

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

Course Description

The New Jersey Coastal Ecology course is intended to reinforce the concepts and ideas introduced in previous science courses and to introduce new information, which is socially relevant, challenging, and meaningful to the students. The subject matter is built around a central theme, *The New Jersey Coastal Environment*. As a result of an increased fascination with marine life and the increasing global trend of migration towards the coasts, more than half of Americans already live in coastal counties. Our coastal ecosystems are under strain as never before. Understanding the balance of these ecosystems and awareness of human impacts on the coast is crucial to the survival of these threatened ecosystems.

This course is intended to be student-centered with discussions and laboratory exercises, including various research activities. The units in this course are reinforced with field trips to coastal environments to apply information and techniques learned in the classroom. At least three field trips are recommended to coastal environments of New Jersey.

This course is aligned to the 2009 NJCCCS, was updated in June 2014, and was Board approved in August 2014.

21st Century Themes

The units throughout this course will integrate the 21st Century Life and Career Standard 9.1 strands A-D. These strands include: critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

Technology connections

For further clarification, refer to NJ Class Standard Introductions at www.njcccs.org.

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

Scope and Sequence for New Jersey Coastal Ecology

UNIT 1: An Introduction to Ecology (3 weeks)

- Ecological Terms: The Basics and Disciplines
- The Organization of Communities
- The Flow of Energy and Materials
- Bioaccumulation and Biomagnification
- Overview of Population Ecology

UNIT 2: Watersheds of New Jersey (2 weeks)

- Watershed Analysis of Crosswicks Creek
- New Egypt High School Rain Garden
- Trout in the Classroom

UNIT 3: Pinelands (4 weeks)

- Geology of New Jersey: History and Present
- New Jersey Physiographic Maps
- New Jersey Legislation and New Jersey Department of Environmental Protection
- Geologic Origins
- National and State Legislation
- Soil Ecology: Sandy, Nutrient Poor Soil
- Acidic Water and Kirkwood-Cohansey Aquifer
- Succession: Fire Ecology
- Herpetofauna (Reptiles and Amphibians of the Pines)
- Seasonality of Animals
- Human Influence on Pinelands

UNIT 4:

The Origin and Structure of the Ocean Basins (2 weeks)

- Creation of Sea Floor/Plate Tectonics
- Geological Provinces: Continental Margins: The Continental Shelf, The Continental Rise, Active and Passive Margins
- Deep Ocean Basins
- The Mid Ocean Ridge and Hydrothermal Vents

Physical Properties of Sea Water (1 week)

- Salinity
- Temperature
- Density
- Transparency
- Pressure

UNIT 5: New Jersey Coastal Ecology (2 weeks)

- Introduction to Atlantic Coastal Ecology
- Beaches, Dunes, and Barrier Islands of New Jersey
- Estuarine Ecosystems
- Human Influence on New Jersey's Coastline

UNIT 6: Biological Zonation and Marine Lifestyles (4 weeks)

- Benthic and Pelagic Zones
- Marine Descriptive Lifestyles: Plankton, Nekton, Benthos
- Life in the Epipelagic
- Multicellular Algae: The Seaweeds
- Marine Invertebrates and Vertebrates

UNIT 1 : An Introduction to Ecology

Enduring Understandings:

- 1.Explain how ecology pertains to everyday life.
- 2.Explain how ecologists build models to solve problems.
- 3.Discuss how essential elements to life are recycled on Earth.
- 4.Explain how populations increase in size and the factors that limit growth.
- 5.Identify ways in which people can act to protect the environment.

Concepts	Objectives	Core Activities/Simulations/Assessments	NJCCCS (CPI)
<p>1. Review of Ecological Terms and Models <u>Essential Questions:</u> What is ecology? What are the generic models of ecology to demonstrate energy flow?</p>	<ul style="list-style-type: none"> • Define ecology and explain why ecology is important • Distinguish between biotic and abiotic components of an ecosystem • Illustrate and define each of the ecological levels of organization • Identify the importance of models in the scientific process of ecology • Explain how energy flows through an ecosystem • Identify how the levels of a trophic level pyramid are organized 	<ul style="list-style-type: none"> • Activity: Creating a New Jersey Marine Food Web and Trophic Level Pyramid • Essay/Internet Activity: How can biomagnification influence your food web? 	<p>5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2</p>
<p>2. Biogeochemical Cycles <u>Essential Questions:</u> What are the biogeochemical cycles?</p>	<ul style="list-style-type: none"> • Describe how inorganic and organic material is recycled through biogeochemical cycles 	<ul style="list-style-type: none"> • Field trip to compose site, recycling center, and water treatment plant • Essay/Internet Activity: What does New Jersey recycle, and how do I find out more? 	
<p>3. Population Ecology <u>Essential Questions:</u> What is population ecology? Why do ecologists study populations? Why are ecologists concerned about the populations of the world? What are two ways to estimate population sizes?</p>	<ul style="list-style-type: none"> • Define population ecology • Compare the similarities and differences between the logistic model and the exponential model • Apply the Quadrat Technique and Peterson Technique 	<ul style="list-style-type: none"> • Graphing: world population using census data • Graphing: New Jersey population using census data • Lab: Duckweed Population Study • Lab: Peterson Technique 	
<p>4. Ecological Succession <u>Essential Questions:</u> How does ecological succession start with pioneer plants and end with a climax community? How can ecologists use the information from studying succession?</p>	<ul style="list-style-type: none"> • Define ecological succession • Apply ecological succession to a terrestrial environment and an aquatic environment 	<ul style="list-style-type: none"> • Activity: drawing and labeling an ecosystem from the pioneer organisms to the climax community • Field Trip: deserted farmland to observe succession • UNIT 1 TEST: Introduction to Ecology 	

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

UNIT 2: Watersheds of New Jersey

Enduring Understandings:

1. Identify the watersheds of New Jersey and the New Egypt's watershed address.
2. Understand the crucial importance of each of these environments and how they work together as a system to protect the water supply, both ground water and waterways.
3. Describe the human impacts on the watersheds of New Jersey and current legislation to protect them.
4. Conduct an actual biosurvey of a waterway.

Concepts	Objectives	Core Activities/Simulations	NJCCCS (CPI)
<p>1. Water Cycle and Water Pollution <u>Essential Questions:</u> What are the two generic types of water pollution? What is a watershed? What is New Egypt's watershed address?</p>	<ul style="list-style-type: none"> • Illustrate the water cycle • Identify groundwater sources in New Jersey • Define watershed • Differentiate between point source and non-point source pollution • Identify New Egypt's watershed address 	<ul style="list-style-type: none"> • Watershed graphing activity • Webquest: How's My Waterway? • Rain garden maintenance 	5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3
<p>2. Rain Garden <u>Essential Questions:</u> How are rain gardens used as a school and community?</p>	<ul style="list-style-type: none"> • Define rain garden • Describe the two overall functions of a rain garden • Identify the major steps of creating and maintaining a rain garden 		5.3.12.C.1-2 5.4.12.F.3
<p>3. Watershed Analysis of Crosswicks Creek <u>Essential Questions:</u> What is a biosurvey, and how are they used to diagnose water quality in a particular area?</p>	<ul style="list-style-type: none"> • Describe how a biosurvey is conducted • Students will understand the different components that make up a stream habitat and what makes a stream 'healthy' • Students will evaluate the stream health using the presence/absence of key macroinvertebrates 	<ul style="list-style-type: none"> • Lab: Macroinvertebrates and Stream Sampling • Walking field trip to Crosswicks Creek • UNIT 2 QUIZ: Watersheds 	5.4.12.G1.7

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

UNIT 3: Pinelands

Enduring Understandings:

1. Identify the distinguishing abiotic and biotic features of the New Jersey Pinelands.
2. Understand the crucial importance of each of these environments and how they work together as a system to create the New Jersey Pinelands.
3. Describe the human impacts on the Pinelands and current legislation to protect them.

Concepts	Objectives	Core Activities/Simulations/Assessments	NJCCCS (CPI)
<p>1. Geology of New Jersey <u>Essential Questions:</u> What are the physiographic provinces of New Jersey? How were the physiographic provinces created, and how are they different?</p>	<ul style="list-style-type: none"> • Identify the coastline and the physiographic provinces of New Jersey • Identify the various counties of New Jersey • Map and identify the various landscapes of New Jersey 	<ul style="list-style-type: none"> • Activity: creating a map of the counties, and features of New Jersey • Activity: creating a geologic map or timeline of the history of New Jersey 	5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2 5.4.12.B.1
<p>2. Overview and Legislation <u>Essential Questions:</u> What and where are the Pinelands of New Jersey? How has the state, federal government, and the United Nations protected the Pinelands of New Jersey?</p>	<ul style="list-style-type: none"> • Present an overview of the uniqueness of the Pinelands of New Jersey • Identify how the Pinelands were created through geological formations from the past • Locate the New Jersey Pinelands National Reserve, noting relative size and proximity to their communities and major metropolitan areas • Identify the state, national, and international legislation regarding the Pinelands • Discuss the purpose of the Pinelands Commission and the Pinelands Comprehensive Management Plan 	<ul style="list-style-type: none"> • Map: Pinelands National Reserve • Map: Pinelands Protection Area, Preservation Area, and Management Areas • Video: Pinelands a Region at Risk 	5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2 5.4.12.B.1 5.4.12.G.5-7

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

<p>3. Abiotic and Biotic Components Essential Questions: What are the defining characteristics of the Pinelands? How has the soil created a unique 17 trillion gallon aquifer in the Pinelands? How have plants and animals adapted to the conditions of the Pinelands?</p>	<ul style="list-style-type: none"> • Identify the Cohansey-Kirkwood Aquifer and describe its vital importance to the Pinelands • Differentiate between the two areas of vegetation within the Pinelands – the Lowlands and the Uplands • List the major factors that influence the kind of vegetation found in the Pinelands today including: porous sandy soil, acidic water, low nutrient levels, frequent fires, climate, and human activity • Describe the characteristics of Pinelands soil including gravel, sand, silt, and clay • Name and be able to identify the most common tree in the Pinelands – the Pitch Pine • List the major factors that influence the animals found in the Pinelands today • Examine how the conditions in the Pinelands have led to animal adaptations • Define the survival status that may be classified as “common,” “endangered,” or “threatened” 	<ul style="list-style-type: none"> • Lab: Percolation Rate of Soil in the Pines • Project: Pinelands Plant and Animal PowerPoint Presentations • Video: Pinelands up Close and Personal 	<p style="text-align: center;">5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2 5.4.12.B.1</p>
<p>4. Fire Ecology Essential Questions: How has fire throughout the centuries altered the normal succession of this place and in turn created the Pinelands? What are the adaptations that plants and animals have for fire? What would happen if there were no fires in New Jersey’s Pinelands? How has New Jersey’s “prescribed burns” protected people and property and in turn maintained the natural landscape of the Pinelands?</p>	<ul style="list-style-type: none"> • Identify the factors that make New Jersey’s Pinelands fire prone • Discuss the past and present of fire ecology (natural succession and fire succession) in the Pinelands • Describe and diagram the adaptations that pitch pine has developed in order to survive in a fire prone forest • Identify and describe the Pygmy Forest • Discuss the Adaptive Hypothesis of the Pygmy Forest 	<ul style="list-style-type: none"> • Lab: Serotiny of Pitch Pine Cones • Diagram: pitch pine tree fire adaptations • Essay/Internet Activities: Prescribed Fires in New Jersey’s Pinelands 	<p style="text-align: center;">5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2 5.4.12.B.1</p>

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

<p>5. Piney People and Culture <u>Essential Questions:</u> How are cranberries harvested, and why do they need to grow in the Pinelands? What were the early industries of the Pinelands?</p>	<ul style="list-style-type: none"> • Identify New Jersey as being 3rd in cranberry production and 2nd in blueberry production • Identify the factors required for cranberry production • Explore the legends and actual events associated with the names people gave to Pineland places, the seasonal cycle of Pinelands life, and how the rise and fall of the Pinelands population can be related to the changing influence of technology, available natural resources, and other social and economic factors 	<ul style="list-style-type: none"> • Essay/Internet Activity: Cranberry Bogs and Production in New Jersey • Essay/Internet Activity: Pinelands Industries of Past 	<p>5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3</p>
<p>6. A Region at Risk/Human Impact <u>Essential Questions:</u> How have the Pinelands become a Region at Risk? How has the Pinelands Commission regulated the management areas in the Pinelands? What is the future of the Pinelands?</p>	<ul style="list-style-type: none"> • Identify the reasons why the Pinelands are considered “A Region at Risk” 	<ul style="list-style-type: none"> • Video: Region at Risk • Essay/Internet Activity: The Future of the New Jersey Pinelands • UNIT 3 TEST: Pinelands 	<p>5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3</p>

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

UNIT 4: Oceanography			
Enduring Understandings: 1. Identify the origin and structure of the ocean basins. 2. Describe the process of sea floor spreading. 3. Illustrate the topography of the ocean floor. 4. Identify and explain the physical properties of sea water.			
Concepts	Objectives	Core Activities/Simulations/Assessments	NJCCCS (CPI)
1. Geography of the Ocean Basins <u>Essential Questions:</u> What are the five ocean basins?	<ul style="list-style-type: none"> • Identify the ocean’s resources • Identify the origin and structure of the ocean basins 	<ul style="list-style-type: none"> • Research ocean’s resources • Map of world oceans 	5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2
2. Creation of the Sea Floor <u>Essential Questions:</u> How have plate tectonics created the current continents and ocean basins? What is the largest geological feature on the planet? What are the two main geological provinces of the ocean?	<ul style="list-style-type: none"> • Relate the continental drift theory and plate tectonics to the formation of the sea floor • Identify the two main geological provinces of the ocean as the continental margin and the abyssal plain • Describe the process of sea floor spreading • Identify and illustrate geological features of the abyssal plain, including the mid-ocean ridge system, hydrothermal vents, seamounts, guyots, and faults 	<ul style="list-style-type: none"> • Map: geological features of continental margin and abyssal plain • Activity: drawing and interpreting a profile map of the ocean • Activity: locating shipwrecks in New Jersey • Essay/Internet Activity: life in the hydrothermal vent ecosystem • UNIT 4 QUIZ: Part 1 Origin and Structure of the Ocean Basins 	5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2 5.4.12.D.1
3. Physical Properties of Sea Water <u>Essential Questions:</u> How do temperature and salinity influence density? How has pressure limited the exploration of the deep ocean?	<ul style="list-style-type: none"> • Discuss the variations of the ocean’s salinity, density, temperature, pressure, and transparency • Describe how salinity and density affect the density of the ocean 	<ul style="list-style-type: none"> • Lab: How salinity and temperature both affect the density of water, using food coloring, ice, salt, and warm water • UNIT 4 QUIZ: Part 2 Physical Properties of Seawater 	

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

UNIT 5: New Jersey Coastal Ecology

Enduring Understandings:

1. Identify the distinguishing features of the New Jersey coastline, including barrier beaches, estuarine ecosystems, and wetlands.
2. Understand the crucial importance of each of these environments and how they work together as a system to create the New Jersey coastline.
3. Describe the human impacts on these environments and current legislation to protect them.

Concepts	Objectives	Core Activities/Simulations/Assessments	NJCCCS (CPI)
<p>1. Sandy Beach <u>Essential Questions:</u> What is a sandy beach?</p>	<ul style="list-style-type: none"> • Describe the factors that influence the zonation along a sandy beach • Identify the zones of sandy beach: offshore, nearshore, foreshore, and backshore 	<ul style="list-style-type: none"> • Lab: Measuring the Littoral Drift 	5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3 5.3.12.C.1-2 5.4.12.G.1,5 5.4.12.G.7
<p>2. Barrier Beaches of New Jersey <u>Essential Questions:</u> What is a barrier island? What are the barrier islands of New Jersey? Why are the sands of the barrier islands of New Jersey constantly shifting each summer and winter?</p>	<ul style="list-style-type: none"> • Define a barrier beach and identify its components • Describe the importance of barrier beaches • List New Jersey barrier beaches • Describe the annual shifting of sands along New Jersey coasts • Describe how humans have interacted with barrier beaches to stop the shifting sands • Analyze and identify sand samples taken from various zones along a barrier beach 	<ul style="list-style-type: none"> • Diagram: sandy beach zones • Diagram: a barrier beach • Lab: Sand Samples, <i>identifying the various minerals in New Jersey sand, and comparing different minerals sizes in various zones along the beach</i> • Essay/Internet Activity: Barrier Islands and Man, <i>Identify the longshore currents in New Jersey and explain in which direction the sand moves in the summer and winter. Can humans stop this natural process?</i> • Field Trip: Barnegat Lighthouse and Maritime Forest 	
<p>3. Estuarine Ecosystems <u>Essential Questions:</u> What are estuarine ecosystems? What abiotic factors influence these ecosystems? How are estuaries like nurseries? What are some estuarine ecosystems of New Jersey?</p>	<ul style="list-style-type: none"> • Identify the various estuarine ecosystems: estuaries, tidal flats, mudflats, sea grass beds, oyster beds, and salt marshes • Describe the abiotic factors that influence life in estuarine ecosystems • Discuss the importance of estuarine ecosystems 	<ul style="list-style-type: none"> • Activity: Life in the Estuary identification sheet, <i>identifying various organisms in the estuary</i> • Activity: The Estuary as a Nursery, <i>identifying various New Jersey organisms that start their lives in the estuary before they go to the ocean</i> 	

**Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology**

<p>4. Saltwater Wetlands <u>Essential Questions:</u> How do wetlands reduce pollution? Why are the wetlands crucial to the survival of our coastal ecosystems?</p>	<ul style="list-style-type: none"> • Identify the three factors that wetlands have in common • Describe how wetlands reduce pollution in coastal ecosystems • Compare and contrast point and non-point source pollution 	<ul style="list-style-type: none"> • Internet Activity: Estuary Live Broadcast, sponsored by Rutgers University • Field Trip: Wetlands Institute 	
<p>5. Human Impacts <u>Essential Questions:</u> How have humans impacted these ecosystems? What is currently being done statewide and nationwide to protect these ecosystems?</p>	<ul style="list-style-type: none"> • Identify the impacts humans have had on estuarine ecosystems • Identify the impacts humans have had on wetlands • Identify the state of New Jersey and United States wetlands • Understand that the threat to water ecosystems is a complex problem because many factors contribute to their pollution and destruction 	<ul style="list-style-type: none"> • Activity: Wetland Debate, study research and take on roles of environmental activists, students, government officials, builders, and residents to debate the issue of wetland development • Essay/Internet Activity: the destruction of water ecosystems • UNIT 5 TEST: Mid-Atlantic Coastal Ecology 	

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

UNIT 6: Biological Zonation and Marine Lifestyles

Enduring Understandings:

1. Zone the ocean vertically and horizontally.
2. Zone the Benthic environment of the ocean.
3. Describe the importance of plankton.
4. Identify various marine invertebrates according to their defining characteristics.
5. Understand the balance between various marine invertebrates and the habitat in which they live.
6. Identify various marine vertebrates according to their defining characteristics.

Concepts	Objectives	Core Activities/Simulations/Assessments	NJCCCS (CPI)
<p>1. Biological Zonation <u>Essential Questions:</u> How is the ocean zoned vertically and horizontally? What are the zones of the benthos?</p>	<ul style="list-style-type: none"> • Define Pelagic • Identify the vertical and horizontal provinces of the ocean • Define and identify the benthic zone 	<ul style="list-style-type: none"> • Diagram: Biozones • Essay/Internet Activity: Where does most life in the ocean occur? Relate this to the amount of sunlit layers in the ocean. 	<p>5.1.12.A.1-3 5.1.12.B.1-4 5.1.12.C.1-3 5.1.12.D.1-3</p> <p>5.3.12.C.1-2</p> <p>5.5.12.B.1</p>
<p>2. Plankton <u>Essential Questions:</u> What is plankton? Why is phytoplankton important? What are the various types of plankton?</p>	<ul style="list-style-type: none"> • Define plankton • Identify and describe the major groups of phytoplankton and zooplankton • Discuss the vital importance of phytoplankton and zooplankton • Explain how harmful algal blooms occur • Define bioluminescence and explain the value of producing light among bioluminescent species 	<ul style="list-style-type: none"> • Essay/Internet Activity: HAB's • Lab: Identifying Plankton – <i>Various live species of phytoplankton and zooplankton</i> • Lab: Identifying Seaweeds – <i>Various live species of seaweeds</i> • Demo: Bioluminescence – <i>Crushing ostracods to observe bioluminescence</i> • Activity: Monitoring the Brown Tide in New Jersey 	
<p>3. Phylum Porifera <u>Essential Questions:</u> What are the defining characteristics of Phylum Porifera? How are sponges identified? Why are sponges important?</p>	<ul style="list-style-type: none"> • List and describe the characteristics of the Phylum Porifera • Describe the cellular organization of the sponge and identify cells used for feeding, protection, and reproduction 	<ul style="list-style-type: none"> • Lab: Sponge Spicules – <i>Dissolving the outer spongin of sponges to isolate the spicules to identify the species of sponge</i> 	

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

<p>4. Phylum Cnidaria <u>Essential Questions:</u> What are the defining characteristics of Cnidarians? What are the habitats of Cnidarians?</p>	<ul style="list-style-type: none"> • List and describe the characteristics of the Phylum Cnidaria • Describe the tissue level of organization of Cnidarians, and identify the tissue layers used for feeding • Explain how nematocysts function 	<ul style="list-style-type: none"> • Lab: Hydra and Daphnia– <i>Hydra using nematocysts to stun Daphnia, before feeding</i> • Activity: Plotting Artificial Reefs in New Jersey
<p>5. Phylum Mollusca <u>Essential Questions:</u> What are the defining characteristics of mollusks? What are the habitats of mollusks?</p>	<ul style="list-style-type: none"> • List and describe the characteristics of the Phylum Mollusca • Examine and identify the internal and external anatomy of the squid • List 20 representatives of this Phylum in New Jersey 	<ul style="list-style-type: none"> • Project: New Jersey Mollusk of Interest Posters • Lab: Squid Dissection
<p>6. Phylum Arthropoda <u>Essential Questions:</u> What are the defining characteristics of Arthropods? How are Arthropods classified? What are the defining characteristics of Crustaceans and Chelicerates? What are the habitats of Arthropods?</p>	<ul style="list-style-type: none"> • List and describe the characteristics of the Phylum Arthropoda • Relate the structure of the Arthropod exoskeleton to its function • Examine and identify representatives of Arthropods • List the characteristics of the Crustaceans • Examine and identify the internal and external anatomy of the crayfish • List 20 representatives of this Phylum in New Jersey • Describe unique anatomy of the horseshoe crab 	<ul style="list-style-type: none"> • Project: New Jersey Arthropods PowerPoint Presentations • Lab: Crayfish Dissection • Essay/Internet Activity: Horseshoe Crabs and New Jersey
<p>7. Phylum Echinodermata <u>Essential Questions:</u> What are the defining characteristics of Echinoderms? What are the main classes of Echinoderms? What are the habitats of Echinoderms?</p>	<ul style="list-style-type: none"> • List and describe the characteristics of the Phylum Echinodermata • Relate the structure of the Echinoderm endoskeleton to its function • Examine and identify representatives of Echinoderms • Examine and identify the internal and external anatomy of the sea star compared to the sea urchin • List 20 representatives of this Phylum in New Jersey 	<ul style="list-style-type: none"> • Project: New Jersey Echinoderm Brochures • Lab: Sea Star Dissection • Lab: Sea Urchin Dissection • UNIT 6 PART 1: Invertebrate Quiz

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

<p>8. Class Agnatha and Class Chondrichthyes <u>Essential Questions:</u> What are the defining characteristics of the agnates? What are the defining characteristics of the cartilaginous fishes? Who are the cartilaginous fishes? What are the misconceptions of shark behavior? What is the current state of large predatory shark populations?</p>	<ul style="list-style-type: none"> • Describe the distinguishing features and characteristics of fishes • Identify the three main classes of fishes – Agnatha, Chondrichthyes, and Osteichthyes • Identify the general external anatomy of a fish, labeling the major fins • Describe the distinguishing characteristics of the Class Agnatha • Describe the distinguishing features and characteristics of the Chondrichthyes Class 	<ul style="list-style-type: none"> • Fish Diagrams • Activity: fish timeline from the beginning to present • Lab: Shark Dissection • Essay/Internet Activity: shark attack file, shark protections and activists
<p>9. Class Osteichthyes <u>Essential Questions:</u> What are the defining characteristics of the bony fishes? How is thermal pollution damaging to fish populations?</p>	<ul style="list-style-type: none"> • Describe the distinguishing features and characteristics of the Osteichthyes Class • Explain the dangers of thermal pollution to coastal fishes 	<ul style="list-style-type: none"> • Internet Activity: Striper Tracker, <i>sponsored by Rutgers University, research being done with the striped bass in New Jersey, significance of protecting the migratory routes of anadromous fishes, procedure used for attaching acoustic tags</i> • Lab: Temperature and Respiration Rates of Fish, <i>how thermal pollution affects the respiration of fish</i> • Lab: Fish Scale Identification, <i>observing and comparing scales</i> • Activity: Models of Mid-water, and Deep-water Fishes, <i>creating models identifying various adaptations these fishes have for living in extreme environments</i>
<p>10. Class Reptilia <u>Essential Questions:</u> What are the marine reptiles? Who are the marine reptiles that can be found off of the coast of New Jersey? What are the human impacts on sea turtles?</p>	<ul style="list-style-type: none"> • Discuss the navigation and migration of sea turtles • Identify possible causes of sea turtle strandings along the Atlantic Coast • Describe how sea turtles are affected by currents in the ocean 	<ul style="list-style-type: none"> • Activity: Stranded Along the Coast, <i>mapping sea turtle strandings along the Atlantic Coast to determine possible causes and conclusions</i>

Plumsted Township Public Schools
Science Program
New Jersey Coastal Ecology

	<ul style="list-style-type: none"> • Discuss the current state of sea turtles and human impacts among sea turtles 		
<p>11. Class Aves <u>Essential Questions:</u> What are sea birds? What are the main groups of sea birds, and how are they classified? Where does New Jersey fall in the migratory routes of sea birds?</p>	<ul style="list-style-type: none"> • Define sea bird • Discuss the various feeding methods and habitats of sea birds • List the three main groups of sea birds: shore-birds, near-shore birds, and oceanic birds • List examples of shore birds and near – shore birds of New Jersey • Identify oceanic sea birds and list examples 	<ul style="list-style-type: none"> • Essay/Internet Activity: Where does New Jersey fall in the migratory path of sea birds? • Field Trip: Sandy Hook, Island Beach State Park, observing migratory sea birds in fall or spring 	
<p>12. Class Mammalia <u>Essential Questions:</u> What are marine mammals? What are the adaptations of marine mammals? What is the human impact on marine mammals?</p>	<ul style="list-style-type: none"> • Relate the structures of marine mammals to the types of habitats in which they can survive • Describe the marine mammal diving response • Identify the various migratory paths of the marine mammals along the Atlantic Coast 	<ul style="list-style-type: none"> • Activity: Analyzing the Marine Mammal Diving Adaptations • Activity: The Migratory Path of the Atlantic Humpback Whale, <i>plotting actual data of humpback whale sightings along the Atlantic coast to create a map of their yearly migratory route from their feeding grounds to their breeding grounds</i> • Field Trip: Marine Mammal Stranding Center • UNIT 6 PART 2: Vertebrate Quiz 	