

LABORATORY 4: ECOSYSTEMS

Due in lab October 10th or 12th

Purpose:

The purpose of the lab this week is to illustrate ecosystem structure, process, and change by diagramming the flow of energy and matter through an ecological community of your own design.

Designing your own ecosystem:

Today you will work alone or with one partner to design and artistically depict your own ecosystem. Your final product must include the components listed below. Please read the list below before outlining the structure of your ecosystem.

1. An ecological community with **four** trophic levels (8 points).

Imaginary organisms are welcome! You must include at least one autotroph, one primary consumer, one secondary consumer, and one decomposer.

Label each species with its trophic level.

2. A **labeled** depiction of energy flow through the ecosystem, beginning with 1,000,000 Joules of sunlight and showing 90% loss at each trophic level (8 points).
3. A **labeled** depiction of the inputs and outputs of your ecosystem (6 points).
4. A **labeled** depiction of the hydrologic cycle within your ecosystem, including **ALL** storage compartments (reservoirs) and pathways in the cycle (18 points).

Start with 1,000,000,000 gallons of water, and store the water in storage compartments in the same proportions as occur on earth (see table below). Complete the table. On your drawing please label the storage compartments, including the volume you've calculated for each.

You do not need to quantify the pathways – just illustrate them in your artistic depiction!

Storage Compartment	% in each Storage Compartment	# of gallons in the Storage Compartment
Oceans	96.5	
Glaciers/Ice Caps	1.74	
Shallow groundwater	0.76	
Lakes	0.013	
Soil moisture	0.001	
Atmosphere	0.001	
Rivers	0.0002	

5. A **labeled** depiction of the calcium, sulfur or phosphorus cycle within your ecosystem, including **ALL** storage compartments and pathways (20 points).

Start with:

For phosphorous: 1,000,000,000 metric tons

For calcium and sulfur 10,000 kilograms per hectare of your ecosystem (you may assume your ecosystem covers 100 hectares)

Store whichever element you pick in storage compartments in the same proportions as occur on earth. Complete the table below (use as many rows as needed). On your drawing please label the storage compartments, including the weight you have calculated for each.

You do not need to quantify the pathways – just illustrate them in your artistic depiction!

Storage Compartment	Mass of element in each Storage Compartment on Earth	Fraction in each Storage Compartment on Earth	Mass of Element in the Storage Compartment in your ecosystem
TOTAL			

6. Now that you have created a beautiful ecosystem, let’s disturb it!

a) Introduce an invasive species by drawing it into your ecosystem. Indicate on your diagram what trophic level it occupies, and describe how it was introduced (6 points).

b) Depict or describe on your diagram how the invasive species you have designed interrupts the flow of energy and matter through your ecosystem (4 points).

c) On *this* page, calculate how many of this species you will have in 5 years, using an initial population of 8, and a population growth rate of 5% per year. Show your work (8 points).

d) What will the population of this invasive species be in 25 years, if the population growth rate increases to 10% *after* the first 5 years? Show your work (8 points).

e) Hypothesize what might have caused the population growth rate to increase (2 points).

f) Outline an experiment that would test your hypothesis (4 points).

7. In the space below, describe one negative and one positive feedback that could occur in your ecosystem (8 points).