



## Science Department Marine Science Curriculum

### Scope and Sequence

Number of Weeks Running  September - June  (56 minute block base)	Unit
2 weeks	Introduction to Marine Science
4 weeks	The World's Oceans
14 weeks	Organisms of the Sea
10 weeks	Marine Ecology and Ecosystems
3 weeks	Humans and the Sea

### Unit 1: Introduction to Marine Science

The world's oceans are a vast place and we do not know all that much about them in comparison to other areas of science. The oceans of the world are home to an array of creatures and ecosystems just waiting to be discovered. This unit will introduce students to the concept of marine science and all that encompasses the area of study. Students will examine the roots of the exploration of aquatic environments, explore some of the work that scientists are doing and get a foundational understanding of marine science as a cohesive area of study. Students will gain an understanding of our exploration of the oceans of the world and how our understanding of the ocean has changed over time.

#### Recommended Pacing

2 weeks

#### Standards

HS-LS2-6.	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but
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	changing conditions may result in a new ecosystem
HS-LS2-2.	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems
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
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.
<b>Interdisciplinary Connections</b>	
NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2	Determine the central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RI.11-12.1 RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence
<b>Integration of Technology</b>	
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment
<b>Instructional Focus</b>	
<b>Enduring Understandings:</b>	<b>Essential Questions:</b>
Marine science encompasses many areas of science as well as varied career and research opportunities. The ocean is vast and largely unexplored.	What are the different areas that encompass the marine science field? What skills, strategies and equipment are used to gather, analyze and interpret data in the marine science field? How is the scientific method used in the marine science field?

<p>Our view of the ocean, its inner workings, the species that live there and how we impact them has changed over time with all the research that has been done.</p>	<p>How have scientific contributions from various cultures throughout history affected our understanding of the ocean?          Why does it benefit you to understand the marine environment?          What are the major oceans of the world?          What are the major changes in our viewpoints of the world's oceans as we have researched over time?</p>
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**Evidence of Learning (Assessments)**

Unit 1 Assessment: Introduction to Marine Science  
 Formative Assessments  
 Labs and Activities  
 Marine Discoveries Roundtable Discussion

**Objectives (SLO)**

<p>Students will know:          The locations and names of the major oceans of the world.          The areas of science and career encompassed by marine science.          The history of the understanding of the oceans, how they were formed and how we arrived at our planet's structure as it now exists.          The discoveries made over time regarding our oceans and the species that live there.</p>	<p>Students will be able to:          Provide the name and location of all of the world's oceans.          Describe the changes in time of the world's oceans and the results of those changes. IE - salinity, sea level rise, etc.          Explain the ways in which our viewpoint of the oceans and what they contain has changed over time citing specific examples. IE- flat land vs. global water placement, species identification vs. legend          Describe the sciences related to marine science and the possible career paths for those who study marine science.</p>
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**Suggested Resources/Technology Tools**

[Video: Introduction to the History of Earth's Oceans](#)  
 Exploration of Marine Science Careers Project

- [Marine Careers I](#)
- [Marine Careers II](#)

How do we explore our oceans?

- [NOAA Excursions and Expeditions](#)
- [Ocean Exploration Vessels](#)

Where is the study of Marine Science right now?

- [Marine Science News NOAA](#)

**Modifications**  
 Teachers select modifications based upon methods of instruction.

**Teachers can choose from any of the suggested modifications below based upon teaching style, learner need and instructional practices.**

**General Modifications for students struggling to learn:**

- Focus on building relationships in the classroom.
- Control the stressors for the student and manage alternate pathways for completion of assignments.
- Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy.
- Boost engagement with material by providing opportunities of differentiation, group work and alternative assignments/assessments where appropriate.

**ELL**

- Provide additional wait time for student responses to questions to allow students the ability to undergo the process of translation between languages, composition of response and attempted response.
- Simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase to allow ELL students to hear the sentence and try to comprehend it.
- Rephrase idioms and teach their meanings as when learning a new language, translations are often very literal. IE “Take a stab at it.” Ensure students understand what is meant.
- Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading questions about the main idea and offer help utilizing key words.
- Allow the use of Google Translate where appropriate.
- Utilize bilingual reading texts provided by the STC program.

**G/T**

Utilize differentiation in the areas of acceleration, enrichment, and grouping. Examples include, but are not limited to:

- interdisciplinary and problem-based assignments with planned scope and sequence
- advance, accelerated, or compacted content
- abstract and advanced higher-level thinking
- allowance for individual student interests
- assignments geared to development in areas of affect, creativity, cognition, and research skills
- complex, in-depth assignments
- diverse enrichment that broadens learning
- variety in types of resources
- internships, mentorships and independent study where applicable

**504/IEP**

Modifications and accommodations must be aligned to stated plan and uphold expectations of the plan lawfully. Every student requires a different set of accommodations based upon need. Examples specific to science practice include, but are not limited to:

- Note taker or lab assistant
- Group lab assignments
- Use of scribe
- Adjustable tables and lab equipment within reach
- Classrooms, labs and field trips in accessible locations
- Additional time and separate room for test taking
- Additional time for in-class assignments
- Additional time in lab
- Visual and tactile instructional demonstrations
- Computer with voice output, spelling and grammar checker
- Seating in the front of the class
- Tactile drawings and graphs, and three-dimensional models
- Assignments in electronic format
- Large-print handouts, lab signs and equipment labels
- TV monitor connected to microscope to enlarge images
- Computer equipped to enlarge screen characters and images
- Auditory lab warning signals

- Adaptive lab equipment (talking calculators, talking thermometers, light probes, tactile timers)
- Staples on sticks to indicate units of measurement
- Visual warning system for lab emergencies

## 21ST CENTURY LIFE AND CAREER STANDARDS

*Please select all standards that apply to this unit of study:*

- ✓ Act as a responsible and contributing citizen and employee.
- ✓ Apply appropriate academic and technical skills.
- ✓ Attend to personal health and financial well being.
- ✓ Communicate clearly and effectively and with reason.
- ✓ Consider the environmental social and economic impacts of decisions.
- ✓ Demonstrate creativity and innovation.
- ✓ Employ valid and reliable research strategies.
- ✓ Utilize critical thinking to make sense of problems and persevere in solving them.
- ✓ Model integrity, ethical leadership, and effective management.
- ✓ Plan education and career paths aligned to personal goals.
- ✓ Use technology to enhance productivity.
- ✓ Work productively in teams while using cultural global competence.

Suggestions on integrating these standards can be found at:

<http://www.state.nj.us/education/cccs/2014/career/9.pdf>

### LINKS TO CAREERS:

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## Unit 2: The World's Oceans

Earth's oceans are home to a variety of organisms adapted to the special conditions of the sea. The characteristics of these organisms and the variety of marine life are the result of the many properties of the ocean. This unit provides a survey of the developmental history and the current structure of the ocean basins as well as a discussion of the properties of seawater and of ocean circulation processes. Students will investigate the process of species evolution of ocean inhabitants as related to the above and view the marine environment through various lenses and points of view dependent upon different scales of time and distance. In this unit, understanding of the ocean as a habitat will be driven through a foundation of ocean development and processes such as seafloor spreading and the Water Cycle.

### Recommended Pacing

4 weeks

### Standards

HS-LS1-6

Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules

HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect the carrying capacity of ecosystems at different scales.
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity
HS-ESS1-5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks
HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
HS-ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere
HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth
<b>Interdisciplinary Connections</b>	
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<b>Instructional Focus</b>	
<b>Enduring Understandings:</b>	<b>Essential Questions:</b>
<p>The world's oceans are in constant motion and impact the climate, weather patterns, and biological activities within the oceans and on land.</p> <p>The Earth's surface have and continue to change and this impacts the world ocean and its organisms.</p>	<p>What are the physical and chemical properties of the world's oceans?</p> <p>How does the ocean influence the climate and weather, and thus life on Earth?</p>
<b>Evidence of Learning (Assessments)</b>	
<p>Unit 2 Assessment: The World's Oceans</p> <p>Formative Assessments</p> <p>Labs and Activities</p>	
<b>Objectives (SLO)</b>	
<p>Students will know:</p> <p>The major ocean basins of the world.</p> <p>The water cycle</p> <p>The general flow patterns of currents throughout the world's oceans</p> <p>The forces responsible for causing ocean currents</p> <p>Circulation of major currents around the world and affect climate and weather in certain regions</p> <p>The forces that cause tides</p> <p>The different types of tides and how regular tides occur</p>	<p>Students will be able to:</p> <p>Relate the theory of continental drift and plate tectonics to the formation of the continents and oceans.</p> <p>Examine the various zones of the ocean, including those of the continental margin and the abyss.</p> <p>Evaluate samples of ocean topography and explore the role of plate tectonics in its formation.</p> <p>Describe the properties and the currents that result because of the characteristics of liquids at different temperatures and salinities.</p> <p>Explain how interrelationships affect the overall behavior of the system on a microscopic and macroscopic level.</p> <p>Demonstrate how water molecules travel through the water cycle.</p> <p>Locate the major oceans of the world on a map.</p>

<p>The factors needed to form a hurricane and how hurricanes are classified</p> <p>Main structural components of a hurricane</p> <p>The effects hurricanes have on ecosystems and humans</p> <p>The manner in which hydrothermal vents allow deep ocean ecosystems rely on chemicals instead of sunlight as their base</p>	<p>Identify the major ocean circulation patterns.</p> <p>Predict how the climate will be affected by a change in an ocean current.</p> <p>Understand the far reaching effects of El Nino.</p> <p>Explain how the tides are affected by the alignment of the sun, moon and Earth.</p> <p>Identify the forces that create different tides.</p> <p>Identify different animals that are affected by the rise and fall of the tides.</p> <p>Classify a hurricane based on its current intensity.</p> <p>Explain how hydrothermal vents arise.</p> <p>Link the presence of hydrothermal vents to the diversity found around them.</p>
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### Suggested Resources/Technology Tools

[Sea Floor Mapping Resources](#)

[Glencoe Online Mapping Activity](#) (NEED ADOBE TO DO)

[Lab Activity Hands-on: Simulating SONAR Mapping](#)

[Natural Disasters Resource](#)

[Tides Resources and Activity](#) (USE EDUCATION TAB at top of page for all resources and links)

[Density of Seawater](#)

[Sea Water Density Lab Example](#)

[Fluidity of Water on Earth Activity](#)

[Water Cycle Resource](#)

[Water Cycle Resource II](#)

[Water Desalination Activity](#)

[Making of the Ocean Floor Activity](#)

[Basics of Plate Tectonics Lesson](#)

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### Unit 3: Organisms of the Sea

To cope with the complexity and variety of the sum total of marine organisms, we divide these complex systems into smaller subunits and organize these units by relating them to the who system on the basis of certain characteristics. The purpose of this unit is to explore marine organisms within their different taxonomic classifications, focusing on their specific characteristics and adaptations. The organisms are then related back to their role within the ecosystem and the concept of interdependence. Students will be exposed to microorganisms, primary multicellular producers, marine invertebrates, and marine vertebrates with an emphasis on structure and how it relates to function.

#### Recommended Pacing

14 weeks

#### Standards

HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms
HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical

	energy
HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
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.
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
<b>Interdisciplinary Connections</b>	
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<b>Instructional Focus</b>		
<b>Enduring Understandings:</b>	<b>Essential Questions:</b>	
<p>Human activities have drastic effects on the ocean and its inhabitants. Plants, animals, topography and resource availability vary in different marine environments. Microorganisms play an important role in marine ecosystems. Organisms are adapted to the habitat they live in.</p>	<p>How does organism structure relate to its function?          What is the importance of algae to marine ecosystems?          What are the identifying characteristics of major invertebrate phyla?          How has the phylogeny of invertebrates lead to greater complexity?          What are the identifying characteristics of major marine vertebrate phyla?          How are marine vertebrates adapted to life in the water?</p>	
<b>Evidence of Learning (Assessments)</b>		
<p>Unit 3 Assessment: Organisms of the Sea          Formative Assessments          Labs and Activities</p>		
<b>Objectives (SLO)</b>		
<p>Students will know:          General characteristics of marine invertebrates          Roles of invertebrates in marine ecosystems          Characteristics of marine vertebrates          Value of marine vertebrates to humans          How humans have impacted or depleted these marine invertebrates.          Microorganisms play an important role in marine ecosystems</p>	<p>Students will be able to:          Understand and apply the rules of classification.          Identify various marine invertebrates          Demonstrate an ability to classify various marine invertebrates using a dichotomous key and/or distinguishable characteristics.          Explain the benefits of external and internal forms of reproduction.          Identify general marine vertebrate structures and characteristics          Correlate how salinity plays an important role in how a fish regulates its blood chemistry.          Describe how gills function to maximize fish respiration.          Analyze statistics on shark attacks and identify possible causations.          List, identify and diagram the characteristics of the protist kingdom using examples          List, identify and diagram the characteristics of the plant kingdom using examples          Describe how planktonic diatoms regulate their oil content and adjust their buoyancy.          Discuss the adaptations of Kelp and microalgae that help them survive in the photic zone.          Compare and contrast diatoms, dinoflagellates and cyanobacteria.</p>	
<b>Suggested Resources/Technology Tools</b>		

[Marine Life Classification Resource](#)  
[Classifying Invertebrates Activity](#)  
[Marine Invertebrates Resource](#)  
[Invertebrates Lesson](#)  
[Marine Vertebrates Resource](#)  
[Classifying Fish](#) (non-oceanic creatures, basic fish classification)  
[Vertebrate Classification Module](#)  
[Reproduction of Marine Life Resource](#)  
[Salinity and Blood Chemistry of Fish](#)  
[Fish Respiration](#)  
[Shark Attack Database](#)  
[Kelp Forest Lesson and Activity](#)  
[Aquatic Plants and Algae](#)  
[Diatoms](#)  
[Dinoflagellates](#)  
[Cyanobacteria](#)

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## Unit 4: Marine Ecology and Ecosystems

Life exists everywhere in the ocean. The type of life you encounter depends on the specific habitat. Every habitat has distinct abiotic factors that determine which organisms will, or will not, live there. Additionally, the organisms living in various ecosystems affect each other by interacting in complex ways. This unit covers the physical and chemical features of a variety of habitats, how the organisms living there are adapted to that habitat, and how they affect each other.

The possible ecosystems included are: Tidal communities/tide pools (rocky shores); Estuaries; Continental Shelf; Coral Reefs; Open Ocean (near the surface); Ocean Depths (aphotic zone).

### Recommended Pacing

10 weeks

### Standards

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RI.11-12.1 RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including

	determining where the text leaves matters uncertain.
NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence
<b>Integration of Technology</b>	
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
<b>Instructional Focus</b>	
<b>Enduring Understandings:</b>	<b>Essential Questions:</b>
<p>The ocean is full of plant and animal diversity, which is interconnected within marine ecosystems. Plants, animals and topography and resource availability vary in different marine environments. The diversity of life in the ocean is directly connected to the type of habitat the specific organisms live in.</p>	<p>What different life zones exist at different depths and distances from the shore?          What are the characteristics and adaptations of flora and fauna in marine environments?          How are energy and nutrients made available to all members of a community?          What are the various relationships between trophic levels?          What are the abiotic factors associated with various marine habitats?</p>
<b>Evidence of Learning (Assessments)</b>	
<p>Unit 4 Assessment: Marine Ecosystems and Ecology          Formative Assessments          Labs and Activities</p>	
<b>Objectives (SLO)</b>	
<p>Students will know:          The different oceanic life zones and depths and coastal formations responsible for them.          Characteristics and adaptations of flora and fauna in marine environments.          Organisms create food webs and ecosystems.          The relationship of organisms and available energy changes from trophic level to trophic level.</p>	<p>Students will be able to:          List and describe key parts of each marine ecosystem.          Label the parts of marine ecosystems.          Explain why certain organisms occupy different habitats.          Explain the importance of phytoplankton in each of the habitats.          Describe the importance of wave stress (as it applies to each habitat).          List and describe organisms on the Great Barrier Reef.          Identify various marine ecosystems around the world.          Distinguish between producers and consumers and their roles in photosynthesis and respiration.          Diagram the flow of energy and nutrients in an aquatic food web.</p>



Plankton are responsible for most of the primary production in the ocean and most of the oxygen production in the world.

Construct an explanation for the downfall of kelp forests after analyzing recent trends in other populations.

### Suggested Resources/Technology Tools

[Mapping Marine Ecosystems Activity](#)

[Marine Ecosystems and Biodiversity](#) (3 activities, scroll down the page for links)

[Oysters in the Chesapeake Bay Unit](#) (4 modules, each associated activities and plans)

### Modifications

**Teachers can choose from any of the suggested modifications below based upon teaching style, learner need and instructional practices.**

#### **General Modifications for students struggling to learn:**

- Focus on building relationships in the classroom.
- Control the stressors for the student and manage alternate pathways for completion of assignments.
- Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy.
- Boost engagement with material by providing opportunities of differentiation, group work and alternative assignments/assessments where appropriate.

#### **ELL**

- Provide additional wait time for student responses to questions to allow students the ability to undergo the process of translation between languages, composition of response and attempted response.
- Simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase to allow ELL students to hear the sentence and try to comprehend it.
- Rephrase idioms and teach their meanings as when learning a new language, translations are often very literal. IE “Take a stab at it.” Ensure students understand what is meant.
- Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading questions about the main idea and offer help utilizing key words.
- Allow the use of Google Translate where appropriate.
- Utilize bilingual reading texts provided by the STC program.

#### **G/T**

Utilize differentiation in the areas of acceleration, enrichment, and grouping. Examples include, but are not limited to:

- interdisciplinary and problem-based assignments with planned scope and sequence
- advance, accelerated, or compacted content
- abstract and advanced higher-level thinking
- allowance for individual student interests
- assignments geared to development in areas of affect, creativity, cognition, and research skills
- complex, in-depth assignments
- diverse enrichment that broadens learning
- variety in types of resources
- internships, mentorships and independent study where applicable

#### **504/IEP**

Modifications and accommodations must be aligned to stated plan and uphold expectations of the plan lawfully. Every student requires a different set of accommodations based upon need. Examples specific to science practice include, but are not limited to:

- Note taker or lab assistant
- Group lab assignments
- Use of scribe
- Adjustable tables and lab equipment within reach
- Classrooms, labs and field trips in accessible locations
- Additional time and separate room for test taking
- Additional time for in-class assignments
- Additional time in lab
- Visual and tactile instructional demonstrations
- Computer with voice output, spelling and grammar checker
- Seating in the front of the class
- Tactile drawings and graphs, and three-dimensional models
- Assignments in electronic format
- Large-print handouts, lab signs and equipment labels
- TV monitor connected to microscope to enlarge images
- Computer equipped to enlarge screen characters and images
- Auditory lab warning signals
- Adaptive lab equipment (talking calculators, talking thermometers, light probes, tactile timers)
- Staples on sticks to indicate units of measurement
- Visual warning system for lab emergencies

## 21ST CENTURY LIFE AND CAREER STANDARDS

*Please select all standards that apply to this unit of study:*

- ✓ Act as a responsible and contributing citizen and employee.
- ✓ Apply appropriate academic and technical skills.
- ✓ Attend to personal health and financial well being.
- ✓ Communicate clearly and effectively and with reason.
- ✓ Consider the environmental social and economic impacts of decisions.
- ✓ Demonstrate creativity and innovation.
- ✓ Employ valid and reliable research strategies.
- ✓ Utilize critical thinking to make sense of problems and persevere in solving them.
- ✓ Model integrity, ethical leadership, and effective management.
- ✓ Plan education and career paths aligned to personal goals.
- ✓ Use technology to enhance productivity.
- ✓ Work productively in teams while using cultural global competence.

Suggestions on integrating these standards can be found at:

<http://www.state.nj.us/education/cccs/2014/career/9.pdf>

### LINKS TO CAREERS:

<https://www.marineinsight.com/careers-2/a-list-of-unique-and-interesting-marine-careers/>  
<https://www.marinecareers.net/>

## Unit 5: Humans and the Sea

Our exploitation of marine resources is now much more sophisticated, but unfortunately, has also become more destructive. This unit focuses on how humans interact with the sea, the resources that the sea contains, the destructive nature of our interactions, and how humans can be the solution to the problems we are causing in our world ocean.

### Recommended Pacing

3 weeks

### Standards

HS-LS2-6.	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem
HS-LS2-2.	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems
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
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.

### Interdisciplinary Connections

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### Integration of Technology

8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge
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<b>Instructional Focus</b>	
<b>Enduring Understandings:</b>	<b>Essential Questions:</b>
Human activities have drastic effects on the ocean and its inhabitants.	How have we impacted the world's marine environments? What measures must be taken to ensure the survival of the world's marine environments?
<b>Evidence of Learning (Assessments)</b>	
Unit 5 Assessment: Humans and the Sea Formative Assessments Labs and Activities	
<b>Objectives (SLO)</b>	
Students will know: Various types and causes of marine pollution. How marine pollution affects humans both directly and indirectly. How marine pollution affects the marine ecosystem.	Students will be able to: List the important living and nonliving marine resources. Identify recent problems in worldwide oceanic fisheries. Describe the different methods of farming aquatic life forms. Discuss the impact of sewage pollution and toxic chemicals on aquatic environments. Explain the importance of clean water to aquatic life forms.
<b>Suggested Resources/Technology Tools</b>	
<a href="#">Human Ocean Impact Lesson and Activities</a> <a href="#">Oil Spill Activity</a> (use leveling extensions listed for HS) <a href="#">Overfishing Activity</a> <a href="#">Human Impact Resources</a>	
<b>Modifications</b>	
<b>Teachers can choose from any of the suggested modifications below based upon teaching style, learner need and instructional practices.</b>  <b>General Modifications for students struggling to learn:</b> <ul style="list-style-type: none"> <li>• Focus on building relationships in the classroom.</li> <li>• Control the stressors for the student and manage alternate pathways for completion of assignments.</li> <li>• Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy.</li> </ul>	

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