




Target Performances for *Ecosystems* Activities

All *Carbon TIME* units are organized around a common purpose: *assessing and scaffolding students' three-dimensional engagement with phenomena*. Every *Carbon TIME* activity has its specific expectation for students' three-dimensional engagement with phenomena, what we call its **target performance**. Each activity also includes tools and strategies that teachers can use to assess and scaffold the target performance in rigorous and responsive ways.

The target performances for each activity in the *Ecosystems* unit are listed in the table below.

Activity	Target Performance
<i>Lesson 1 – Pretest and Features of Ecosystems (students as questioners)</i>	
Activity 1.1: Ecosystems Unit Pretest	Students show their initial proficiencies for the overall unit goal: Questioning, investigating, and explaining how carbon cycles and energy flows in ecosystems.
Activity 1.2: Expressing Ideas and Questions for Patterns in Ecosystems	Students ask and record specific questions about changes in matter and energy in response to the unit driving question: How many foxes can live in a meadow?
Activity 1.3: Carbon Pools	Students identify where carbon atoms are located in ecosystems and groups of organisms that have similar functions (carbon pools).
<i>Lesson 2 – Patterns in Organic Matter in Ecosystems (students as investigators)</i>	
Activity 2.1: Predictions and Planning for the Meadow Simulation	Students make predictions about changes in the mass of different populations in a meadow ecosystem and plans to maximize the fox population.
Activity 2.2: The Meadow Simulation	Students identify patterns in relationships among organic mass of populations at different trophic levels in a simulated meadow ecosystem (the organic matter pyramid).
Activity 2.3: Evidence-Based Arguments for Meadow Simulation	Students develop arguments from evidence about possible patterns in relationships among mass of populations at different trophic levels in a simulated meadow ecosystem (the organic matter pyramid).
Activity 2.4: Organic Carbon Pools in Other Ecosystems	Students describe patterns in relationships among mass of populations at different trophic levels in a other ecosystems (the organic matter pyramid).

Activity	Target Performance
<i>Lesson 3 – Matter Cycles and Energy Flows in Ecosystems (students as explainers)</i>	
Activity 3.1: Large-Scale Four Questions	Students identify carbon pools in ecosystems and processes that move carbon atoms from one pool to another.
Activity 3.2: Carbon Dice Game	Students record and share data about their movement to different carbon pools when they play the role of carbon atoms in an ecosystem (the Carbon Dice Game).
Activity 3.3: Tracing Carbon Through an Ecosystem	Students name carbon pools and the processes that move carbon atoms among pools in terrestrial ecosystems.
(Optional) Activity 3.4: What Happens to Soil Carbon?	Students explain the role of detritus and detritus-based food chains in ecosystems.
Activity 3.5: Tracing Energy Through an Ecosystem	Students trace changes in energy and energy flow through carbon pools in ecosystems.
Activity 3.6: Explaining Patterns in Ecosystems	Students explain matter cycling and energy flow in ecosystems, answering the Carbon Pools Question, the Carbon Cycling Question, and the Energy Flow Question.
 <i>Lesson 4 – Carbon Pools and Fluxes in Changing Ecosystems (students as explainers)</i>	
Activity 4.1: Tiny Pool and Flux Game	Students describe the relationship between pools and fluxes in a physical model: changes in pool sizes depend on balance among fluxes.
Activity 4.2: Carbon Pools and Constant Flux Simulation	Students describe the relationship between pools and fluxes in an online computer model: changes in pool sizes depend on balance among fluxes.
Activity 4.3: How Fluxes Change and Photosynthesis Limits	Students use an online computer model to describe how changes in carbon pools over time depend on the maximum possible rate of photosynthesis in an ecosystem.
Activity 4.4: Seasonal Changes and Ecosystem Disturbances	Students use an online computer model to describe how seasons and disturbances affect an ecosystem.
<i>Lesson 5 – Ecosystem Services and Posttest (students as explainers)</i>	
Activity 5.1: Introduction to Ecosystem Products and Services	Students explain how humans change matter cycling and energy flow in ecosystems to produce products and services.

Activity	Target Performance
Activity 5.2: Ecosystem Products and Services Jigsaw	Students explain how humans manage matter cycling and energy flow in specific ecosystems to produce products that they need (beef, corn, forest).
 Activity 5.3a: Ecosystem Posters	Students use posters to explain matter cycling, energy flow, and ecosystem services in a different ecosystem.
OR	
 Activity 5.3b: Ecosystem Posters	Students use posters to explain matter cycling, energy flow, ecosystem services, and effects of disturbances in a different ecosystem.
Activity 5.4: Ecosystems Unit Posttest	Students show their end-of unit proficiencies for the overall unit goal: Questioning, investigating, and explaining how carbon cycles and energy flows in ecosystems.