

## Treasure Coast Science Scope and Sequence 2012-2013

Course: Marine Science I Honors

Course Code: 2002510

Quarter: 2

**Topic(s) of Study:** Physical Oceanographic Factors

**Bodies of Knowledge:** Nature of Science, Earth and Space Science, Life Science, Physical Science

**Standard(s):** 1: The Practice of Science, 2: The Characteristics of Scientific Knowledge, 3: The Roles of Theories, Laws, Hypotheses and Models, 4: Science and Society, 6: Earth Structures, 7: Earth Systems and Patterns, 10: Energy, 17: Interdependence

**Essential Questions:** What physical oceanographic factors shape our coasts and weather patterns? Why and how does the seafloor change? How do scientists design an investigation to answer a scientific question and communicate their findings?

[Concept Map\(s\): Click here](#)

[Resources: Click here](#)

[Syllabus: Click here](#)

[CCSS Literacy Standards: Click here](#)

NGSSS	OUTLINE OF CONTENT (CONCEPT/SKILLS)	TARGETS
<p>SC.912.E.7.4 Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans. Cognitive Complexity: Moderate</p> <p>SC.912.E.7.6 Relate the formation of severe weather to the various physical factors. Cognitive Complexity: Moderate</p> <p>SC.912.E.7.9 Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water. Cognitive Complexity: High</p> <p>SC.912.L.17.3 Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms. Cognitive Complexity: Moderate</p> <p>SC.912.P.10.20 Describe the measurable properties of waves and explain the relationships among them and how these</p>	<p>I The Earth's Heat Balance</p> <p>II Heat Transport, and Climate</p> <p>III Air-Sea Interaction</p> <p>IV The Coriolis Effect</p> <p>V Global Wind Patterns</p> <p>VI Special Weather Events: Hurricanes, Monsoons, El Nino, La Nina</p> <p>VII Surface Currents and Deep Currents</p> <p>VIII Waves and Tides</p> <p style="padding-left: 20px;">A. Anatomy of Waves</p> <p style="padding-left: 20px;">B. Tsunamis</p> <p style="padding-left: 20px;">C. Tidal Patterns</p> <p style="padding-left: 20px;">D. Causes and Impact of Tides</p> <p style="padding-left: 40px;">i. Sun, Earth, and Moon Interactions</p> <p>IX Earth's Internal Structure</p>	<ul style="list-style-type: none"> <li>• Explain seasonal changes of Earth in terms of the intensity of solar radiation energy and the Earth's tilt. (I)</li> <li>• Illustrate how the angle of insolation relates to differential heating of the Earth's surface. (I)</li> <li>• Differentiate between types of incoming solar radiation. (I)</li> <li>• Relate changes in SSTs to changes in animal movements. (I)</li> <li>• Indicate that heat energy in the ocean is distributed through currents. (I, VII)</li> <li>• Identify sea surface temperature (SST) and ocean currents from satellite imagery. (I, VII)</li> <li>• Explain the concept of heat capacity and the role of the ocean in moderating Earth's climate. (II)</li> <li>• Give examples of the ocean's influence on weather and climate. (II, III)</li> <li>• Explain how energy is transferred from the ocean to the atmosphere through the formation of air masses and weather systems. (III)</li> <li>• Define terms including current, gyre, and Coriolis Effect. (IV)</li> <li>• Explain how the Coriolis Effect and wind patterns create ocean currents. (IV, V)</li> </ul>

## Treasure Coast Science Scope and Sequence 2012-2013

<p>properties change when the wave moves from one medium to another. Cognitive Complexity: High</p> <p>SC.912.L.17.4 Describe changes in ecosystems resulting from seasonal variations, climate change and succession. Cognitive Complexity: Moderate</p> <p>SC.912.E.6.3 Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates. Cognitive Complexity: High</p> <p>SC.912.E.6.5 Describe the geologic development of the present day oceans and identify commonly found features. Cognitive Complexity: Moderate</p> <p>SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: Cognitive Complexity: High</p> <ol style="list-style-type: none"> <li>1. pose questions about the natural world,</li> <li>2. conduct systematic observations,</li> <li>3. examine books and other sources of information to see what is already known,</li> <li>4. review what is known in light of empirical evidence,</li> <li>5. plan investigations,</li> <li>6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and</li> </ol>	<p>X Continental Drift, Seafloor Spreading, and Plate Tectonics</p> <p>XI Seismic Activity and Related Events</p> <ol style="list-style-type: none"> <li>A. Volcanoes,</li> <li>B. Earthquakes,</li> <li>C. Tsunamis</li> </ol> <p>XII Continental Shelf Sediments and Deep-Ocean Sediments</p> <p>XIII Ocean Fossil Records</p> <p>XIV Primary and Secondary Coasts</p> <p>XVI Longshore Drift and Beach Dynamics</p> <p>XVII Origin of the Atmosphere and Oceans</p>	<ul style="list-style-type: none"> <li>• Explain the occurrence of upwelling currents and their relationship to El Nino/La Nina. (VI)</li> <li>• Detail the characteristics and movement patterns of Atlantic hurricanes. (VI)</li> <li>• Describe the factors that lead to the formation of weather events, including thunderstorms and hurricanes. (VI)</li> <li>• Describe how and why an El Nino/La Nina event occurs and explain its effects. (VI)</li> <li>• Recognize the importance of upwelling currents to the ecology of fisheries. (VII)</li> <li>• Identify the properties and types of ocean waves. (VIII)</li> <li>• Determine the factors that influence wave height and speed. (VIII)</li> <li>• Describe how the gravitational pull from the Earth, Moon, and Sun create tides. (VIII)</li> <li>• Explain how Earth’s ocean basins are interconnected through the flow of currents. (VIII, IX)</li> <li>• Discriminate among the structures of the ocean floor (mid-ocean ridges, seamounts, subduction zones, abyssal plains, and trenches). (IX)</li> <li>• Relate the theories of continental drift and plate tectonics to the evolution of the ocean basins. (X, XIII,)</li> <li>• Explain the Theory of Plate Tectonics by describing the processes involved, the geologic features used as supporting evidence, and the major changes in Earth’s crust that have occurred as a result of crustal movement. (X, XIII, XVI)</li> <li>• Use the development of the Theory of plate Tectonics to discuss how scientific ideas and research evolve into a unified theory. (X)</li> <li>• Describe the evolution of today’s ocean basins. (X)</li> </ul>
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## Treasure Coast Science Scope and Sequence 2012-2013

<p>also the generation and interpretation of graphical representations of data, including data tables and graphs),</p> <p>7. pose answers, explanations, or descriptions of events,</p> <p>8. generate explanations that explicate or describe natural phenomena (inferences),</p> <p>9. use appropriate evidence and reasoning to justify these explanations to others,</p> <p>10. communicate results of scientific investigations, and</p> <p>11. evaluate the merits of the explanations produced by others. Cognitive Complexity: High</p> <p>SC.912.N.2.5 Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. Cognitive Complexity: High</p> <p>SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science. Cognitive Complexity: Moderate</p> <p>SC.912.N.4.1 Explain how scientific knowledge and</p>		<ul style="list-style-type: none"> <li>• Identify the three major types of plate boundaries and explain the consequences of these interactions. (X)</li> <li>• Analyze bathymetric images and identify seafloor features. (X, XII)</li> <li>• Describe how scientists map the ocean floor. (X, XI, XIV, XV)</li> <li>• Create a model of the seafloor. (X, XI, XIV, XV)</li> <li>• Identify and label the major oceans on a world map. (XVI)</li> <li>• Describe the geologic history of Florida.</li> <li>• Define a scientific problem or question based on the specific body of knowledge correlated to the Marine Science I Honors course. (I-X)</li> <li>• Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals. (I-X)</li> <li>• Explain why models are used in science to observe processes that happen too slowly, too quickly, or are too small or vast for direct observation. (I-X)</li> <li>• Describe scientific knowledge's impact on societal decisions. (I-X)</li> </ul>
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## Treasure Coast Science Scope and Sequence 2012-2013

reasoning provide an empirically-based perspective to inform society's decision making.  
Cognitive Complexity: Moderate

SC.912.N.4.2 Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.  
Cognitive Complexity: High

MA.912.S.1.2 Determine appropriate and consistent standards of measurement for the data to be collected in a survey or experiment.  
Cognitive Complexity: Moderate

MA.912.S.3.2: Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following:  
bar graphs, line graphs, stem and leaf plots, circle graphs, histograms, box and whisker plots, scatter plots and cumulative frequency (ogive) graphs. Cognitive Complexity: High