Winslow Township School District

Marine Biology CP (Semester Course)

Unit 3: Marine Ecology

Overview: In this unit, students will learn about marine ecology: the interactions between the living and nonliving components of a habitat. They will have a basic introduction to ecology with examples from marine environments: populations, communities, food webs, and nutrient cycling while delineating the major marine lifestyles. Students will then learn about specific marine ecosystems: estuaries, continental shelves, coral reefs, the pelagic, and the deep ocean. They will cover the major abiotic factors that define these habitats, and highlight the unique communities living there.

Overview	Standards for Science	Unit Focus	Essential Questions
Unit 3 **Marine Ecology**	• **HS-ESS3-4** • **HS-LS2-4** • **HS-LS2-6** • **HS-ESS3-1** • **WIDA 1, 4**	• Compare and contrast the various marine ecosystems • Identify major abiotic and biotic factors that determine a specific marine ecosystem • Explain the human impact on the various marine ecosystems • Identify various parts of the world where the marine ecosystems can be found	• How do organisms in each marine ecosystem depend on one-another? • How has co-evolution influenced interactions among organisms in the marine environment?

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Unit 3: Enduring Understandings	• Both abiotic and biotic factors affect the structure and organization of a marine community. • Marine scientists categorize marine communities based on where and how organisms live. • The flow of energy and matter through an ecosystem can be traced through trophic relationships as well as nutrient cycles. • Organisms that live in the intertidal zone are well adapted to the harsh conditions found in this environment. • Zonation of organisms living in the rocky intertidal is determined by both physical and biological factors. • The four main types of estuaries are categorized by how they formed. • Estuaries have wide fluctuations in salinity and dissolved oxygen, and contain various types of sediments. • Estuaries provide many important functions, both to the marine environment and to humans, which are lost when humans impact estuaries by dredging or filling them. • The subtidal zone consists of the sea floor from the low tide level to the outer edge of the continental shelf. • Two types of hard-bottom subtidal communities are submerged rocky bottoms and kelp forests. • Cnidarians and other organisms, such as encrusting coralline algae, build coral reefs in shallow, warm waters. • Coral reefs are productive and diverse ecosystems where inhabitants interact with each other and with their environment in complex ways. • Plankton and nekton are the two overarching categories of organisms found in the epipelagic. • Epipelagic food webs are an important part of how matter and energy flow through the ocean. • Organisms in the mesopelagic must deal with extremely low light conditions as well as a limited food supply. • Despite living in the deepest parts of the ocean, there is a surprisingly high biodiversity in the deep-sea benthos.	• How do the physical features of marine environments determine where organisms can be found? • How are marine communities organized? • In what ways do we depend on the oceans for our current needs and ways of life? • How has the human race negatively impacted the marine environment? • What is the best way for us (humans) to conserve/preserve marine natural resources? • How should (human) communities along the coast deal with the constant threat of weather and water? • What is the appropriate role of government in protecting marine environments? • How can/should individuals influence meaningful change for our Marine ecosystems?

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Curriculum Unit 3	Standards		Pacing	
			Days	Unit Days
Unit 3: Marine Ecology	**HS-ESS3-4**	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.	7	28
	HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	5	
	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.	8	
	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.	6	
	Assessment, Re-teach and Extension		2	

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Unit 3 - Marine Biology CP		
Disciplinary Core Ideas	**Indicator #**	**Indicator**
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems • Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4) **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2), (HS-LS2-6) **ESS3.B: Natural Hazards** • Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1) **ESS3.C: Human Impacts on Earth Systems** • Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste & that preclude ecosystem degradation. (HS-ESS3-4)	**HS-ESS3-4**	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
	HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
	HS-LS2-6	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-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.

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Unit 3 – Marine Biology CP	
Assessment Plan	
• Exploratory activities • Warm-up/Ticket Out activities • Class discussions • Student Participation • Teacher Observations • Virtual/Hands-On Labs • Self-Test Assessments • Scientist Timeline Activity	• Quizzes and Tests (Chapters 12-18, "Marine Science" by Castro and Huber, 2nd edition) • Authentic assessments and projects • Exploratory activities • Presentations • Lecture Notes • Think-Pair-Share • Graphic Organizers • Study Questions at the end of each chapter • Multiple Choice and Critical Thinking at the end of each chapter
Resources	**Activities**
•Chromebooks •Textbook ("Marine Science, 2nd edition" Castro and Huber) •www.My.mheducation.com •Web Quests •Virtual Field Trips •Video Streaming •BrainPOP •Puzzlemaker: Game Based Learning | Discovery Education Diversity, Equity & Inclusion Educational Resources https://www.nj.gov/education/standards/dei/	• Use various forms of expository writing-procedural writing, narrative writing, descriptive writing, labeling, as well as to create visuals, graphs, tables, diagrams and charts. • Use scientific argumentation with exercises on writing claims, using evidence to support your claim and explaining the reasoning behind their claim. • Mini-lessons • Independent reading • Films • Website exploration • Discussions, dialogues • Debates • Laboratory experiments • Partner or small group work • Student presentations, reports, journals, reflections • In-class assessments • Written reports, essays, research, and homework

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Instructional Best Practices and Exemplars	
1. Identifying similarities and differences 2. Summarizing and note taking 3. Reinforcing effort and providing recognition 4. Homework and practice 5. Nonlinguistic representations	6. Cooperative learning 7. Setting objectives and providing feedback 8. Generating and testing hypotheses 9. Cues, questions, and advance organizers 10. Manage response rates

9.1 Personal Financial Literacy, 9.2 Career Awareness, Exploration, Preparation and Training & 9.4 Life Literacies and Key Skills

The implementation of the 21st Century skills and standards for students of the Winslow Township District is infused in an interdisciplinary format in a variety of curriculum areas that include, English language Arts, Mathematics, School Guidance, Social Studies, Technology, Visual and Performing Arts, Science, Physical Education and Health, and World Language.

Additional opportunities to address 9.1, 9.2 & 9.4:

Philadelphia Mint

https://www.usmint.gov/learn/kids/resources/educational-standards

Different ways to teach Financial Literacy.

https://www.makeuseof.com/tag/10-interactive-financial-websites-teach-kids-money-management-skills/

- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
- 9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5)
- 9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 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).

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Modifications for Special Education/504
Students with special needs: The students' needs will be addressed on an individual and grade level using a variety of modalities. Accommodations will be made for those students who need extra time to complete assignment. Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered. • Small group instruction • Audio books/ Text-to-speech platforms • Leveled texts/Vocabulary Readers • Leveled informational texts via online • Modeling and guided practice • Read directions aloud • Repeat, rephrase and clarify directions • Extended time as needed • Break down assignments into smaller units • Provide shortened assignments • Modify testing format • Repeat directions as needed • Graphic organizers • Study Guides, Study Aids and Re teaching as needed

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Modifications for At-Risk Students
Formative and summative data will be used to monitor student success. At first signs of failure, student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations • Audio books and Text-to-speech platforms • Leveled texts/Vocabulary Readers • Leveled informational texts via online • Extended time as needed • Read directions aloud • Assist with organization • Use of computer • Emphasize/highlight key concepts • Recognize success • Provide timelines for work completion • Break down multi-step tasks into smaller chunks • Provide copy of class notes and graphic organizer

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English Language Learners	Modifications for Gifted Students

All WIDA Can Do Descriptors can be found at this link:
https://wida.wisc.edu/teach/can-do/descriptors
Grades 9-12 WIDA Can Do Descriptors...
Listening…
• Process recounts by…
  ○ Categorizing perspectives of multiple speakers
  ○ Identifying important information on specific event & concept from lecture/presentation
• Process explanations by…
  ○ Recognizing specific language used to enhance clarity and precision
  ○ Recognizing and following language related to the same event or phenomenon throughout presentations
• Process arguments by…
  ○ Identifying strengths, limitations, and potential biases from oral presentations
  ○ Organizing claims and counter claims presented in debates
Speaking…
• Recount by…
  ○ Adjusting presentation style, degree of formality, word choice, tone, and information to the context and audience
  ○ Presenting information that follows discipline specific organization (e.g., orientation to topic, sequence of events, conclusion)
• Explain by…
  ○ Providing precision and accuracy in classifications, procedures, processes, and accounts using abstraction, technical language, and a variety of active/passive verb forms
  ○ Following discipline-specific organization (e.g., orienting the reader, details, conclusion) and supporting presentations with graphs, formulas, quotes or other media
• Argue by…
  ○ Organizing claims and counter claims in debates with evidence from multiple sources
  ○ Negotiating differing cultural perspectives in pairs or small groups
Reading…
• Process recounts by…
  ○ Analyzing and comparing how authors use language for specific purposes and audiences
  ○ Identifying how authors develop and maintain cohesion by connecting ideas or events in extended texts
• Process explanations by…
  ○ Recognizing discipline-specific patterns (e.g., orienting the reader, part-whole classification, neutral/ authoritative tone)
	Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic.
	• Raise levels of intellectual demands
	• Require higher order thinking, communication, and leadership skills
	• Differentiate content, process, or product according to student's readiness, interests, and/or learning styles
	• Provide higher level texts
	• Expand use of open-ended, abstract questions
	• Critical and creative thinking activities that provide an emphasis on research and in-depth study
	• Enrichment Activities/Project-Based Learning/ Independent Study
	
	Additional Strategies may be located at the links:
	❖ Gifted Programming Standards
	❖ Webb's Depth of Knowledge Levels and/or Revised Bloom's Taxonomy
	❖ REVISED Bloom's Taxonomy Action Verbs

- Identifying authors' precision and accuracy in classifications, comparisons, accounts, or procedures as a result of clear language choices

- Process arguments by…
  - Evaluating word choice and nuance as tools for distinguishing facts, claims, reasoned judgment, and opinions
  - Identifying the logical connections among claims, counterclaims, reasons, and evidence

Writing…

- Recount by…
  - Summarizing content-related notes from lectures or readings
  - Producing research reports using multiple sources of information
- Explain by…
  - Developing ideas about phenomena with relevant and sufficient facts, extended descriptions, concrete details, or quotations
  - Maintaining discipline-specific patterns that bridge across key uses (e.g., explanation to argument in history, explanation to recount for information reports)
- Argue by…
  - Evaluating positive and negative implications associated with various positions (e.g., historical events, scientific discoveries, individuals)
  - Organizing information logically and coherently to represent contrasting views

Oral Language…

- Discuss by…
  - Identifying and reacting to subtle differences in speech and register (e.g., hyperbole, satire, comedy)
  - Producing coherent oral discourse appropriate to task, purpose, and audience
  - Synthesizing and sharing information from a variety of sources and perspectives

Students will be provided with accommodations and modifications that may include:

- Relate to and identify commonalities in Social Studies and science in student's home country
- Assist with organization
- Use of computer
- Emphasize/highlight key concepts
- Teacher Modeling
- Peer Modeling
- Label Classroom Materials - Word Walls

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Interdisciplinary Connections

English Language Arts/Literacy

1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.1** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6)
2. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.7** (HS-LS2-6)
3. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.8** (HS-LS2-6)
4. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.11-12.9** (HS-ETS1-1),(HS-ETS1-3)
5. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.2** (HS-LS2-1),(HS-LS2-2)
6. 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. **WHST.9-12.7** (HS-LS1-3)
7. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **WHST.11-12.8** (HS-LS1-3)
8. Draw evidence from informational texts to support analysis, reflection, and research. **WHST.9-12.9** (HS-LS1-1)
9. **WIDA Standards 1** English language learners communicate for social and instructional purposes within the school setting
10. **WIDA Standards 4** English language learners communicate information, ideas, and concepts necessary for academic success in the content area of science
11. 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. **SL.11-12.5** (HS-LS1-2)

Mathematics

1. Reason abstractly and quantitatively. **MP.2** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6)
2. Model with mathematics. **MP.4 (**HS-LS2-1),(HS-LS2-2)
3. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays**. HSN.Q.A.1** (HS-LS2-1),(HS-LS2-2)
4. Define appropriate quantities for the purpose of descriptive modeling. **HSN.Q.A.2** (HS-LS2-1),(HS-LS2-2)
5. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSN.Q.A.3** (HS-LS2-1),(HS-LS2-2)
6. Represent data with plots on the real number line. HSS-ID.A.1 (HS-LS2-6)
7. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **HSS-IC.A.1** (HS-LS2-6)

Integration of Computer Science and Design Thinking NJSLS 8

- 8.2.12.EC.2: Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded.
- 8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
- 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
- 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.
- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
- 8.2.12.ED.6: Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
- 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.