

Populations and Ecosystems

Students raise populations of organisms to discover population dynamics and interactions over a range of conditions. They learn that food is the source of energy used by all life-forms in all ecosystems to conduct life processes. Reproduction, including limiting factors, heredity, and natural selection are explored as ways to understand both similarity and the variation within and between species.

Essential Questions: What are the factors that compose an ecosystem?
How does energy pass from organism to organism in an ecosystem?
How do the available resources and abiotic factors affect the carrying capacity of an ecosystem?
How do changes in the environment affect different populations?
How is hereditary information passed from one generation to another in order to insure the continuation of a species?
How does the diversity of species develop over time?

Unit Length: 9-12 weeks

Resources: FOSS Populations and Ecosystems Module
FOSS Populations and Ecosystems Resources
FOSS Populations and Ecosystems Notebook
Premier Genetics Module
Prentice Hall Science Explorer Life Science Textbook

NJCCCS: 5.1.8B 3- Collect, organize, and interpret the data that result from experiments.
5.5.8A 1- Explain how products of respiration and photosynthesis are recycled.
5.5.8B 2- Discuss how changing environmental conditions can result in evolution or extinction of a species.
5.5.8B 3- Recognize that individual organisms with certain traits are more likely to survive and have offspring.
5.5.8C 1- Describe how the sorting and recombining of genetic material results in the potential for variation among offspring of humans and other species.
5.10.6A 1- Explain how organisms interact with other components of an ecosystem.

Science Content (Declarative Conceptual Knowledge)	NJCCCS
Students Will Know and Understand:	
An organism is any living thing.	5.10.6A 1
An organism's habitat is where it lives, the place where it can meet all of its requirements.	5.10.6A 1
A species is a kind of organism that is different from other kinds of organisms.	5.10.6A 1
A population is all the interacting individuals of one kind in an area.	5.10.6A 1
A community is all the interacting populations in a specified area.	5.10.6A 1
An ecosystem is a system of interacting organisms and nonliving factors in a specified area.	5.10.6A 1
An aquatic ecosystem functions in water.	5.10.6A 1
A terrestrial system functions on land.	5.10.6A 1
The sequence of organisms that eat one another is a food chain.	5.10.6A 1
All the feeding relationships in an ecosystem define the food web for the system.	5.10.6A 1
Food is energy-rich organic matter that organisms need for life.	5.10.6A 1
In photosynthesis, food is made from water, carbon dioxide, and light.	5.5.8A 1
Feeding relationships define trophic levels: producers, consumers, and decomposers.	5.10.6A 1
Reproductive potential is the theoretical unlimited growth of a population over time.	5.5.8B 3
A limiting factor is any biotic or abiotic component of the ecosystem that controls the populations size.	5.5.8B 2
Similar ecosystems occur in areas of similar abiotic conditions on Earth.	5.10.6A 1
All ecosystems have characteristics in common, such as trophic levels.	5.10.6A 1
Variation is the range of expression of a feature in a population.	5.5.8C 1
An adaptation is any trait of an organism that helps it survive and reproduce in its environment.	5.5.8B 3
Variation in a population helps the population survive when the environment changes.	5.5.8C 1
Genes are the basic units of heredity carried by chromosomes in the nucleus of every cell. Genes code for features of organisms.	5.5.8 C 1
An organism's particular combination of paired alleles is its genotype; the traits produced by those alleles result in the phenotype.	5.5.8C 1
Environmental factors out selective pressure on populations.	5.5.8B 2
Natural selection is the process by which the individuals best adapted to their environment tend to survive and pass their traits to subsequent generations.	5.5.8B 3

Thinking Processes (Procedural Knowledge)	NJCCCS
Students Will Be Able To:	
Observe individual organisms and populations to monitor changes.	5.1.8B 3
Describe and communicate a sequence of events during a long-term study.	5.1.8B 3
Identify biotic and abiotic elements.	5.10.6A 1
Relate the characteristics of a population, community, and ecosystem.	5.10.6A 1
Construct a classroom ecosystem.	5.10.6A 1
Observe and record changes to an ecosystem using a scientific log.	5.10.6A 1
Describe the relationships among biotic and abiotic factors.	5.10.6A 1
Use data to construct a food web.	5.10.6A 1
Investigate and measure the amount of energy from a food source.	5.10.6A 1
Determine the mass of production needed to support primary, secondary, and third-level consumers.	5.10.6A 1
Analyze and infer how energy moves through an ecosystem.	5.10.6A 1
Calculate theoretical growth of a population with no limits.	5.5.8B 3
Relate biotic and abiotic factors to the growth or decline of populations.	5.5.8B 2
Apply understanding of ecological concepts to a new system.	
Use a multimedia simulation to investigate the adaptive value of protective coloration.	5.5.8B 3
Explain how adaptations help organisms survive in a specific environment.	5.5.8B 3
Describe how a population can change over time in response to environment factors.	5.5.8B 2
Use a simulation to determine the transfer of genetic information during breeding and the traits that result.	5.5.8 C 1
Use Punnett squares to explain how organisms inherit dominant and recessive alleles.	5.5.8 C 1
Use Punnett squares to predict the proportion of offspring that will have certain traits.	5.5.8 C 1
Describe how selective pressure can affect the genetic makeup of a population.	5.5.8 C 1
Explain how the traits expressed by the members of a population can change naturally over time.	5.5.8 C 1

Diversity of Life

Students observe and maintain protists, plants, and animals in the classroom and study their characteristic features. The study progresses from macroscopic to microscopic observation to discover the fundamental unit of life, the cell. Students then investigate organism subsystems and behaviors, and consider their diversity of adaptive structures and strategies.

Essential Questions: What are the common characteristics of living organisms?
How do organisms demonstrate the interdependent structure and function of cells, tissues, organs, and organ systems?
How do organisms respond to an ever-changing external environment?
How are organisms classified?

Unit Length: 9-12 weeks

Resources: FOSS Diversity of Life Module
FOSS Diversity of Life Resources
FOSS Diversity of Life Notebook
Prentice Hall Science Explorer Life Science Textbook

NJCCCS: 5.1.8B 1- Identify questions and make predictions that can be addressed by conducting investigations.
5.1.8B 2- Design and conduct investigations incorporating the use of a control.
5.1.8C 2- Understand and practice safety procedures for conducting science investigations.
5.5.6A 2- Identify and describe the structure and function of cells and cell parts.
5.5.8A 2- Recognize that complex multicellular organisms, including humans, are composed of and defined by interactions of cells, tissues, organs, and systems.
5.5.8B 1- Compare and contrast kinds of organisms using their internal and external characteristics.

Science Content (Declarative Conceptual Knowledge)	NJCCCS
Students Will Know and Understand:	
All living organisms exhibit common characteristics; they grow, consume nutrients, exchange gases, respond to stimuli, reproduce, need water, and eliminate waste.	5.5.8B 1
The cell is the basic unit of life.	5.5.6A 2
Cells have the same needs and perform the same functions as more complex organisms.	5.5.6A 2
Cells contain cell organelles.	5.5.6A 2
Animal and plant cells have many organelles in common, but some organelles like cell walls and chloroplasts are only found in plant cells.	5.5.6A 2
Many cells of the same type make a tissue.	5.5.8A 2

More than one tissue working together to complete the same job is an organ.	5.5.8A 2
More than one organ functioning together is an organ system.	5.5.8A 2
The organ systems work interdependently to create an organism.	5.5.8A 2
Different kinds of organisms have different internal and external structures that help them survive in their environment.	5.5.8B 1
Organisms are grouped by common characteristics.	5.5.8B 1
The classification system consists of several levels grouping organisms from general common characteristics to more specific characteristics in the following categories: kingdom, phylum, class, order, family, genus, and species.	5.5.8B 1
Seeds contain the dormant, living embryo of a plant.	5.5.8B 1
Germination is the onset of growth and differentiation in plant seeds.	5.5.8B 1
The cotyledon is the primary source of energy for seed germination.	5.5.8B 1
Xylem is the system of tube-like connected cells that transports water from the roots to all structures of the plant.	5.5.8B 1
Stomates are openings on leaves that are controlled by guard cells.	5.5.8B 1
Sepals, petals, stamens, and pistils are the major structures of typical flowers.	5.5.8B 1
Pollen from the anthers on stamens and eggs in the ovules of the pistil are the male and female cells that combine during sexual reproduction.	5.5.8B 1
The animal kingdom consists a wide variety of organisms.	5.5.8B 1
Microbe is the general name for microscopic bacteria and fungi, especially those that cause disease and promote fermentation.	5.5.8B 1
Bacteria, fungi, and algae have the characteristics of living organisms.	5.5.8B 1
Bacteria have a cell membrane but no internal organelles.	5.5.8B 1

Thinking Processes (Procedural Knowledge)	NJCCCS
Students Will Be Able To:	
Categorize pictures of objects and organisms into living and nonliving groups.	5.5.8B 1
Investigate unknown materials by placing them in aquatic environments and observing them for evidence of life.	5.5.8B 1
Use the microscope to study organisms.	5.5.8B 1
Draw scale representations of images seen in the microscope to estimate size accurately.	5.5.8B 1
Observe single-celled microorganisms with a microscope and investigate structure-function relationships.	5.5.8A 2
Generate evidence to support the idea that a paramecia are organisms.	5.5.8B 1
Compare microorganisms.	5.5.8B 1
Compare structure and unction of cells from different organisms.	5.5.8B 1
Relate the structure and function of cells, tissues, organs, systems and organisms.	5.5.8A 2
Describe the structure and function of the human organ systems and how they are interdependent.	5.5.8A 2
Classify organisms based on similar characteristics.	5.5.8B 1
Examine and compare the internal and external structures of organisms through either real or digital dissection.	5.5.8B 1
Dissect seeds to discover their structures.	5.5.8B 1

Investigate the effect of light on germinated seeds.	5.5.8B 1
Compare the development of two groups of complex plants-monocots and dicots.	5.5.8B 1
Collect and analyze data to develop evidence for an explanation for how water enters a plant's roots and flows through the plant during transpiration.	5.5.8A 2
Relate transpiration to the water cycle.	5.5.8A 2
Investigate the structure-function relationships of plant flowers.	5.5.8A 2
Make a model observations to develop a general model of how seeds disperse.	5.5.8B 1
Explain how seed-dispersal mechanisms contribute to a plant's survival.	5.5.8B 1
Design and conduct an experiment on a plant and/or animal using proper safety and ethical procedures.	5.1.8B 1&2 5.1.8C 2
Use lab procedures to inoculate agar plates with bacteria and fungi from natural sources.	5.1.8C 2
Compare bacteria and fungi to plants, animals, and protists.	5.5.8B 1

Human Brain and Senses

The brain and nervous system control all human thoughts, emotions, and physical actions. The brain has been compared to a computer, but the human brain can do far more than a computer, it has the awesome ability to redesign itself, adding components, disconnecting unproductive parts and reconfiguring the network of connections between parts. Each brain is different from every other in its detail and finish creating the dramatic diversity in humanity. Students will investigate the brain and senses to better understand their own body processes.

Essential Questions: How is sensory information obtained and utilized by the body?
How does the brain interpret sensory information?

Unit Length: 9-12 weeks

Resources: FOSS Human Brain and Senses Module
FOSS Human Brain and Senses Resources
FOSS Human Brain and Senses Notebook
Prentice Hall Science Explorer Life Science Textbook

NJCCCS: 5.1.8B 1- Identify questions and make predictions that can be addressed by conducting investigations.
5.1.8B 2- Design and conduct investigations incorporating the use of a control.
5.1.8B 3- Collect, organize, and interpret the data that result from experiments.
5.5.8A 2- Recognize that complex multicellular organisms, including humans, are composed of and defined by interactions of cells, tissues, organs, and systems.

Science Content (Declarative Conceptual Knowledge)	NJCCCS
Students Will Know and Understand:	
Learning is a skill enhanced by repetition.	5.5.8A 2
The sensory input that results in the most effective memory retention is different for different people.	5.5.8A 2
Memory is enhanced by firsthand experience and associations.	5.5.8A 2
The mammalian eye has predictable parts, like cornea, iris, pupil, lens, optic nerve, retina, and sclera.	5.5.8A 2
Lenses bend (refract) light; lenses with greater curvature refract light more.	5.5.8A 2
A receptor cell responds to a stimulus and sends an electric message to the brain.	5.5.8A 2
The brain has three major parts.	5.5.8A 2
Technology can be used to map and study the brain.	5.5.8A 2
The brain processes visual images providing depth and motion perception.	5.5.8A 2
Touch is expressed in at least four sensations: pressure, pain, hot and cold.	5.5.8A 2
Each touch sensation has its own kind of receptor cell.	5.5.8A 2
Some locations on the skin's surface have no receptors for pain and temperature.	5.5.8A 2
Neurons are the cells that convey messages to and from the brain.	5.5.8A 2

Messages travel through neurons as electricity and from neuron to neuron via neurotransmitter chemicals.	5.5.8A 2
All senses have specialized receptors.	5.5.8A 2
Sensory systems can decline or fail in many ways.	5.5.8A 2

Thinking Processes (Procedural Knowledge)	NJCCCS
Students Will Be Able To:	
Conduct experiments on memory and motor skills.	5.1.8B 1,2&3
Compare structures found in different kinds of eyes.	5.1.8B 3
Determine the relationship between light and pupil response.	5.1.8B 3
Investigate objects and materials to determine lens characteristics.	5.1.8B 1,2&3
Construct three-dimensional models to understand brain structure and imaging processes.	5.1.8B 2&3
Sequence images using relational data.	5.1.8B 3
Conduct experiments, organize data, and draw conclusions about sensory data.	5.1.8B 1,2&3
Research how sensory systems can fail. Present findings.	5.1.8B 3