How Can We Predict Change in Ecosystems?

Unit Storyline

Focus Question 1: How can plants get what they need to live and Grow?

Lesson 1: From Seedling to Skyscraper

Plants need many things to live & grow, but not all of them contribute most of the matter to growth.

Students ask questions about possible sources of matter for plant growth.

Lesson 2: It's a Gas

Plants take in carbon dioxide from the air, and air is made up of particles.

Students analyse data from an investigation to develop a model that explains how matter can enter or leave the air.

Lesson 3: From Thin Air

Air is matter and light is energy.

Students carry out an investigation to collect evidence that air is matter and develop a model to represent transfers of matter and energy.

Lesson 4: Weighing the Willow

Plants get most of their matter for growth from air and water, not soil.

Students obtain and evaluate information from a text to provide evidence to support a claim that plants get most of their matter from air and water.

Focus Question 2: How can animals get what they need to live and grow?

Lesson 5: Active Animals

Animals need matter and energy to live and grow, and to gain weight they need to consume more food.

Students analyse graphs of weight and food intake for growing animals to identify patterns.

Lesson 6: Eating for Energy

Food is a source of energy for animals.

Students make a claim based on observations about which of two pieces of food has more energy stored in it.

Lesson 7: Building Bodies

Animals get both the matter and the energy they need from food.

Students develop a model that supports a claim that when animals eat, they are getting both matter and energy.

Focus Question 3: How do matter and energy flow through ecosystems?

Lesson 8: A Tangled Web

Organisms are related in food webs, which can be used to model the flow of matter and energy.

Students develop and use food web models to trace the path of matter and energy through ecosystems.

Lesson 9: Cleanup Crew

Decomposers return matter from dead organisms to the environment.

Students obtain information and analyse data showing that decomposers return matter to the air and soil.

Lesson 10: Flows and Cycles

Energy flows and Matter cycles through living and nonliving components of ecosystems.

Students develop and use a model to show matter cycles and energy flows through living and nonliving parts of ecosystems.

Focus Question 4: What affects the stability of ecosystems?

Lesson 11: A Whales Tale

Organisms can survive only in environments in which their needs for matter and energy are met.

Students analyse data to construct an agreement that explains how a decrease in available matter and energy can cause a killer whale population to decline.

Lesson 12: A Lion's Share

Newly introduced species can often cause problems in native ecosystems.

Students obtain and evaluate information from a text about the causes and effects of the lionfish invasion in the Caribbean.

Lesson 13: Top Trout

The introduction of a top predator can sometimes have a cascade effect that reaches the bottom of the food web.

Source: Smithsonian Science Education Center, *How Can We Predict Change in Ecosystems?* in Smithsonian Science for the Classroom. Carolina Biological, Burlington, NC, 2019.

Students use food web models to predict changes to the system of native organisms when a nonnative predatory fish is introduced.

Science Challenge

Focus Question 5: How can we use models to make predictions about invasive sea squirts?

Lesson 14: Surveying Sea Squirts Part 1

Sea squirts often hitchhike on boats and become invasive species.

Students analyse and interpret data to develop and compare food web models of matter and energy flow in two coastal ecosystems.

Lesson 15: Surveying Sea Squirts Part 2

Models can be used to make predictions about locations that are more susceptible to invasion.

Students modify food web models to make predictions about which of two locations is more likely to cause a new species of sea squirt to become invasive.

Source: Smithsonian Science Education Center, *How Can We Predict Change in Ecosystems?* in Smithsonian Science for the Classroom. Carolina Biological, Burlington, NC, 2019.