

Marine Science: The Dynamic Ocean Meets Next Generation Science Standards (NGSS) and Common Core State Standards (CCCS)

Marine Science: The Dynamic Ocean offers data driven investigations, meaningful context-based activities and lessons that seamlessly integrate Science, Technology, Engineering and Mathematics (STEM) for the deeper conceptual understanding valued by the Next Generation Science Standards (NGSS).

NGSS focuses the developmental progression through Disciplinary Core Ideas on a core understanding of content and the application of knowledge in real-world scenarios. From cover to cover, *Marine Science: The Dynamic Ocean* is built on the integrated STEM philosophy that drives NGSS.

Lessons are thoughtfully sequenced to build strong, conceptual understanding of the ocean and the Earth as a system, and make real-life data driven connections that are interesting and meaningful to today's high school students.

Foundations of NGSS and Marine Science: The Dynamic Ocean

Nature of Science (NOS)

A deep understanding of the NOS is essential to a strong science education and highly valued in *Marine Science: The Dynamic Ocean.* The text directly addresses important NOS terminology and contextualizes examples of how science is conducted in everyday life. The course highlights the tenets of the NOS in each lesson to show the educator exactly how the content helps students learn and apply principles, to ensure that NOS is a consistent, underlying theme.

Science and Engineering Practices

Inquiry as a scientific practice is central to the development of *Marine Science: The Dynamic Ocean*. The application of concepts to socio-scientific issues which inspire meaningful discourse and justification of ideas occurs throughout exciting investigations of marine ecosystems. Students engage in an exploration of the threats to marine life and the responsibility of humans to protect the ocean and its vast resources. They employ the Engineering Design Process, which incorporates *NGSS's eight practices of science and engineering* to investigate point source pollution and design ways to effectively clean up oil spills. Throughout the course, students demonstrate a deep understanding of scientific concepts through the application of engineering.

Crosscutting Concepts

The field of Marine Science is truly interdisciplinary, void of conceptual boundaries. *Marine Science: The Dynamic Ocean* includes exciting applications of STEM that demonstrate bridging concepts across disciplines in the exciting context of the ocean.

Examples of some topics covered in *Marine Science: The Dynamic Ocean* that demonstrate NGSS Crosscutting Concepts:



1. Patterns.

Classification of marine organisms; structure and function; biological evolution; properties of matter; properties of water

- 2. Cause and effect: Mechanism and explanation Scientific investigations; engineering practices; impacts of coastal development; symbiotic relationships between species
- 3. Scale, proportion, and quantity. Population dynamics
- 4. Systems and system models.

Using models to demonstrate various concepts: 1) transfer of energy; 2) using engineering design to address pollution challenges; 3) studying human induced habitat destruction; 4) identifying solutions

- 5. Energy and matter: Flows, cycles, and conservation. Cycling of energy and matter; biogeochemical cycles; conservation of energy
- 6. Structure and function. Study of living things; cell type; adaptations to marine environments
- 7. Stability and change. Population dynamics and age structure diagrams; natural selection

Disciplinary Core Ideas

Marine Science: The Dynamic Ocean is a comprehensive investigation of the ocean, Earth's largest resource, where lessons address the Disciplinary Core Ideas carefully constructed in *A Framework for K-12 Science Education*. Connections to performance expectations are outlined by course lesson below:

Marine Science The Dynamic Ocean



1Diving into Ocean EcosystemsHS-LS2-32Water on EarthHS-ESS2-5, HS-PS1-5, HS-PS1-13More About WaterHS-ESS2-5, HS-PS1-2, HS-PS1-34The Ocean Over TimeHS-ESS2-3, HS-ESS3-45Migrations in the SeaHS-PS4-56Explore the Sea FloorHS-PS4-57The Formation of the OceanHS-PS4-58Seasons of ChangeHS-PS4-1, HS-ESS2-1, HS-ESS2-4, HS-ESS2-49The Sea Surface: The Great Heat DistributorHS-PS3-1, HS-PS3-2, HS-ESS2-4, HS-ESS2-4, HS-ESS2-410Energy and the OceanHS-PS3-1, HS-PS3-2, HS-PS3-411Weather, Climate and the OceanHS-ESS2-2, HS-ESS2-4, HS-ESS2-7, HS-ESS2-4, HS-ESS2-7, HS-ESS2-4,	Lesson	Title	Disciplinary Core Idea code
2 Water on Earth HS-ESS2-5, HS-PS1-5, HS-PS1-1 3 More About Water HS-ESS2-5, HS-PS1-2, HS-PS1-3 4 The Ocean Over Time HS-ESS2-5, HS-PS1-2, HS-PS1-3 4 The Ocean Over Time HS-ESS2-1, HS-ESS2-4 5 Migrations in the Sea HS-PS4-5 6 Explore the Sea Floor HS-PS4-5, HS-PS4-2 7 The Formation of the Ocean HS-ESS2-1, HS-ESS2-1, HS-ESS2-4, HS-ESS2-4 9 The Sea Surface: The Great Heat Distributor HS-PS3-2, HS-ESS2-4, HS-ESS2-4 9 The Sea Surface: The Great Heat Distributor HS-PS3-2, HS-ESS2-4, HS-ESS2-4 10 Energy and the Ocean HS-FSS2-2 11 Weather, Climate and the Ocean HS-ESS2-2 12 Vayage to the Deep HS-ESS2-2 13 Photosynthesis in the Ocean HS-LS1-1, HS-LS2-4, HS-LS2-5, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-5, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-5, HS-ESS2-4, H			· · ·
4The Ocean Over TimeHS-ESS3-1, HS-ESS3-45Migrations in the SeaHS-PS4-5, HS-PS4-26Explore the Sea FloorHS-PS4-5, HS-PS4-27The Formation of the OceanHS-ESS2-1, HS-ESS2-1, HS-ESS2-48Seasons of ChangeHS-ESS2-1, HS-PS4-3, HS-ESS2-49The Sea Surface: The Great Heat DistributorHS-PS3-2, HS-ESS2-4, HS-ESS2-410Energy and the OceanHS-ESS2-211Weather, Climate and the OceanHS-ESS2-212Voyage to the DeepHS-ESS2-213Photosynthesis in the OceanHS-LS1-5, HS-ESS2-4, HS-ESS2-4, HS-ESS2-5, HS-ESS2-6, HS-ESS2-7, HS-LS4-1, HS-LS2-2, HS-LS2-6, HS-ESS2-6, HS-ESS2-7, HS-LS4-1, HS-LS2-2, HS-LS2-6, HS-ESS2-6, HS-LS1-716Population ChangesHS-HS-HS-1, HS-LS2-2, HS-LS2-4, HS-ESS2-6, HS-ESS2-6, HS-LS1-7, HS-LS2-1, HS-LS2-3, HS-LS2-2, HS-ESS2-6, HS-LS1-217Food Webs in ActionHS-ESS18Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-311Marine Reptiles and birdsHS-LS1-4, HS-LS2-812Relationships in the SeaHS-PS4-113Introduction to Marine InvertebratesHS-LS1-414A Time for TidesHS-ESS1-415Marine Reptiles	2	· ·	HS-ESS2-5, HS-PS1-5, HS-PS1-1
 Migrations in the Sea HS-PS4-5, HS-PS4-2 Explore the Sea Floor HS-PS4-5 The Formation of the Ocean ESS2-3, Seasons of Change HS-ESS2-1, HS-ESS2-1, HS-ESS2-4, HS-ESS2-4 The Sea Surface: The Great Heat Distributor HS-PS3-2, HS-ESS2-4, HS-ESS2-4 The Sea Surface: The Great Heat Distributor HS-PS3-2, HS-ESS2-4, HS-ESS2-4 The Sea Surface: The Great Heat Distributor HS-PS3-2, HS-ESS2-4, HS-ESS2-4 The Sea Surface: The Great Heat Distributor HS-PS3-2, HS-ESS2-4, HS-ESS2-4 The Sea Surface: The Great Heat Distributor HS-PS3-2, HS-ESS2-4, HS-ESS2-4 Yoyage to the Deep HS-ESS2-2 Yoyage to the Ocean HS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-5, HS-ESS2-4, HS-ESS2-5, HS-LS1-5, HS-LS2-2, HS-LS2-2, HS-LS2-2, HS-LS2-2, HS-LS2-2, HS-LS2-2, HS-LS2-2, HS-LS2-2, HS-LS2-2, HS-LS2-3, HS-LS2-2, HS-LS2-3, HS-LS2-2, HS-LS3-3, HS-LS2-2, HS-LS3-3, HS-LS2-2, HS-LS3-3, HS-LS2-2, HS-LS3-3, HS-LS2-4, HS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-2, HS-LS3-3, HS-LS2-4, HS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-4, HS-LS3-3, HS-LS2-4, HS-LS3-4, HS-LS3-7, HS-LS3-4, HS-LS3-4, HS-ESS3-4, HS-ESS3-4, HS-ESS3-7, HS-ESS2-4, HS-ESS3-4, HS-ESS3-4, HS-ESS3-7, HS-ESS2-7, HS-LS3-4, HS-ESS3-4, HS-ESS3-4, HS-ESS3-7, HS-ESS3-4, HS-ESS3-5, HS-ES	3	More About Water	HS-ESS2-5, HS-PS1-2, HS-PS1-3
6Explore the Sea FloorHS-PS4-57The Formation of the OceanHS-PS4-58Seasons of ChangeHS-ESS2-1, HS-PS4-3, HS-ESS2-49The Sea Surface: The Great Heat DistributorHS-PS3-2, HS-PS4-3, HS-ESS2-49The Sea Surface: The Great Heat DistributorHS-PS3-2, HS-ESS2-4, HS-ESS2-410Energy and the OceanHS-PS3-2, HS-PS3-2, HS-PS3-411Weather, Climate and the OceanHS-ESS2-212Voyage to the DeepHS-ESS2-113Photosynthesis in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-4, HS-ESS2-514Biddiversity in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-4, HS-ESS2-5, HS-ESS2-4, HS-ESS2-7, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-815Marine PopulationsHS-ESS2-7, HS-LS4-1, HS-LS2-2, HS-LS2-6, HS-LS2-816Population ChangesHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-4, HS-LS2-821Marine RominalsHS-ESS1-422Relationships in the SeaHS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-425Student Expert AnalysisHS-PS4-426Student Expert AnalysisHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-4, HS-ESS2-4, HS-ESS2-7, HS-ESS2-7, HS-ESS2-7, HS-ESS2-4, HS-ES	4	The Ocean Over Time	HS-ESS3-1, HS-ESS3-4
6Explore the Sea FloorHS-PS4-57The Formation of the OceanHS-ESS1-5, HS-ESS2-1, HS-ESS2-1, HS-ESS2-4,8Seasons of ChangeHS-ESS2-1, HS-PS4-3, HS-ESS2-49The Sea Surface: The Great Heat DistributorHS-PS3-2, HS-ESS2-4, HS-ESS2-510Energy and the OceanHS-PS3-2, HS-PS3-2, HS-PS3-411Weather, Climate and the OceanHS-ESS2-212Voyage to the DeepHS-ESS2-213Photosynthesis in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-5,14Biodiversity in the OceanHS-LS1-5, HS-LS2-2, HS-LS2-2, HS-LS2-6, HS-LS2-515Marine PopulationsHS-ESS2-7, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-816Population ChangesHS-ESS2-6, HS-LS1-7, HS-LS2-2, HS-LS2-2, HS-LS2-3, HS-LS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-4, HS-ESS2-6, HS-LS1-7, HS-LS2-2, HS-LS2-6, HS-LS1-7, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS1-7, HS-LS2-2, HS-LS2-6, HS-LS1-7, HS-LS2-2, HS-LS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-2, HS-LS2-816Population ChangesHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-3, HS-LS1-120Marine Reptiles and birdsHS-LS1-3, HS-LS2-821Marine MammalsHS-LS1-4, HS-LS2-822Relationships in the SeaHS-LS1-423The Ocean's WavesHS-PS4-424A Time for TidesHS-ESS1-4, HS-ESS2-4, HS-ESS2-7, HS-ESS2-6, HS-ESS2-7, HS-ESS2-6, HS-ESS2-7, HS-ESS2-6, HS-ESS2-7, HS-ESS2-7, HS-ESS2-6, HS-ESS2-7, HS-ESS2-6, HS-ESS2-7, HS-ESS2-4, HS-ESS	5	Migrations in the Sea	HS-PS4-5, HS-PS4-2
7The Formation of the OceanHS-ESS1-5, HS-ESS2-1, HS-ESS2-1, HS-ESS2-1, HS-ESS2-4,8Seasons of ChangeHS-ESS2-1, HS-PS4-3, HS-ESS2-49The Sea Surface: The Great Heat DistributorHS-PS3-2, HS-PS3-2, HS-ESS2-4,10Energy and the OceanHS-PS3-2, HS-PS3-2, HS-PS3-411Weather, Climate and the OceanHS-ESS2-112Voyage to the DeepHS-ESS2-213Photosynthesis in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-4,14Biodiversity in the OceanHS-LS1-1, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-6, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-815Marine PopulationsHS-LS1-4, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-816Population ChangesHS-LS1-4, HS-LS2-1, HS-LS2-2, HS-LS2-2, HS-LS2-6, HS-LS2-817Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-2, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-4, HS-LS2-819Biology of FishesHS-LS1-4, HS-LS2-821Marine Reptiles and birdsHS-LS1-4, HS-LS2-822Relationships in the SeaHS-PS4-123The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-425Student Expert AnalysisHS-ESS2-1, HS-ESS2-4, HS-ESS2-7, HS-ESS2-7	6		HS-PS4-5
9The Set Surface: The Great Heat DistributorHS-PS3-2, HS-ESS2-4, HS-ESS2-510Energy and the OceanHS-PS3-1, HS-PS3-2, HS-PS3-411Weather, Climate and the OceanHS-ESS2-212Voyage to the DeepHS-ESS2-213Photosynthesis in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-5,14Biodiversity in the OceanHS-LS1-1, HS-LS1-215Marine PopulationsHS-LS1-4, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS- LS2-816Population ChangesHS-ESS2-7, HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS2-4, HS-LS2-3, HS-LS2-2, HS-LS2-3, HS-LS2-4, HS-LS2-3, HS-LS2-4, HS-LS2-3, HS-LS2-4, HS-LS2-7, HS-LS2-7, HS-LS2-4, HS-ESS2-6, HS- ETS1-1, HS-ESS2-4, HS-ESS2-6, HS- ETS1-1, HS-ESS2-4, HS-ESS3-6, HS- ETS1-1, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1,	7	The Formation of the Ocean	
Image: Section of the section of th	8	Seasons of Change	HS-ESS2-1, HS-PS4-3, HS-ESS2-4
1Weather, Climate and the OceanHS-ESS2-211Weather, Climate and the OceanHS-ESS2-212Voyage to the DeepHS-ESS2-213Photosynthesis in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-5.14Biodiversity in the OceanHS-LS1-1, HS-LS1-215Marine PopulationsHS-ESS2-7, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS- LS2-816Population ChangesHS-ESS2-7, HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS2-2, HS-LS2-3, HS-LS2-2, HS-LS2-6, HS-LS2-817Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-2, HS-LS2-3, HS-LS2-2, HS-LS2-318Introduction to Marine InvertebratesHS-LS1-119Biology of FishesHS-LS1-4, HS-LS2-820Marine Reptiles and birdsHS-LS1-4, HS-LS2-821Marine MammalsHS-LS1-4, HS-LS2-822Relationships in the SeaHS-PS4-123The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-225Student Expert ResearchHS-PS4-426Student Expert AnalysisHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-PS3-2, HS-ESS2-2, HS-ESS2-6, HS- ETS1-1, HS-ESS2-2, HS-ESS2-6, HS- ETS1-1, HS-ESS2-2, HS-ESS2-6, HS- ETS1-1, HS-ESS2-1, HS-ESS3-4, HS-ESS2-7,30Point source pollution - includes expanded oil spill investigationHS-ESS3-1, HS-ESS2-4, HS-ESS3-5, HS-ESS2-7, T33Changing ClimateHS-ESS3-6, HS-LS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	9	The Sea Surface: The Great Heat Distributor	HS-PS3-2, HS-ESS2-4, HS-ESS2-5
12Vayage to the DeepHS-ESS2-213Photosynthesis in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-5.14Biodiversity in the OceanHS-LS1-1, HS-LS1-215Marine PopulationsHS-ESS2-7, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-816Population ChangesHS-ESS2-7, HS-LS4-1, HS-LS4-2, HS-LS2-4, HS-LS2-4, HS-LS2-817Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-4, HS-LS2-821Marine Reptiles and birdsHS-LS1-3, HS-LS2-822Relationships in the SeaHS-LS1-4, HS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-225Animal Needs and Animal TrackingHS-PS4-427Student Expert ResearchHS-PS4-428Which Way to the SeaHS-PS4-429Nonpoint Source PollutionHS-ESS2-2, HS-ESS2-4, HS-ESS2-6, HS-ESS2-7,32The Ocean's ResourcesHS-PS4-133Changing ClimateHS-ESS3-4, HS-ESS3-5, HS-ESS2-7,34Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	10	Energy and the Ocean	HS-PS3-1, HS-PS3-2, HS-PS3-4
11Photosynthesis in the OceanHS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-5.13Photosynthesis in the OceanHS-LS1-1, HS-LS1-214Biodiversity in the OceanHS-LS1-4, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-815Marine PopulationsHS-ESS2-7, HS-LS4-1, HS-LS4-2, HS-LS2-6, HS-LS2-816Population ChangesHS-ESS2-6, HS-LS1-7, HS-LS4-3, HS-LS2-2, HS-LS2-6, HS-LS2-817Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-321Marine Reptiles and birdsHS-LS2-822Relationships in the SeaHS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-425Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source pollutionHS-ESS3-1, HS-ESS3-4, HS-ESS3-6, HS-ESS2-720Nonpoint Source pollution - includes expanded oil spill investigationHS-ESS3-1, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ESS3-4, HS-ESS3-5, HS-ESS2-733Changing ClimateHS-ESS3-6, HS-ESS3-6, HS-ESS3-7, HS-ESS3-5, HS-ESS3-7, HS-ESS3-6, HS-ESS3-7, HS-ESS	11	Weather, Climate and the Ocean	HS-ESS2-2
14Biodiversity in the OceanHS-LS1-1, HS-LS1-215Marine PopulationsHS-LS1-4, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS- LS2-816Population ChangesHS-ESS2-7, HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5, HS-LS3-3, HS-LS2-2, HS-LS2-817Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-3, HS-LS1-120Marine Reptiles and birdsHS-LS1-4, HS-LS2-821Marine MammalsHS-LS2-822Relationships in the SeaHS-LS2-823The Ocean's WavesHS-ESS1-424A Time for TidesHS-FS4-225Student Expert ResearchHS-FS4-426Student Expert AnalysisHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-ESS3-4, HS-ESS3-4, HS-ESS3-6, HS-ESS3-6, HS-ESS3-6, HS-ESS3-1, HS-LS2-631Humans and CoastlinesHS-ESS3-1, HS-ESS2-4, HS-ESS3-5, HS-ESS2-733Changing ClimateHS-ESS3-6, HS-ESS2-7, HS-ESS3-6, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-ESS3-6, HS-ESS2-7	12	Voyage to the Deep	HS-ESS2-2
15Marine PopulationsHS-LS1-4, HS-LS2-1, HS-LS2-2, HS-LS2-6, HS- LS2-816Population ChangesHS-ESS2-7, HS-LS4-1, HS-LS2-2, HS-LS4-3, HS-LS2-817Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS4-3, HS-LS2-2, HS-LS2-818Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-310Marine Reptiles and birdsHS-LS1-211Biology of FishesHS-LS1-312Marine ManmalsHS-LS1-313The Ocean's WavesHS-LS2-814A Time for TidesHS-ESS1-415Student Expert ResearchHS-PS4-116Student Expert ResearchHS-PS4-417Student Expert AnalysisHS-PS4-418Point source PollutionHS-ESS2-1, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ESS3-6, HS- ETS3-1, HS-ESS3-1, HS-LS2-71729Nonpoint Source Pollution - includes expanded oil spill investigation includes expanded oil spill investigation HS-ESS3-1, HS-ESS3-5, HS-ESS3-5, HS-ESS3-718Protecting Marine HabitatsHS-ESS3-6, HS-ESS2-7, HS-ESS3-5, HS-ESS3-5, HS-ESS3-5, HS-ESS3-5, HS-ESS3-1	13	Photosynthesis in the Ocean	HS-LS1-5, HS-LS2-5, HS-ESS2-4, HS-ESS2-5.
15Marine PopulationsIS2-816Population ChangesHS-ESS2-7, HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5, HS-LS3-3, HS-LS2-2, HS-LS2-8, HS-LS2-8, HS-LS1-7, HS-LS2-3, HS-LS2-417Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS1-320Marine Reptiles and birdsHS-LS1-421Marine MammalsHS-LS1-422Relationships in the SeaHS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-225Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-728Which Way to the SeaHS-ESS2-1, HS-ESS3-4, HS-ESS3-6, HS- includes expanded oil spill investigation HS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS3-6, HS-LS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	14	Biodiversity in the Ocean	HS-LS1-1, HS-LS1-2
16Population ChangesHS-LS4-4, HS-LS4-5, HS-LS3-3, HS-LS2-2, HS-LS2-817Food Webs in ActionHS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-418Introduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS4-3, HS-LS1-120Marine Reptiles and birdsHS-LS4-321Marine MammalsHS-LS1-4, HS-LS2-822Relationships in the SeaHS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-225Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-LS4-630Point source pollution - includes expanded oil spill investigation ETS1-1, HS-ETS1-2, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ESS3-5, HS-ESS2-7, 3233Changing ClimateHS-ESS2-1, HS-ESS2-4, HS-ESS3-5, HS-ESS2-7, HS-ESS3-4, HS-ESS3-5, HS-ESS2-7, HS-ESS3-4, HS-ESS3-5, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-6	15	Marine Populations	
IsIntroduction to Marine InvertebratesHS-LS1-219Biology of FishesHS-LS4-3, HS-LS1-120Marine Reptiles and birdsHS-LS4-321Marine Reptiles and birdsHS-LS2-822Relationships in the SeaHS-LS2-823The Ocean's WavesHS-FS4-124A Time for TidesHS-FS4-225Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-FS4-427Student Expert AnalysisHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-131Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	16	Population Changes	HS-LS4-4, HS-LS4-5, HS-LS3-3, HS-LS2-2,
10Information for historia for the formation19Biology of FishesHS-LS4-3, HS-LS1-120Marine Reptiles and birdsHS-LS4-321Marine MammalsHS-LS1-4, HS-LS2-822Relationships in the SeaHS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-225Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS3-6, HS-LS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	17	Food Webs in Action	HS-ESS2-6, HS-LS1-7, HS-LS2-3, HS-LS2-4
20Marine Reptiles and birdsHS-LS4-321Marine MammalsHS-LS1-4, HS-LS2-822Relationships in the SeaHS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-ESS1-425Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-1, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-132The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS3-6, HS-LS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	18	Introduction to Marine Invertebrates	HS-LS1-2
11Marine MammalsHS-LS1-4, HS-LS2-812Relationships in the SeaHS-LS2-813The Ocean's WavesHS-PS4-114A Time for TidesHS-ESS1-415Animal Needs and Animal TrackingHS-PS4-216Student Expert ResearchHS-PS4-417Student Expert AnalysisHS-PS4-418Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-719Nonpoint Source PollutionHS-LS4-611Humans and CoastlinesHS-ESS3-1, HS-LS2-713Changing ClimateHS-ESS2-1, HS-ESS2-4, HS-ESS3-5, HS-ESS2-714Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	19	Biology of Fishes	HS-LS4-3, HS-LS1-1
22Relationships in the SeaHS-LS2-823The Ocean's WavesHS-PS4-124A Time for TidesHS-PS4-125Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS3-6, HS-LS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	20	Marine Reptiles and birds	HS-LS4-3
12Interformation23The Ocean's WavesHS-PS4-124A Time for TidesHS-ESS1-425Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-132The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS3-6, HS-LS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	21	Marine Mammals	HS-LS1-4, HS-LS2-8
11111111124A Time for TidesHS-ESS1-425Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-132The Ocean's ResourcesHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-7 734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	22	Relationships in the Sea	HS-LS2-8
Animal Needs and Animal TrackingHS-PS4-226Student Expert ResearchHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ESS3-2, HS-ESS3-6, HS- ETS1-1, HS-ESS3-1, HS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-1, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-132The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS3-6, HS-LS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	23	The Ocean's Waves	HS-PS4-1
11Initial Protecting Marine Habitats12Finder Protecting Marine Habitats12Noncoint Source Pollution13HS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-714Protecting Marine Habitats15HS-ESS2-1, HS-ESS2-2, HS-ESS3-6, HS-ESS3-6, HS-ESS3-6, HS-ESS3-1, HS-ESS3-4, HS-ESS3-6, HS-ESS1-6, HS-ESS3-1, HS-ESS3-1, HS-ESS3-6, HS-ESS1-6, HS-ESS3-1, HS-ESS3-2, HS-ESS3-2, HS-ESS3-2, HS-ESS3-2, HS-ESS3-2, HS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS-ESS3-1, HS-ESS3-2, HS-ESS3-5, HS-ESS2-7, T	24	A Time for Tides	HS-ESS1-4
10Difference Expert AnalysisHS-PS4-427Student Expert AnalysisHS-PS4-428Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-7 734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	25	Animal Needs and Animal Tracking	HS-PS4-2
28Which Way to the SeaHS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-729Nonpoint Source PollutionHS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	26	Student Expert Research	HS-PS4-4
29Nonpoint Source PollutionHS-LS4-630Point source pollution - includes expanded oil spill investigationHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	27	Student Expert Analysis	HS-PS4-4
30Point source pollution - includes expanded oil spill investigationHS-ESS3-2, HS-ESS3-4, HS-ESS3-6, HS- ETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	28	Which Way to the Sea	HS-ESS2-1, HS-ESS2-2, HS-ESS1-6, HS-ESS2-7
30includes expanded oil spill investigationETS1-1, HS-ETS1-2, HS-ETS1-3, HS-LS4-631Humans and CoastlinesHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	29	Nonpoint Source Pollution	HS-LS4-6
31Humans and CoastlinesHS-ESS3-1, HS-LS2-732The Ocean's ResourcesHS-ESS3-133Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	30	▲	
33Changing ClimateHS-ESS2-2, HS-ESS2-4, HS-ESS3-5, HS-ESS2-734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	31		
33Changing Climate734Protecting Marine HabitatsHS-ESS3-6, HS-LS2-7	32	The Ocean's Resources	HS-ESS3-1
	33	Changing Climate	
	34	Protecting Marine Habitats	HS-ESS3-6, HS-LS2-7 © 2013 U.S. Satellite Laboratory

Marine Science The Dynamic Ocean



Common Core State Standards

Marine Science: The Dynamic Ocean meets ALL of the English Language Arts Standards in Science & Technical Subjects for Grades 9-10 and Grades 11-12.

Students engage with the text in various laboratory activities, Engineering Design Challenges, and reading and writing assignments which facilitate deep understanding. For example, students

- engage in close readings of science and technical text while learning precise details of various authentic elements of marine science.
- determine central ideas and conclusions of the text through applications of content in activities, active discussions, labs, group work, etc.
- follow precise procedures in experiments with properties of water, heat transfer, and more.
- use specific symbols and terms in the appropriate scientific context throughout the text.
- identify the close relationships between key terms and concepts used to describe concepts and analyze how ideas are structured in the text based on their relationships.
- discuss and analyze the purpose of the text through activities that require justification and explanation of concepts.
- use charts, graphs, and diagrams to communicate data regarding movement of marine animals and their environments.
- apply reasoning skills when assessing evidence presented for solving problems related to marine pollution, for example.
- compare data generated through experimentation to findings presented by the authors.
- integrate ideas from various sources when addressing questions.
- verify and analyze data on climate change when justifying their position.