Unit 08: Sustainability of the Marine Environment

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **4 weeks**
Status: **Published**

Brief Summary of Unit

Students will learn about the different sources and forms of marine pollution and its effects on marine life and ecosystems. Students will learn how their actions add to these problems. Students will learn who is fighting to save our seas and how they can help. Students will also better understand the effects that pollution (toxic chemicals, sewage, and litter) has on marine environments. Students will study the ocean as a renewable natural resource and investigate modern methods of harvesting ocean resources. The class will explore the need for better conservation of the oceans and focus on mitigating the impacts of climate change.

June 2024

Essential Questions

Essential Questions:

How are federal regulations helping to control the sustainability of our marine resources?

What global efforts have been made to preserve our oceans?

What are the effects of marine pollution on coral reefs and other marine environments?

How has the fishing industry changed over the decades?

What causes climate change?

How does Climate Change impact different Marine Ecosystems and processes?

Enduring Understandings:

Marine pollution has a major impact on the biodiversity of the worlds oceans

Coral reefs are a vital ecosystem and are especially vulnerable to pollution and climate change

Overfishing is having a major impact on the biodiversity of the worlds oceans

Climate change will cause large-scale lasting impacts on a wide variety of marine ecosystems and organisms

Students Will Know / Students Will Be Skilled At

Students will know how they as individuals can help reduce ocean pollution.

Students will know how the current fishing regulations help maintain ocean resources and sustainability.

Students will know the sources and impacts of greenhouse gases

Students will be skilled at describing how ocean debris and pollution affect marine life.

Students will be skilled at the sustainability of our oceans by defining the following key terms: biomagnification, effluent, biodegradable, point-source pollution, sludge, thermal pollution, and turbidity.

Students will be skilled at differentiating between point and nonpoint source pollution, and name examples of each.

Students will be skilled at identifying major concerns that climate change poses to marine ecosystems and organisms

Learning Plan

Meaningful participation in guided question/answer sessions, individual/group discussions, demonstrating an understanding of the purpose of the unit lesson(s), key terms, and concepts.

Presentation on Fisheries Management, NJ Fish and Wildlife, Aquaculture, Cyanide Fishing, ecosystems and sustainability, possession, catch limits, and size restrictions.

Preview the essential questions, provide answers, and connect to learning throughout the unit.

Google Slides Presentation: Marine Debris: Pollution in Our Oceans.

Google Slides Presentation: Bioaccumulation and Biomagnifications - the Effect of Pesticides on the Oceans.

Demonstrate point, non-point pollution and watersheds.

Research local and global activist organizations and write a letter to an elected official urging them to protect our oceans.

Learn how their trash contributes to marine pollution and devise a local plan to help stop this pollution.

Learn about pesticides and bioaccumulation and biomagnification in various ways depending on previous knowledge and expertise in the area.

Research different activist organizations currently active in the fight against marine pollution.

NASA Website Research Assignment: Identifying the sources, causes, evidence and impacts of climate change on oceanic and planetary processes.

Evidence / Performance Tasks

Formative Assessments:

Worksheets

Do Nows

Exit Tickets

Class Discussions

Complete daily classwork and regular homework assignments related to the identification of concepts learned in the natural setting, vocabulary, problem solving, and critical thinking.

Quiz on the types, uses and disposal protocol of solid wastes, how to keep them out of the waste stream, and recycling protocol.

Review current NJ Fish, Game, and Wildlife marine resource regulations.

Discussion: how one person can make a difference in environmental activism.

Debate: Is the ocean in trouble, and what should we do about it?

Summative:

Unit test topics: marine pollution sources, biomagnification, ocean acidification and impacts of climate change on marine ecosystems

Bench Marks:

Midterm / Final Exam

Alternative:

Create a new law or regulation for NJ Fish, Game, and Wildlife, create a solution to plastic pollution by building a model, drawing a blueprint, or making a presentation.

Materials

Textbook, *Essentials of Oceanography (13th Ed.), Trujillo and Thurman and ancillary materials*

Earth Science, Merrill, and ancillary resource materials

Earth Science, Prentice-Hall, and ancillary resource materials

Environmental Science, Wiley

quantitative/qualitative lab equipment for activities, experiments

related oceanography maps, ocean current charts

Informational & interactive Websites: noaa.gov and nasa.gov

Standards

L.SS.11–12.1	Demonstrate command of the system and structure of the English language when writing or speaking.
S.ID.A	Summarize, represent, and interpret data on a single count or measurement variable
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
L.KL.11–12.2	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
S.ID.B	Summarize, represent, and interpret data on two categorical and quantitative variables
	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
L.VL.11–12.3	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, including technical meanings, choosing flexibly from a range of strategies.
9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
S.IC	Making Inferences and Justifying Conclusions
S.IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies
RL.CR.11–12.1	Accurately cite strong and thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what a literary text says

	explicitly and inferentially, as well as interpretations of the text; this may include determining where the text leaves matters uncertain.
RI.CR.11–12.1	Accurately cite a range of thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text.
	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
RI.TS.11–12.4	Evaluate the author's choices concerning structure and the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.
	Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems, and inform the decision-making.
	Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.
W.AW.11–12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
	Accurate information may help in making valuable and ethical choices.
W.IW.11–12.2	Write informative/explanatory texts (including the narration of historical events, scientific procedures/experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.
	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.
W.WR.11–12.5	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
SL.PE.11–12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
SL.II.11–12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
SL.ES.11–12.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
SL.UM.11–12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect 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-LS2-3	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-LS2-5	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-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
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.
HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
HS-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
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.
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems

and how those relationships are being modified due to human activity (i.e., climate change).

Suggested Strategies for Modification

https://docs.google.com/spreadsheets/d/1BoXlgGboaurkHWyNqQpnIzl77z6Lb7Dg_ExD7n7FQJw/edit?usp=sharing

Additional modifications may be made based on individual needs of students as stated in student IEP (Individualized Education Program) documentation and as observed by the teacher:

Student directed research/presentation (power point, skit, demonstration) - Recent Scientific Contributions.

Design your own lab experiment

modified tests

cooperative learning groups

one-to-one instruction and assistance

additional time on task

alternative outcome options

individualized student assessment

preferential seating

handouts of class materials

guided notes

visual aides

computer web search