## Southern Cayuga Central School District – Curriculum Map

Subject: Marine Science

School Year: 2023-2024

Title or Topics	Essential Questions & Vocabulary	Content Skills	Major Assessments	Time
w/ NYS Standards		(Activities to cover Essential	(Tests, Project, etc.)	Frame
		Questions)		
Unit 1: Chemistry of	1. Compare and Contrast the heating cooling of	Demonstration: Warm and	Lab: Freezing, Melting, and	6 Weeks
Water	freshwater and salt water.	Cold Water	Boiling	
	2. Determine whether substances will float or sink in	Activity: SST Maps	Lab: Floating and Sinking	
HS-PS1-3	water based on densities	Demonstration: Investigating	Lab: Solutions	
HS-PS1-4	3. Properties that affect marine organisms.	Warm and Cold Water	Lab: Investigating Surface	
HS-PS1-5	4. Describe the structure of the water molecule and	Demonstration: Ocean	Tension	
HS-PS3-1	relate its structure to water's unique properties.	Supports Life	Lab: Investigating Heat Flow	
	5. Explain the sources of salt in sea water.	Video: Water Molecules		
	6. Explain how the properties of water affect marine organisms.			
	7. Indicate that energy in the ocean is distributed through currents.			
	8. Identify sea surface temperature (SST) and ocean currents from satellite imagery.			
	9. Explain how Earth's Ocean basins are interconnected through the flow of currents.			
	10. Explain concept of heat capacity and the role of			
	the ocean in moderating Earth's climate.			
	systems.			
	12. Demonstrate the Law of Conservation of Energy in			
	various scenarios of energy transformation.			
	<u>Vocabulary:</u>			
	Atom, molecule, bond, hydrogen bonding, density,			
	solution, solubility, brackish, estuaries, erosion,			
	osmosis, isolines, radiometer, buoy, current,			
	convection, radiation, heat capacity,			

Unit 2: Ecosystems	1.	Recognize that the ocean is not a uniform body of	Activity: Marine Ecosystems	Lab: Modeling Changes in	6 Weeks
		water.	Activity: The Ocean in History	Water Temperature	
HS-LS2-6	2.	Cite examples of diverse marine ecosystems and	Activity: Investigating Marine	Lab: Study CTD Data	
HS-LS2-7		their locations on Earth	Algae		
	3.	Characterize ecosystem components as abiotic	Activity: Plotting Animal		
		and biotic factors and give examples of how they	Movements		
		influence one another.	Activity: Changes with Depth		
	4.	Describe the process of biological succession,			
		explaining that marine ecosystems undergo			
		natural, gradual changes over time.			
	5.	Discuss how humans affect marine ecosystems			
		both positively and negatively.			
	6.	Introduce wetlands as productive and highly			
		diverse marine ecosystems.			
	7.	Identify how humans have relied upon and			
		utilized the ocean for thousands of years.			
	8.	Investigate the many technologies and tools that			
		scientists use to make observations about marine			
		processes.			
	9.	Compare and contrast migratory movements of			
		different marine animals			
	10	. Utilize mapping and plotting skills by plotting			
		sample animal movement data.			
	11	. Relate satellite tagging of marine animals to			
		principles of the nature of science.			
	12	. Explain how pressure, temperature, density,			
		salinity, and light change with increasing depth.			
	13	. Describe the characteristics of some animals that			
		allow them to cope with changes in pressure,			
		temperature, density, salinity, and light.			
	Vo	cabulary:			
	Bio	ological community, ecosystem, organism,			
	su	ccession, latitude, longitude, uplink, downlink,			
	sa	tellite, remote sensing,			

Unit 3:	1. Analyze bathymetric images and identify seafloor	Activity: Exploring Oceanic	Lab: Classroom Model of	3 weeks
Oceanography	features.	Evidence for Plate Tectonics	the Ocean Floor	
	2. Describe how scientists map the ocean floor.	Video: Plate Tectonics	Lab: SONAR	
HS-ESS1-5	3. Create a model of seafloor features.	Video: Tsunamis		
HS-ESS2-1	4. Explain the theory of plate tectonics by describing			
HS-ESS2-5	the process 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.			
	5. Use the development of the Theory of Plate			
	Tectonics to discuss how scientific ideas and			
	research evolve into a unified theory.			
	6. Identify the major layers of the Earth.			
	<u>Vocabulary:</u>			
	continental slope, mid-ocean huge, seamount,			
	shelf continental rise plate tectonics subduction			
	convection bathymetry			

Unit 4: Weather and	1.	Explain seasonal changes on Earth in terms of the	Demonstration: Modeling the	Cyber Lab: Investigating	3 weeks
the Ocean		intensity of solar radiation energy and the Earth's	Seasons	Hurricane Data	
		tilt, and understand that Earth's slightly varying	Demonstration: It's all about	Cyber Lab: Air Temperature	
HS-PS4-1		distance from the Sun has nothing to do with the	the Rays	and Water Vapor	
HS-ESS1-1		cause of the seasons.	Activity: The Sun's Rays	Project: Hurricane PSA	
	2.	Illustrate how the angle of insolation relates to	Activity: Analyzing Weather		
		differential heating of the Earth's surface.	and Climate		
	3.	Differentiate between types of incoming solar	Demonstration: Human Wave		
		radiation.	Activity: Wind and Waves		
	4.	Give examples of how marine mammals respond	Activity: A Problem to Solve		
		to seasonal cues.	Activity: Analyzing Tides in		
	5.	Explain how energy and water are transferred	Three Locations		
		from the ocean to the atmosphere through the			
		formation of air masses and tropical weather			
		systems.			
	6.	Describe how air masses, the water cycle, air			
		pressure, and wind contribute to hurricane			
		formation.			
	7.	Give examples of the ocean's influence on			
		weather and climate.			
	8.	Describe how seabirds can be affected by wind			
		patterns.			
	9.	Analyze the characteristics of waves using			
	10	mathematical calculations.			
	10	. Determine the factors that influence wave neight			
	11	and wave speed.			
		nower plant			
	12	Power plant.			
	12	gravitational forces of the Earth Sun and Moon			
	12	Distinguish between tides currents and waves			
	1/	Give examples of how tides affect marine			
	1-1	organisms			
		or Barnon of			
	Vc	ocabularv:			
	So	lar radiation, albedo, differential heating. climate.			
	fro	ont, leeward, wave, spring tide, neap tide. surf			
	zo	ne, rip current			

Unit 5: Plant Life	1. Identify the reactants and products of	Demonstration: Observing	Cyberlab: Virtual Plankton	3 weeks
	photosynthesis and note the sources of the	Photosynthesis	Exploration	
HS-LS1-5	reactants in the ocean.	Activity: Water Samples	Lab: Local Plankton	
HS-LS1-7	2. Describe how carbon is cycled through Earth's		Exploration	
	spheres.			
	3. Analyze chlorophyll imagery, looking for evidence			
	of blooms of phytoplankton that contribute to			
	the food sources of marine animals.			
	4. Discuss the importance of biodiversity and			
	provide examples of diverse organisms in the			
	ocean.			
	5. Describe the system of classification used by			
	6 Classify organisms based on their characteristics			
	7 Analyze the similarities and differences between			
	major groups of organisms.			
	8. Explain how the structures of marine organisms			
	support their functions.			
	9. Identify the characteristics that all living things			
	share.			
	<u>Vocabulary:</u>			
	Autotroph, photosynthesis, phytoplankton,			
	cyanobacteria, ozone, chloroplast, decompose,			
	biodiversity, population, genetic diversity, plankton,			
	nekton, halophile, methanogen, thermophile,			
	chemosynthesis			

Unit 6: Populations	1.	Explain the concepts of carrying capacity and	Activity: Analyzing Marine	Cyberlab: The Arctic Food	4 weeks
		population density.	Populations	Web	
HS-LS2-1	2.	Identify the factors that increase or decrease	Activity: Researching	Cyberlab: Oxygen in the	
HS-LS2-2		population sizes and analyze changes in animal	Endangered Species	Water	
HS-LS2-4		populations.	Activity: Modeling Changes		
	3.	Describe the importance of the Endangered	Over Time in Sea Stars		
		Species Act and give examples of species that are	Activity: Invasive Species		
		listed under the Act.	Awareness		
	4.	Explain how the process of natural selection	Activity: North Atlantic Right		
		influences the evolution of species.	Whales		
	5.	Determine how invasive species can result in	Activity: Marine Food Webs		
		biodiversity loss.			
	6.	Give examples of adaptations in diverse marine			
		ecosystems.			
	7.	Construct a sample marine food web.			
	8.	Describe the critical role of phytoplankton in			
		marine food webs.			
	9.	Make predictions about changes in food webs			
		that result from natural disruptions and human			
		activities. Explain why nutrient cycling is critical			
		within the Earth system.			
	10.	. Describe the relationship between water			
		temperature, and dissolved oxygen.			
	11.	. Explain the process of upwelling and relate the			
		process to atmospheric winds, ocean currents,			
		eddies, and bathymetry.			
	12.	. Identify areas of upwelling and eddies in sea			
		surface and phytoplankton satellite imagery			
	13.	. Relate the process of upwelling to the tracking of			
		marine animals.			
	<u>Vo</u>	<u>cabulary:</u>			
	Ро	pulation, carrying capacity, population density,			
	eve	olve, natural selection, species, mutation, fitness,			
	ada	aptation, speciation, producer, consumer,			
	he	terotroph, trophic level, decomposer			
					1

Unit 7: Animals	1.	Identify common organisms classified into the	Activity: Investigating the	Lab: Investigating Structure	6 weeks
		major invertebrate phyla.	Animal Kingdom	and Function in the Squid	
HS-LS1-3	2.	Give examples of how the structures of marine	Activity: Exploring the	Cyberlab: Lights at Night	
HS-LS1-2		invertebrates support their functions.	Structures and Function of	Cyberlab: Observing Marine	
HS-LS1-5	3.	Describe diverse strategies for obtaining food in	Marine Fishes	Mammal Behavior	
		the ocean.	Activity: Examining the	Lab: 6 Animal Dissections	
	4.	Analyze the internal and external anatomy of	Ranges of Marine Reptiles		
		common marine invertebrate.	and Birds		
	5.	Identify and analyze the external structures of	Activity: Identifying Individual		
		fish.	Whales		
	6.	Compare and contrast cartilaginous and bony	Activity: Symbiotic		
		fishes.	Relationships in the Ocean		
	7.	Give examples of adaptations of fish species in	Activity: Symbiosis Game		
		various marine ecosystems.			
	8.	Give the reasons for sharks' evolutionary success			
		over the last 450 million years.			
	9.	Compare and contrast the characteristics of			
		marine reptiles and birds.			
	10	. Give examples of adaptations that allow some			
		reptile and bird species to inhabit the ocean.			
	11	. Explain the adaptations that allow birds to be far			
		more far-ranging than reptiles.			
	12	. Observe and describe characteristics and			
		behaviors of marine mammals.			
	13	. Classify marine mammals into their major groups.			
	14	. Give examples of behaviors observed in marine			
		mammals.			
	15	. Describe ways in which marine biologists study			
		marine mammals.			
	16	. Describe examples of mutualism, parasitism, and			
		commensalism in the ocean.			
	17	. Consider the costs and benefits of diverse			
		reproductive strategies used by species.			
	Vo	cabulary:			
	M	orphology, physiology, anatomy, substrate, niche,			
	ve	rtebrate, ectoderms, cnidarians, amphibians,			
	ma	ammals			