural land features affect the direction and flow of water (e.g., faults, fractures, and various kinds of soil and rock)	• Computer • Notebooks	Constructing Explanations. (4-ESS1-1) Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science notebook entries on predictions and evaluation of evidence• Aerial drawing of stream flow• Appropriate use of science vocabulary on water flow• Participation in investigation and class discussion Formal Assessments can be found in TG, Section 5	• Stream Table • Notebooks	Constructing Explanations (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	Research how moving water underground forms caves and other features.	• Computer with internet access	-Constructing Explanations. -Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Lesson Pace & Sequence					
Lesson Title/Number: 12 Dams - How Humans Change the Direction and Flow of Water		**Learning Objective : Students design and construct dams in their stream tables and test their effects**		**Lesson Duration: 90 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students will brainstorm human activities that can affect flowing water.	• TG, Section 4, pgs. 135–137 *Advance preparation, several days before Lessons 13 and 14	Asking questions	ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Use Class Chart: "What We Know About Dams." (TG, Section 4, pg. 136, Figure 12-1 to record ideas as student's brainstorm why and how humans build dams for their benefit. They Write questions they have about dams.	• Information on hydropower: http://www.ducksters.com/science/environment/hydropower.php	Constructing Explanations. (4-ESS1-1)	ETS1.B: Designing Solutions to Engineering Problems •Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students use the stream table model to design and build a dam• Students test and analyze their designs and materials	• Stream table	-Developing and using models . -Planning and carrying out investigations. -Constructing Explanations and Designing Solutions. ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Student Investigation book: "Releasing a River" pgs. 72–75 Draw and label your dam in detail. How did the dam you built differ from your plan? Research what engineers do when planning and building dams and write suggestions for your next steps. W.4.2, W.4.8	• Reading in SI, "Releasing a River" pgs. 72–75 • Notebooks	-Constructing Explanations and Designing Solutions. (4-ESS3-2) - ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs.	ESS2.E: Biogeology •Living things affect the physical characteristics of their regions. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Discussing impact of dam on plant and animal life (TG, Section 4, pg. 138 .How do man-made structures, like dams, impact aquatic plant and animal life?. They can research pros and cons of dams and debate about using hydroelectric power as alternative source of energy.	• Teacher Guide. section 4 pg. 138	-Constructing Explanations and Designing Solutions. (4-ESS1-1) §. (4-ESS3-2). -Engaging in argument with evidence.	"ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)"	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science notebook entries on dam test design and results• Construction of dam to prevent flooding• Completion of student Record Sheet 12-A: Building a Dam" • Appropriate use of science vocabulary on dam design and construction• Participation in investigation and class discussion. Formal Assessments can be found in TG, Section 5		-Constructing Explanations and Designing Solutions. -Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)"	Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Extend: How will students deepen their conceptual understanding through use in new context?	(TG, Section 4, pg. 138) • Researching current droughts in the US and the world and the need for dams. Researching impact of dams on water supply and flood	• Effect of Dams on environment: http://sciencenetlinks.com/lessons/soil-erosion/	Constructing Explanations and Designing Solutions. . (4-ESS3-2)	ETS1.B: Designing Solutions to Engineering Problems •Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Lesson Pace & Sequence					
Lesson Title/Number: 13 Exploring Slope		**Learning Objective :** Students explore the effects of slope on stream formation			**Lesson Duration:** 90 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students predict how elevating one end of the stream table might affect the direction and flow of the water and how it erodes and deposits soil	• TG, Section 4, pgs. 150–153 *Advance preparation several days before next lesson • TG, Section 4, pg. 15	Asking Questions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Guide students to discuss experiences with riding bikes downhill and its effect on speed. Students discuss ways to reduce the speed.	• Reading in STC Literacy Series™, Land and Water, Part 2, "The Dust Bowl" pgs. 36–38 Science: Investigating the effects	Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students elevate one end of their stream tables to investigate slope.• Students continue to investigate runoff and re-examine runoff cylinders from Lessons 4 and 10.• Students investigate ways to protect slopes from erosion.• Students plant seeds on the slope	• Erosion: http://sciencenetlinks.com/lessons/soil-erosion/	-Planning and Carrying Out Investigations (4-ESS2-1) -Analyzing and Interpreting Data. (4-ESS2-2) -Constructing Explanations and Designing Solutions	ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Groups share their results. Students use evidence from stream table to explain the effects of slope on stream formation. They describe various ways erosion can be prevented. Class discussion questions are provided in the Teacher's Guide (e.g., In what ways did the water change the sloped land? How did the sloped land affect the way the water moved? How do the cylinders of runoff compare?) (TG, Section 4, pg. 153,	• TG, Section 4, pgs. 150–153 *Advance preparation several days before next lesson • TG, Section 4, pg. 15	-Analyzing and Interpreting Data. (4-ESS2-2) -Constructing Explanations and Designing Solutions	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students can vary the elevation to compare the degree of slope and its effect on stream formation and flood.	• Various Text books • Notebooks • Stream table	-Constructing Explanations and Designing Solutions.	ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Science notebook entries on planting seeds and plant development and drawings of runoff• Evaluation of evidence on effect of slope on water flow• Completed student record sheet (4-A)• Participation in investigation and class discussion• Appropriate use of vocabulary on sloping ground Formal Assessments can be found in TG, Section 5	• Notebooks	-Analyzing and Interpreting Data. (4-ESS2-2) -Constructing Explanations and Designing Solutions Identify the evidence that supports particular points in an explanation. (4-ESS1-1) Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design"	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	Researching effect of contour farming on erosion (TG, Section 4, pg. 154 Debate whether or not people should be allowed to rebuild homes in an area prone to serious flooding.	• Computer • Notebooks	-Constructing Explanations and Designing Solutions. -Engaging in argument from evidence.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1). ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 14 Plants: Protecting Sloped Land from Erosion		**Learning Objective: Students predict and model how plants affect water flow and erosion.**		**Lesson Duration: 60 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Predict how soil on land with plants will be eroded and explain why.	• TG, Section 4, pgs. 160–161 *Advance preparation for one day before next lesson • TG, Section 4, pg. 16	Asking questions and defining problems	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-

				smaller particles and move them around. (4-ESS2-1)	ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Discuss various ways that Human interaction with the natural landscape can reduce soil erosion	• Soil Erosion sample plan: http://sciencenetlinks.com/esheets/soil-erosion/	- Constructing explanations. -ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students use a hand lens to observe plant growth in the model. • Students observe plant growth from above, below, and from the sides of the stream table. •	• Record Sheet 14-A: Investigating the Effects of Plants on Erosion. (TG, Section 4, pgs. 167–168)	-Making observations. -Analyzing and interpreting data -Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students collect, observe, and analyze runoff. They draw conclusions about how plants affect erosion and runoff?) (TG, Section 4, pg. 162, Final Activities	• Stream Table • Computer • Notebooks	Constructing Explanations	ESS2.A: Earth Materials and Systems §. (4-ESS2-1) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ESS3.B: Natural Hazards (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Reading in STC Literacy Series™, Land and Water, Part 3, “Adventure in a Cave”, pgs. 47–4	• Reading in STC Literacy Series™, Land and Water, Part 3, “Adventure in a Cave”, pgs. 47–4	Constructing Explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Completed student Record Sheet 14-A: “Investigating the Effects of Plants on Erosion”• Science notebook entries on slope’s vegetation• Stream table with varying degrees of vegetation• Appropriate use of science terms on vegetation• Participation in investigation and class discussion. Formal Assessments can be found in TG, Section 5	• Record Sheet 14-A: Investigating the Effects of Plants on Erosion. (TG, Section 4, pgs. 167–168)	Constructing Explanations	ESS2.A: Earth Materials and Systems. (4-ESS2-1) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ESS3.B: Natural Hazards Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Extend: How will students deepen their conceptual understanding through use in new context?	After student's investigation on how plants hold back runoff and reduce erosion, Students apply their knowledge to real-world situations. Have students become "erosion detectives" and develop a list of things in their area (school, home, park) that show erosion at work. Have students design a way to show the effects of multiple types of erosion on one piece of land (or pile of soil). Does adding more types of erosion (wind and water) to the land	• Stream Table • Computer • Notebooks	-Constructing Explanations and Designing Solutions.- -ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs.	ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

	increase the changes in landscape? Next, have the students draw designs of how to protect their land (or pile of soil) from the different types of erosion. This is something an engineer might design.				
Lesson Pace & Sequence					
Lesson Title/Number: 15 Planning Our Home sites: Testing the Interactions of Land and Water		**Learning Objective :** Students design landscapes, predict how runoff will affect these landscapes, and use these predictions to select a safe home site			**Lesson Duration:** 120 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Guide students to review erosion and its impact on environment	• TG, Section 4, pgs. 171–174 *Advance preparation several days before next lesson • TG, Section 4, pg. 17	Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students plan and then build a landscape in their stream tables Predicting and testing effect of rainfall on designed landscape (TG, Section 4, pg. 174)	• Stream Table	-Planning and Carrying Out Investigations. -Developing and using models -ETS1.B: --Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Observing and comparing landscape designs. Use evidence from stream table design to explain best location for home sites. Explain similarities and differences.	• Stream Table	-Constructing Explanations and Designing Solutions. -Engaging in argument from evidence.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Writing a story about living in the student designed house (TG, Section 4, pg. 174)• Researching formation of the Grand Canyon (TG, Section 4, pg. 174	• Reading in STC Literacy Series Land and Water, Part 3, “Journeying Down the Grand Canyon” pgs. 41–44 • KIDS DISCOVER Reader, Earth: “The Ecological Footprint” and “A Whole New World” pgs. 16–17	Constructing Explanations and Designing Solutions. (4-ESS1-1)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Landscape design on stream table with placement of houses and plants and other features• Completion of student Record Sheet 15-A: “Designing and Building a Landscape”• Science notebook entries on design• Participation in investigation and class discussion• Use of appropriate vocabulary	• Stream Table	Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs."	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	Writing a story about living in the student designed house (TG, Section 4, pg. 174) Imagine that you are living in the house you put on your landscape. What if a sudden storm comes? Will you be protected? Using unit vocabulary and technical terms, write a story about the storm and your house. Be sure to describe the components of the house, why you chose the scientifically based design features, and how/why the water would flow near the house? W.4.2, W.4.4, W.4.8	• Notebooks	Constructing Explanations and Designing Solutions. Use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. § Identify the evidence that supports particular points in an explanation. (4-ESS1-1) § Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 16 Protecting Our Home sites: Testing the Interactions of Land and Water		**Learning Objective : Students test the effectiveness of the placement of their home sites**		**Lesson Duration: 90 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Students discuss their reasons for their home site choices.	• Stream Table • Notebooks	Constructing explanations	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students begin to discuss various landforms. They can complete webquest on landforms. see link	• Webquest on landforms: http://www.chsd.us/~mbendele/earth's changing surface/landform webquest.htm	Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explore: What hands-on/minds-on common experience(s) will you provide for students?	In Lesson 16, students test their designs and predictions. As students conduct this final investigation, they must reflect on concepts and skills learned throughout the unit. Students take notes of the stream path while it is running. • After pouring water, students draw the landscape on white drawing paper. •	• Stream Table • Notebooks	ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Explain: How will you help students connect their exploration to the concept/topic under investigation?	TG, Section 4, and pg. 182, Final Activities) Groups make a presentation to the class to demonstrate how water flows in their landscape. Guidelines provided in the Teacher's Guide include the following: • Why they built the landscape as they did. • How water affects the home sites. The position of the home sites and why group members selected each location. • Evidence in the stream table that supports how the home sites were affected	• Stream Table • Notebooks	-ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs. -Engaging in argument from evidence. Analyzing and Interpreting data.	ESS2.A: Earth Materials and Systems (4-ESS2-1) ESS3.B: Natural Hazards Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students analyze the results of their investigation and compare these results with their predictions. Students read and discuss-Reading in SI, "Falling water: Wright On!" pgs. 93–95. Students can create brochures advertising their home sites as the best, and advocating for others to choose the same home sites.	• Reading in STC Literacy Series™, Land and Water, Part 1 • Computer with internet access	Constructing Explanations and Designing Solutions.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Student plan for community and test results and suggestions for modification• Science notebook entries on testing process• Aerial drawings with labels• Participation in investigation, class presentation, and class discussion• Appropriate use of science vocabulary from unit• Comparison of self-assessment after Lesson 15 with that from Lesson 9Formal Assessments can be found in TG,	• Stream Table • Notebooks	-Planning and Carrying Out Investigations. (4-ESS2-1) -ETS1.B: Designing Solutions to Engineering Problems - Testing a solution involves investigating how well it performs."	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	Volcano in a Cornfield, Falling Water: Wright On! Research some of the landforms you modeled in your stream table landscape, such as canyons, valleys, mountains, floodplains, or deltas. Explain how water affects the development of these landforms in the real world? Students can choose research and present findings on National Parks. They will identify major landforms and describe how they were formed.	• Learning about landforms Webquest: http://questgarden.com/67/85/1/080630145432/task.htm	-Constructing Explanations and Designing Solutions. -Obtaining, evaluating and communicating	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) ETS1.B: Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Lesson Pace & Sequence

Lesson Title/Number: 17 Post-Unit Assessment: Sharing What We Know About Land and Water		**Learning Objective :**		**Lesson Duration: 45 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Discuss student's new knowledge about Land and Water. Students complete the know section of their KWL chart	• TG, Section 4, pgs. 189–191	- Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2- -Constructing explanation.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Address questions students may have. Allow them to complete post unit assessment.		-Constructing Explanations and Designing Solutions. -compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Changes in student responses from the pre- to the post-assessment stages• Appropriate use of vocabulary• Awareness of investigations to develop their knowledge base by students• Understanding of scientific ways to test predictions and hypotheses• Understanding of use of evidence to support conclusion		Constructing Explanations and Designing Solutions. Use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. § Identify the evidence that supports particular points in an explanation. (4-ESS1-1) § Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

Extend: How will students deepen their conceptual understanding through use in new context?	Sample CCSS Culminating Assessment Lockwood's Folly The Story Lockwood's Folly Inlet was once the mouth of Lockwood's Folly River. Today the inlet separates two barrier islands: Oak Island and Holden Beach Isle. Legend has it that the river and inlet got their names back in the 1600s when a man named Lockwood began building a boat on the bank of the river. After months of hard work, Lockwood finished his boat and pushed it into the river. The boat floated well but it floated too deep. When he tried to sail into the Atlantic, Lockwood's boat ran aground on a sandbar at the mouth of the river. Lockwood tried and tried to free his boat but it was stuck so tightly in the sand that it could not be freed. He finally gave up and left his boat to rot in the sand. People soon began calling the boat "Lockwood's Folly" and according to the legend, that name became the name of the river and the inlet. The same sandbar that snagged Lockwood's boat back almost 400 years ago would still be there today if it were not for dredging. Dredging is used to remove the sand and open the channel to boats.		-Planning and carrying out investigation. -Constructing Explanations and Designing Solutions. -Developing and using models. -Asking questions. -Engaging in argument with evidence. -Obtaining, evaluating and communicating information.	ESS2.A: Earth Materials and Systems § Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)	Patterns § Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Cause and Effect § Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2)

	The sandbar forms when the longshore current carries sand from Oak Island and drops in the gap between Oak Island and Holden Beach Isle. Every few years, the current deposits enough sand in the inlet to clog it again. Could there be a better way? Your Task The Army Corps of Engineers has hired you and your partner to study how different structures can stop or slow the erosion that the longshore current causes. You and your partners have been asked to represent and describe your results in the form of a poster and short report. Prior to beginning your task, research maps of Oak Island and Holden Beach Isle to determine and describe patterns of the landscapes' features. 1. Building a Beach Create a model beach by spreading 500mL of wet play sand across the shallow/higher end of a paint tray. Make the beach straight and flat. 2. Adding an Inlet Split the beach into two parts by digging a trench in the sand that reaches the bottom of the paint trap. This will represent the inlet. The inlet should be about 4 cm. 3. Filling the Ocean Add approximately 1L of water to the deep part of the tray where there is no sand. The water represents the ocean. (Add just enough				

	water to fill the inlet making sure that two beaches remain.) In your notebook, draw a diagram of your model. 4. Making Waves You and your partners should each take a turn creating waves in the ocean. Hold the wave stick vertically and use quick but short pushing motions to make a wave at an angle to the beach. Each of you will make 20 waves at the same angle. After everyone has had a turn, make a second diagram. Label any special features caused by the erosion. Compare the before-and-after diagrams and describe how the shape of the coastline has changed. 5. Saving the Inlet Brainstorm ways that you can use the rocks and/or tongue depressor (or craft stick) to keep your beach from eroding away and the inlet from filling. Seawalls, groins, jetties, and other barriers are used to prevent beach erosion. Decide on a strategy and test it by rebuilding your beaches and inlet then repeating the wave-making procedure described in Step 4. Again, try to make the waves at the same angle to the beach as before. Draw another set of before-and-after diagrams. 32				