Connections between Waves, Wetlands, and Watersheds and the NGSS

Individual activities can serve as a component of meeting year-long Performance Expectations.

Chapter 3	Activity 3.1: Wetlands at Work	Activity 3.2: Marsh Munchers	Activity 3.3: The Perfect Beak
Cross Cutting Concepts:			
Cause and Effect	●		●
Systems and System Models		●	
Disciplinary Core Ideas:			
LS1.A: Structure and Function			●
LS4.A: Interdependent Relationships in Ecosystems		●	
LS4.B: Cycles of Matter and Energy Transfer in Ecosystems		●	
LS4.C: Adaptation	●	●	
LS4.D: Biodiversity and Humans		●	●
ESS2.A: Earth Materials and Systems	●		
Science and Engineering Practices:			
Asking questions (for science) and defining problems (for engineering)	●	●	
Developing and using models	●	●	●
Planning and carrying out investigations	●	●	●
Analyzing and interpreting data	●	●	●
Using mathematics and computational thinking		Extension 1	●
Constructing explanations (for science) and designing solutions (for engineering)	●	●	●
Engaging in argument from evidence	●	●	●
Obtaining, evaluating, and communicating information	●		
Performance Expectations:			
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.		Observes a simulation of marsh species behavior	Observes a simulation of bird behavior
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	●	●	●
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.			●
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.	●		
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.		Place greater emphasis on sunlight as the ultimate source of energy in this system	

Chapter 4	Activity 4.1: Moving Mountains to the Sea	Activity 4.2: No Ordinary Sandy Beach	Activity 4.3: Beach in a Pan
Cross Cutting Concepts:			
Cause and Effect	●	●	●
Systems and System Models			●
Disciplinary Core Ideas:			
ESS2.A: Earth Materials and Systems	●	●	●
ESS3.B: Natural Hazards			
Science and Engineering Practices:			
Asking questions (for science) and defining problems (for engineering)	●	●	●
Developing and using models	●		●
Planning and carrying out investigations			●
Analyzing and interpreting data	●		●
Constructing explanations (for science) and designing solutions (for engineering)	●	●	●
Engaging in argument from evidence	Extension		
Obtaining, evaluating, and communicating information		Extension	●
Performance Expectations:			
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.	●	●	●
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.	Extension	Extension	
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.			●
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.			●

Chapter 5	Activity 5.1: A Drop in the Bucket	Activity 5.2: Alice in Waterland	Activity 5.3: Branching Out
Cross Cutting Concepts:			
Cause and Effect		●	●
Patterns	●		●
Scale, Proportion, and Quantity	●		
Systems and System Models		●	●
Influence of Engineering, Technology, and Science on Society and the Natural World		●	
Disciplinary Core Ideas:			
PS2.B: Types of Interactions			●
ESS2.C: The Roles of Water in Earth's Surface Processes	●		
ESS3.C: Human Impacts on Earth Systems		●	
ETS1.B: Developing Possible Solutions		●	

Science and Engineering Practices:

Asking questions (for science) and defining problems (for engineering)		•	•
Developing and using models	•	•	•
Planning and carrying out investigations		•	•
Analyzing and interpreting data	Extension	•	
Using mathematics and computational thinking	•	•	
Constructing explanations (for science) and designing solutions (for engineering)	•	•	•
Engaging in argument from evidence			
Obtaining, evaluating, and communicating information		•	•

Performance Expectations:

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.	•		
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.		•	
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.	Extension		•
5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	Graph results		
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.		•	
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.			•
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.		•	

Chapter 6	**Activity 6.1: Beaches—Here Today, Gone Tomorrow?**	**Activity 6.2: Shifting Sands**	**Activity 6.3: Rollin' Down the Sand Highway**

Cross Cutting Concepts:

Cause and Effect	•	•	•
Patterns			•
Scale, Proportion, and Quantity	•	•	•
Systems and System Models	•	•	•
Influence of Engineering, Technology, and Science on Society and the Natural World	•	•	•

Disciplinary Core Ideas:

ESS2.A: Earth's Materials and Systems	•	•	•
ESS2.B: Plate Tectonics and Large-Scale System Interactions			•

ESS2.C: The Roles of Water in Earth's Surface Processes	●	●	●
ESS3.A: Natural Resources	●	●	●
ESS3.C: Human Impacts on Earth Systems			●
ETS1.B: Developing Possible Solutions		●	●

Science and Engineering Practices:

Asking questions (for science) and defining problems (for engineering)	●	●	●
Developing and using models	●	●	
Planning and carrying out investigations	●	●	
Analyzing and interpreting data	●		●
Using mathematics and computational thinking	●		●
Constructing explanations (for science) and designing solutions (for engineering)	●	●	●
Engaging in argument from evidence	●	●	●
Obtaining, evaluating, and communicating information			●

Performance Expectations:

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.		Use beach simulation and photos to investigate ways to preserve sand at a particular location.	●
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.	Students may need more assistance with measuring the transect.	●	●
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.			●
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	●	●	
MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	●	●	●
MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	●	●	●
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.			●
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.			●

Chapter 7	Activity 7.1: What's So Special About Native Species?	Activity 7.2: Adapted for Survival?	Activity 7.3: Survivor: California
Cross Cutting Concepts:			
Cause and Effect	●	●	●
Systems and System Models	●		
Disciplinary Core Ideas:			
LS2.A: Interdependent Relationships in Ecosystems	●	●	●
LS2.C: Ecosystem Dynamics, Functioning, and Resilience	●		
LS4.C: Adaptation	●		
LS4.D: Biodiversity and Humans	●		●
Science and Engineering Practices:			
Asking questions (for science) and defining problems (for engineering)	●	●	●
Developing and using models			
Planning and carrying out investigations			
Analyzing and interpreting data			
Using mathematics and computational thinking			
Constructing explanations (for science) and designing solutions (for engineering)	●	●	●
Engaging in argument from evidence		●	●
Obtaining, evaluating, and communicating information	●		●
Performance Expectations:			
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	●		
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.		●	●
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations	●	●	
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	●		●
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment	Extension		
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.			●
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	●		●

Chapter 8	Activity 8.1: Keep Your Head Above Water	Activity 8.2: You Are What You Eat	Activity 8.3: The Edge of the Wedge
Cross Cutting Concepts:			
Cause and Effect	●	●	●
Disciplinary Core Ideas:			
ESS2.C: The Roles of Water in Earth's Surface Processes			●
ESS3.C: Human Impacts on Earth Systems		●	
ETS1.A: Defining and Delimiting Engineering Problems	●		
ETS1.B: Developing Possible Solutions	●		
Science and Engineering Practices:			
Asking questions (for science) and defining problems (for engineering)	●	●	●
Developing and using models		●	●
Using mathematics and computational thinking	Extension		
Constructing explanations (for science) and designing solutions (for engineering)	●	●	●
Engaging in argument from evidence		●	
Obtaining, evaluating, and communicating information		●	
Performance Expectations:			
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment		●	
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	●		
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	●		

Community Action Activities	Activity CA.1: Marine Debris: It's Everywhere	Activity CA.2: Searching Out Nonpoint Sources of Pollution	Activity CA.3: Clean Shorelines, Clean Oceans: Shoreline Cleanup	Activity CA.4: Preventing Pollution at the Source
Cross Cutting Concepts:				
Patterns		●	●	
Cause and Effect	●		●	●
Systems and System Models	●	●	●	●
Stability and Change	●	●		●
Influence of Engineering,	●	●	●	●

Technology, and Science on Society and the Natural World				

Disciplinary Core Ideas:

LS2.C: Ecosystem Dynamics, Functioning, and Resilience	•	•		
LS4.D: Biodiversity and Humans	•		•	•
ESS3.C: Human Impacts on Earth Systems	•	•	•	•
PS1.A: Structure and Properties of Matter			•	
ETS1.A: Defining and Delimiting Engineering Problems	When solution ideas are focused and more fully designed	When solution ideas are focused and more fully designed	When performed in conjunction with CA4	•
ETS1.B: Developing Possible Solutions	•	•	•	•
ETS1.C: Optimizing the Design Solution				•

Science and Engineering Practices:

Asking questions (for science) and defining problems (for engineering)	•	•	•	•
Developing and using models		•		
Planning and carrying out investigations			•	
Analyzing and interpreting data		•	•	
Using mathematics and computational thinking			•	
Constructing explanations (for science) and designing solutions (for engineering)	•	•	•	•
Engaging in argument from evidence	•	•	•	•
Obtaining, evaluating, and communicating information	•	•	•	•

Performance Expectations:

K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.	•		When performed in conjunction with CA4	•
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple	Guide solutions toward “tools” that support Reduce, Reuse, Recycle			•

problem that can be solved through the development of a new or improved object or tool.				
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.			Prior to cleanup, spend time analyzing materials that you may find and categorize during the cleanup: plastic, metal, glass, paper, rubber, wood, cloth	
3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	Emphasize impacts of marine debris on marine life prior to development of solutions.		When performed in conjunction with CA4	•
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	•	•		•
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.		•		
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	Use multiple sources (videos, books, websites) to explore marine debris problem and possible solutions.	•		
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	Further expand upon and evaluate the Reduce, Reuse, Recycle ideas.	Choose two or more of the pollution solutions to further evaluate.		•
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.			•	
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment	Students may focus on one proposed solution, addressing a specific Reduce, Reuse, Recycle need	Students may focus on one proposed pollution solution.	When performed in conjunction with CA4	•

that may limit possible solutions.				
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	See above			•
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity	See above	Students may focus on one proposed pollution solution.		•
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	See above	See above	When performed in conjunction with CA4	•
HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	Increase depth of discussion and planning for solution suggestions	Increase depth of discussion and planning for solution suggestions	When performed in conjunction with CA4	•
HS-ETS1-2. Design a solution to a complex real world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	Students focus on one proposed solution, addressing a specific Reduce, Reuse, Recycle need			•
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	Students may focus on one proposed solution, addressing a specific Reduce, Reuse, Recycle need			•