Ecology

HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

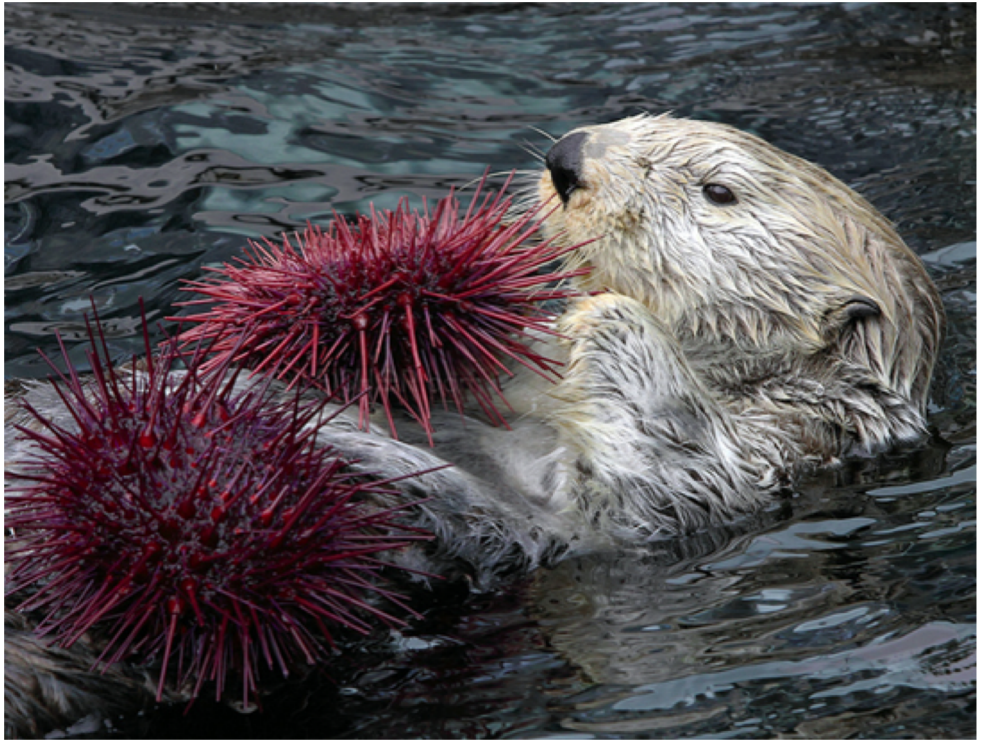
HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem

What determines how many species live in a given place?
And, what determines how large each population can grow?

To answer the question, we must first define..

POPULATION = all members of a species living in an area

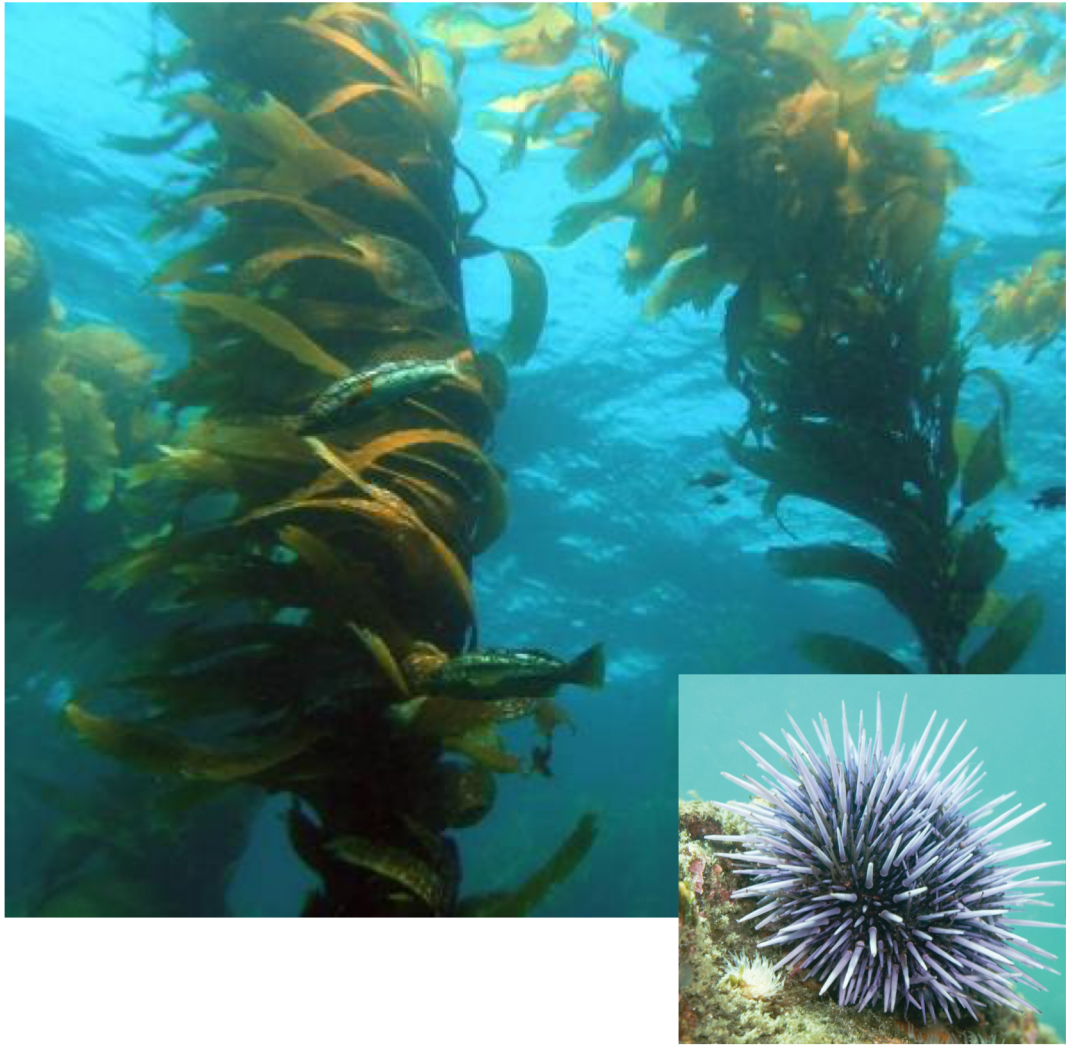
COMMUNITY = all the populations in an area



Sea otter and sea urchins. What do you think their relationship is?

Sea urchins live in kelp forests. They graze on plants there.

What is the relationship between kelp, sea otters and sea urchins?



[Some Animals Are More Equal Than Others](#) - HHMI Film

Consider the following ideas as you watch (take notes):

1) Green World Hypothesis

2) Keystone Species

3) Trophic Cascades

4) Hypothesis and experimentation

ECOLOGY - the study of interactions among organisms with each other and with environment.

An ecologist might study:

- effects of a forest fire
- number and locations of whales
- reasons for frog deaths in a pond
- how pesticides affect bees
- how changing temperatures affect plants

Ecologists attempt to solve real-world problems related to the environment.

Some ecologists work in the field.

Levels of Organization:

Population = single group/species in an area

Community = all the population

Ecosystem - living and nonliving factors

Biome = large areas with certain climates, plants and animals (forest)

Biosphere = part of earth that supports life

Quick Check

1. All the different populations in an area make up the
   a) biosphere b) ecosystem c) community

2. Ecology is the study of the _____ of organisms with the environment.

3. The part of the earth that can support life is the _____.

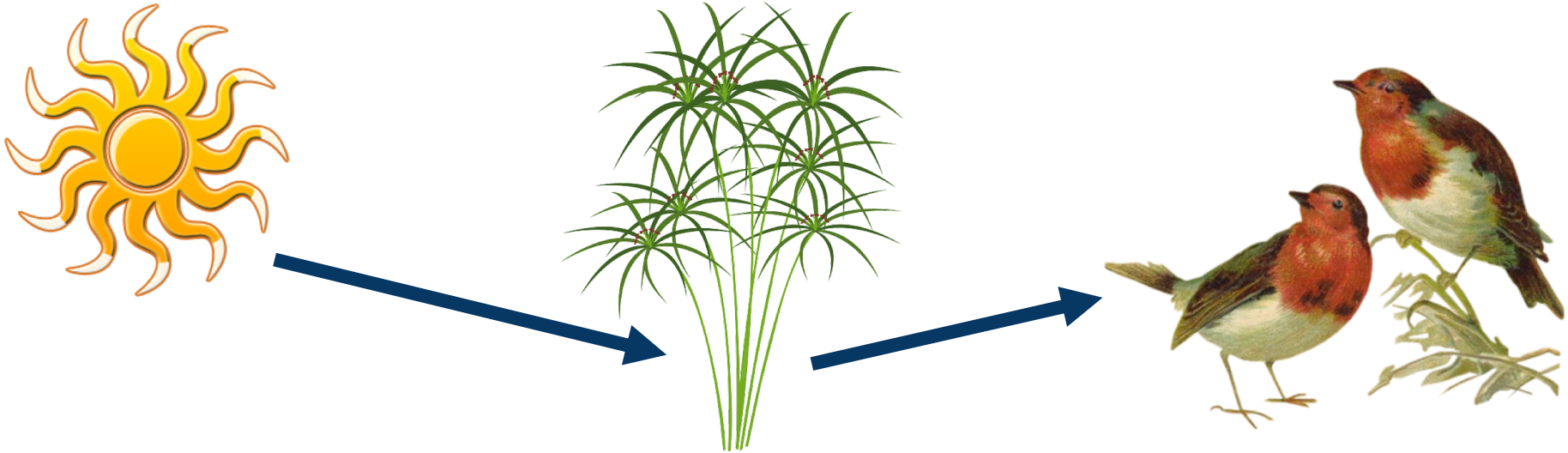
4. All the living and non-living factors in an area make up the:
   a) population b) ecosystem c) community

5. A desert, rain forest, tundra and grassland are all different kinds of:
   a) biospheres b. biomes c) biotics

Energy Flow

Autotrophs (producers) - capture energy and convert to "food" (plants)

Heterotrophs (consumers) - must eat things (animals)



Types of Consumers

Herbivores

Carnivores

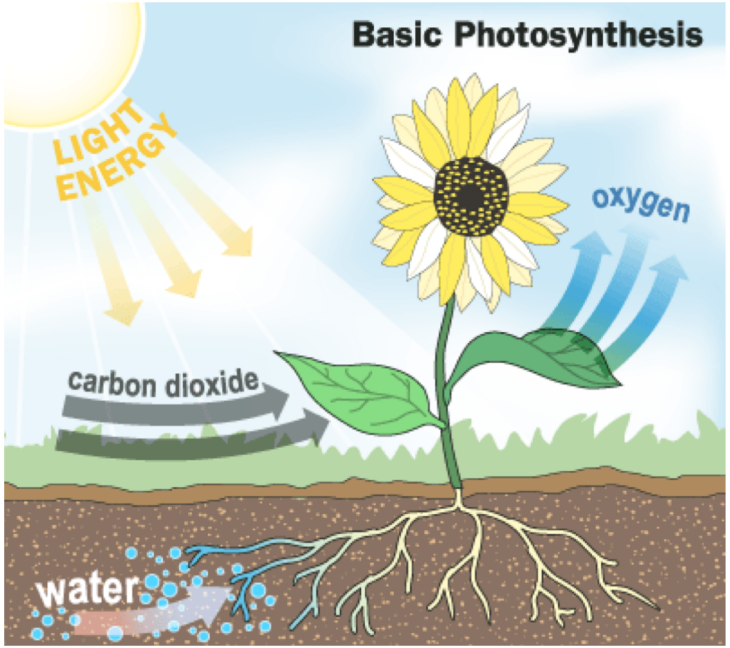
Omnivores

Detritivores / Decomposers

SUNLIGHT is the main source of energy

Photosynthesis - uses light energy to make "food"

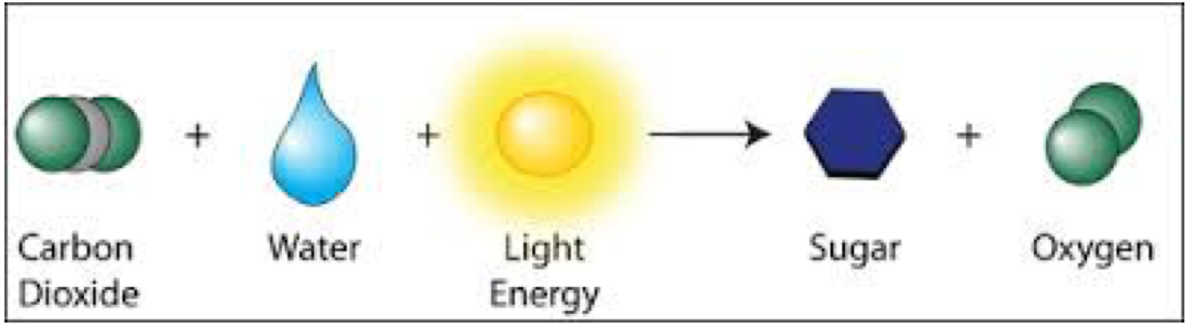
Do you remember the equation for photosynthesis?



Photosynthesis

$$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$$

carbon dioxide + water ⟶ glucose + oxygen



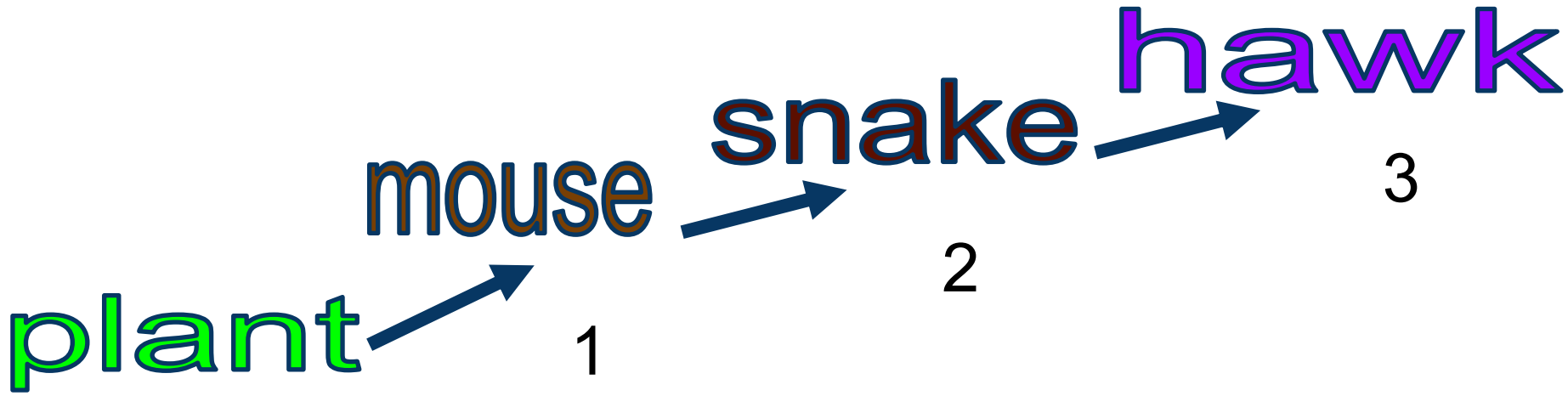
*You need to know this equation for the test!

FOOD CHAINS AND FOOD WEBS

- shows the flow of energy in an ecosystem

*Note the direction of the arrows, they indicate where the energy is going when one organism consumes another.

Each step in a chain or web is called a <u>TROPHIC LEVEL</u>



Primary Productivity

the rate at which organic matter is created by producers

More plants = more productivity.

Which of the following ecosystems has the greatest primary productivity?

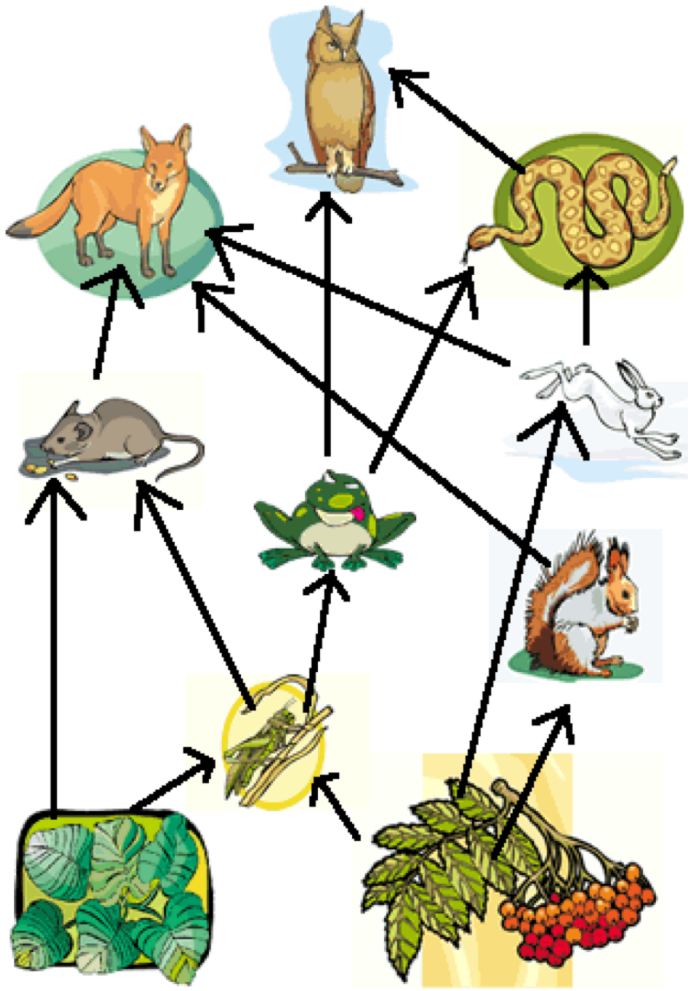
a) rain forest b) desert c) tundra

Primary Consumers (1st)

Secondary Consumers (2nd)

Tertiary Consumers (3rd)

* Find the Omnivore.

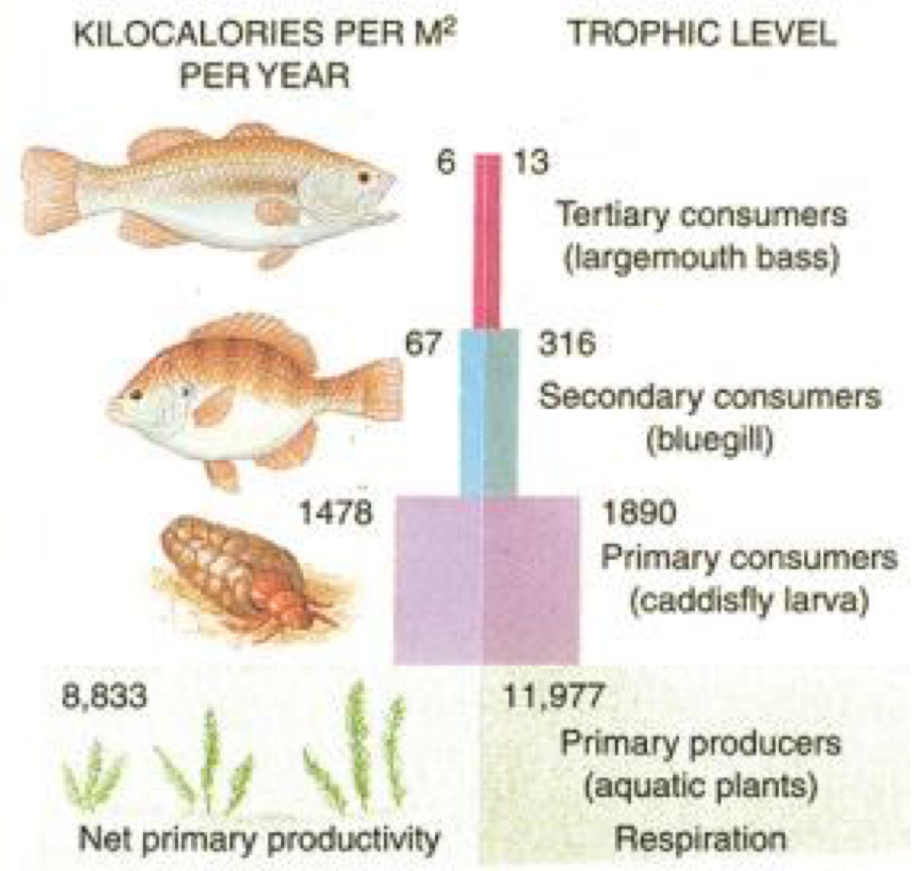


Practice Another Food Web - Draw a lake ecosystem

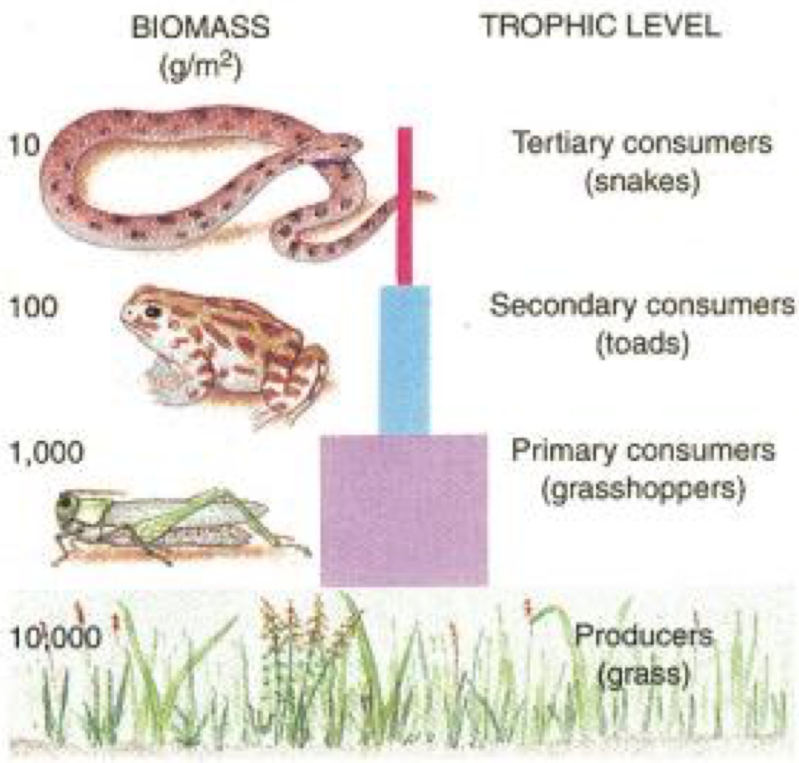
Ecological Pyramids

Energy Pyramid - shows how much energy is produced at each level.

Draw an energy pyramid for a prairie.



Pyramid of Numbers



A biology student counts the number of animals viewed on a Trailcam. In the forest, the camera photographed:

Grizzly bears
Deer
Rabbits
Sparrows
Squirrels

Based on the models, which of the animals would you expect to be most abundant in the forest? Why?

A study just like this is taking place in Gorongosa park, check out the WILDCAM!

Quick Check

1. An organism that only eats plants is called a _____
   On a food web, this organism is also called a _____ consumer.

2. What human activities cause carbon to be released into the atmosphere?

3. An ecosystem can support a [small number / large number] of top predators.

4. In a pyramid of numbers, what type of organism makes up the base of the pyramid? [producers / consumers / predators]

5. On a food web, secondary consumers are eaten by _____ consumers.

6. On a food web, arrows represent a) the flow of energy b) the passage of time

Consider the kelp forest ecosystem to answer these questions.

What determines how many species live in a given place?

And, what determines how large each population can grow?

CLAIM = answer to the question, at least one complete sentence

EVIDENCE = use principles we have learned to provide evidence for your claim

REASONING = explain why your evidence relates to the claim made (link the evidence to the claim)