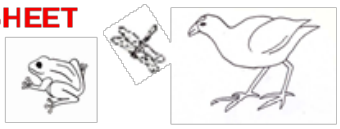
KESAB Patawalonga and Torrens Waterwatch

Activity 6 – FOOD WEB WORKSHEET



Read through the text. Design a food web and answer some questions from the following information:

The Torrens River starts in the Adelaide hills as several small creeks which join to form one larger creek. As it winds its way down the hills to the city, more and more water is added. It generally only flows in winter, when the rainfall is sufficient, and dries up into small waterholes during the summer. A weir is used to hold water permanently in the city. It is surprising how many organisms rely on the river for their existence.

Algae can be observed growing in the water, as well as water ribbons *(Triglochin procerum)*. On the water's edge, fluffy topped reeds such as the common reed *(Phragmites australis)* and the bulrush *(Typhus sp)* grow. Water boatmen are observed swimming in the water. They are eating the algae and reeds. Mosquito larvae also eat the algae while the freshwater snail eats both the algae and water ribbons. A long necked tortoise pokes its nostrils above the water. The tortoise eats the algae too, as well as feeding on snails, boatman and yabbies. The water boatman provides food for many species including fish, frogs, diving beetles and dragonfly larvae. The yabbies are scavengers, feeding on rotting plant and animal matter, while bacteria also help break down this dead material by digesting it and recycling nutrients in the food web. The mosquito larvae are considered a delicacy for several varieties of fish (such as the big-headed gudgeon or the congolli).

Birds are in abundance along the waterway. Pacific black ducks are feeding on fish, dragonfly larvae and diving beetles, while the occasional visiting pelican feeds on fish, frogs and dragonfly larvae. Black swans make a beautiful sight, bending their elegant necks to forage under the water grazing on the water ribbons, snails and an occasional fish. The white-faced heron makes a meal of the fish and frogs. The purple swamp hen runs quickly from the bulrushes where it feeds on the tender growth of the bulrushes and also makes its nest. On the bank a blue-tongue lizard is sunning itself in a warm rock. It snaps at the dragonflies and diving beetle and beware the unwary frog, the lizard will sometimes eat them too.

1. Use the pictures provided to construct a food web

It is best to start with the producers and build up. When you are happy with your placement, glue/write the animals in place and complete the arrows to show the flow of energy. You may need to read through parts of the text again.

2. Divide the organisms into the following categories:

Producers	1st Order Consumer	2nd Order Consumer (and higher)

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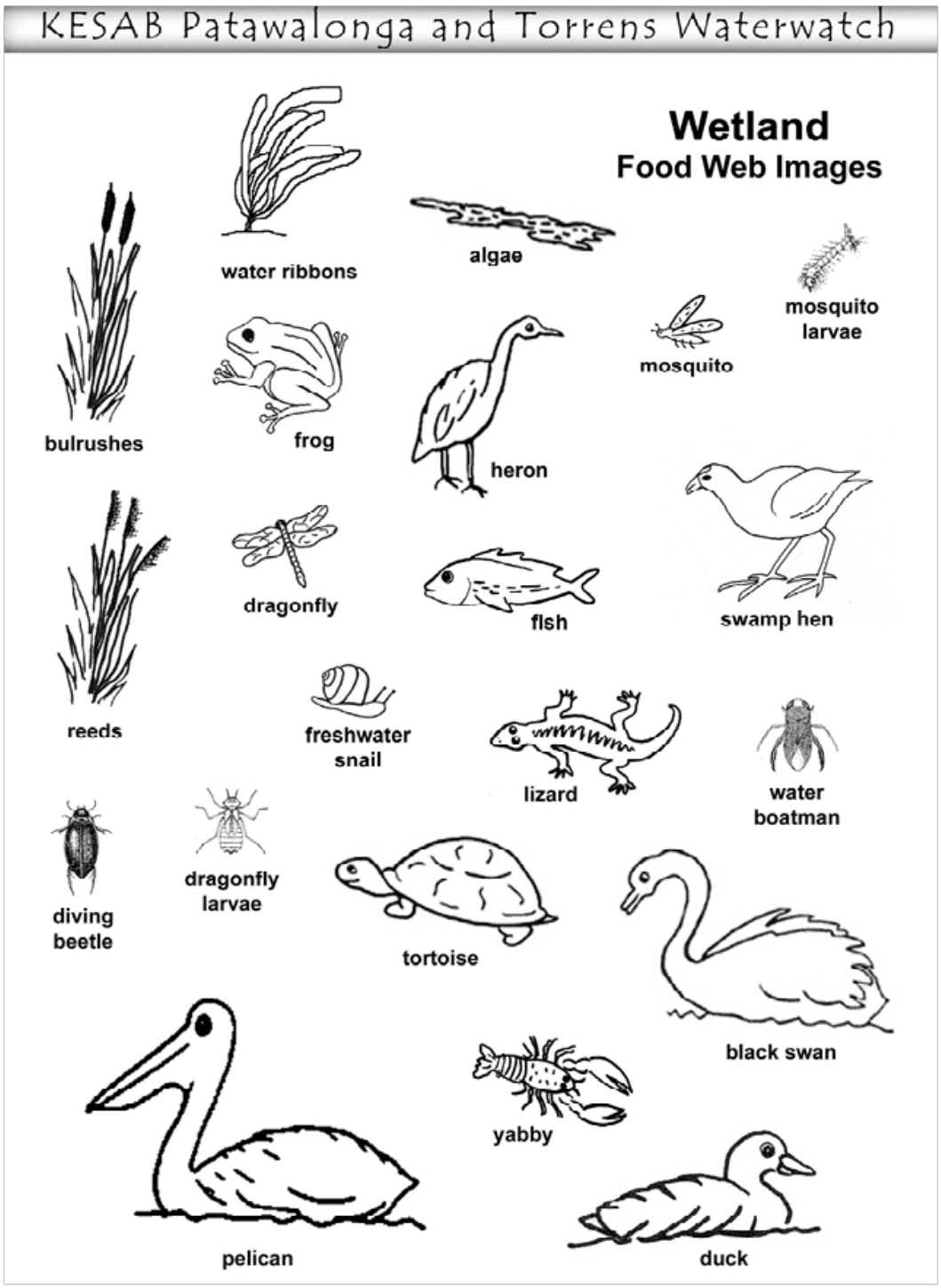


SOLUTIONS...

1. Complete the chart. (10)

Producers	First Order Consumer	Second Order Consumer and Higher
- algae - water ribbons - common reed - bulrush	- water boatman - mosquito larvae - freshwater snail - tortoise - gabby - black swans - swamp hen - dragonfly - bacteria	- tortoise - fish - frog - diving beetle - dragonfly larvae - pacific black duck - pelican - black swan - heron - lizard

2) Food Web: Cut and layout organisms FIRST…then tape/glue.

* All possible food chains [32 total] are...

5
- algae → water boatmen → dragonfly larvae → pelican
- algae → water boatmen → dragonfly larvae → duck
- algae → water boatmen → diving beetles → duck
- algae → water boatmen → diving beetles → lizard
- algae → water boatmen → tortoise

4
- algae → water boatmen → fish → pelican
- algae → water boatmen → fish → heron
- algae → water boatmen → fish → black duck
- algae → water boatmen → fish → black swan

4
- algae → mosquito larvae → fish → heron
- algae → mosquito larvae → fish → black swan
- algae → mosquito larvae → fish → pelican
- algae → mosquito larvae → fish → black duck

2
- algae → freshwater snails → tortoise
- algae → freshwater snails → black swan

1
- algae → tortoise

1 [Common reed → water boatmen → tortoise

2 [Common reed → water boatmen → dragonfly larvae → pelican
Common reed → water boatmen → dragonfly larvae → duck

2 [Common reed → water boatmen → diving beetles → lizard
Common reed → water boatmen → diving beetles → duck

4 [Common reed → water boatmen → fish → black swan
Common reed → water boatmen → fish → heron
Common reed → water boatmen → fish → pelican
Common reed → water boatmen → fish → black duck

3 [Common reed → water boatmen → frog → pelican
Common reed → water boatmen → frog → lizard
Common reed → water boatmen → frog → heron

2 [water ribbons → fresh water snails → black swan
water ribbons → fresh water snails → tortoise

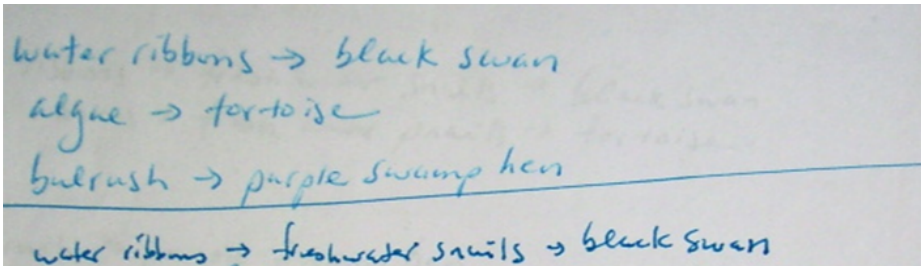
1 [water ribbons → black swan

1 [bulrush → purple swamp hen

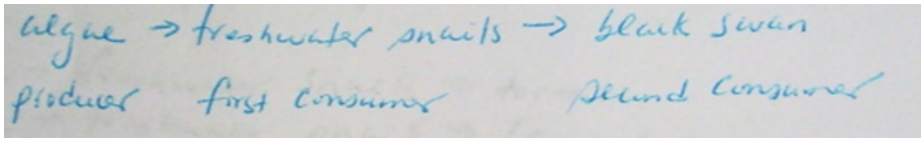
* **Answers will vary...be sure to have correct number of species!**

3. Write your food chains below. (7)

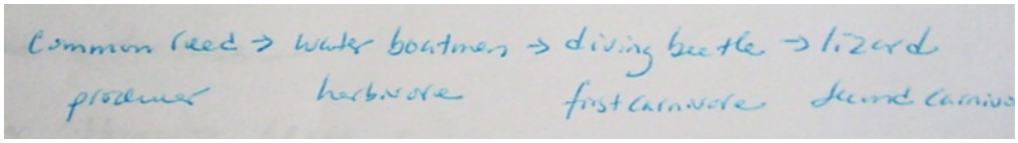
(i)



(ii)

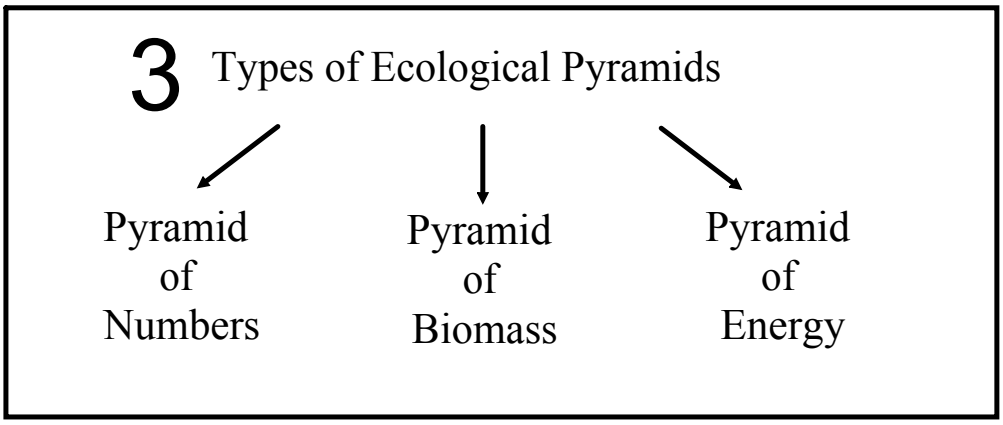


(iii)



Ecological Pyramids

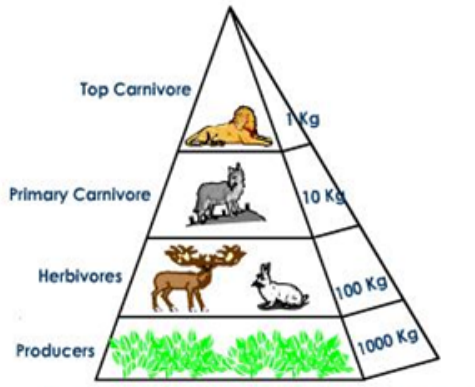
Ecological pyramids are graphical representations of the trophic structure of ecosystems.



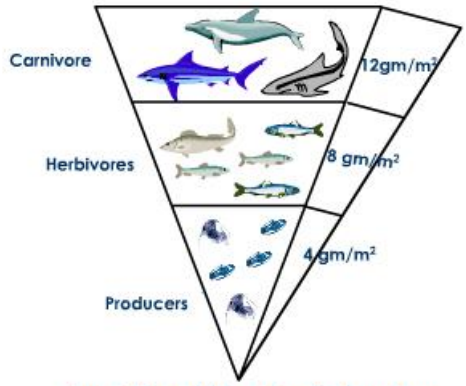
Pyramid of Biomass

- the graphic representation of the relationship between the amounts of biomass* at different trophic levels

*biomass - the total mass of all the living organisms in a given area



Upright Pyramid of biomass in a Terrestrial Ecosystem



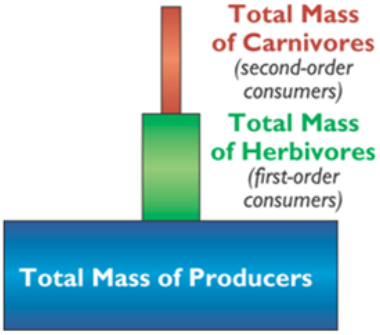
Inverted Pyramid in an Aquatic Ecosystem

Maximum mass occurs in producers.

Biomass of trophic levels depend upon the reproductive potential and longevity of the members.

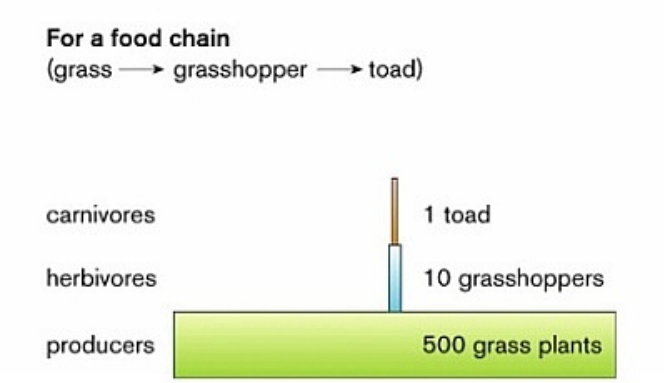
Pyramid of Biomass

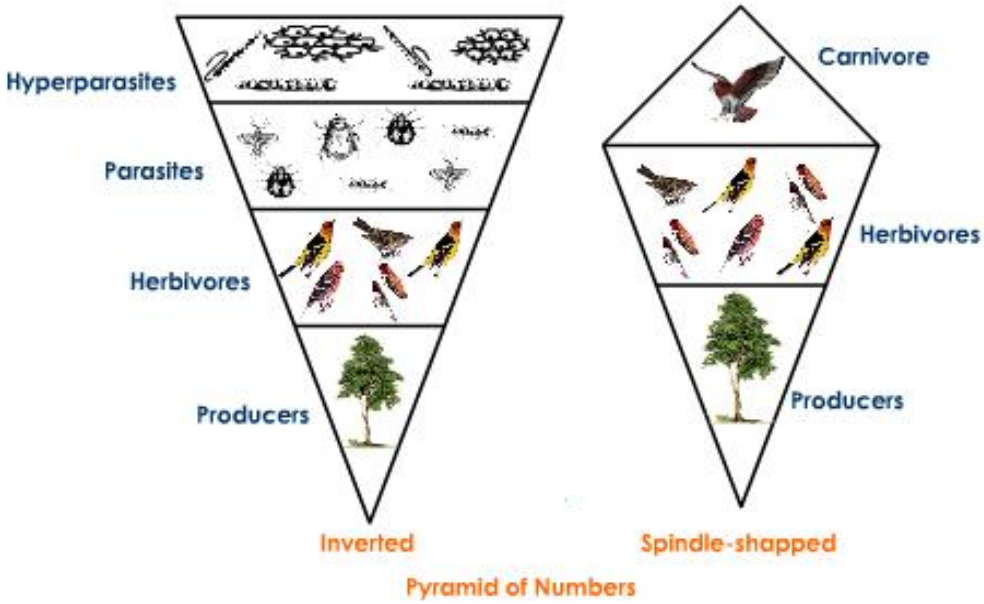
The biomass of the producers is always greater than the biomass of the herbivores, and the biomass of the herbivores is always greater than the biomass of the carnivores. The biomass decreases with each additional step in a food chain. A diagram that shows this decrease in biomass is a pyramid of biomass.



Pyramid of Numbers

- the graphic representation of the number of individuals at various trophic levels
- usually shows a large number of producers with diminishing numbers of consumers





hyperparasite - an organism that is parasitic on or in another parasite

Pyramid of Energy

- a graphic representation that shows the amount of energy that is available at each trophic level

Can an energy pyramid be inverted?

Never

Notes - Pyramids of Energy.pdf

Activity - Energy Pyramids.pdf

Square Based Pyramid Net.pdf

Pyramid Directions

1. Shade the first (bottom) level of each pyramid green.
2. Shade the second level of each pyramid yellow.
3. Shade the third level of each pyramid blue.
4. Shade the fourth (top) level of each pyramid red.
5. Label each level of the first pyramid side with the following terms as you move up the pyramid: producer, primary consumer, secondary consumer, tertiary consumer.
6. Label each level of the second pyramid side with the following terms as you move up the pyramid: plants, herbivores, carnivores, top carnivores.
7. Label each level of the third pyramid side with the following terms as your move up the pyramid: autotroph, 1st order heterotroph, 2nd order heterotroph, 3rd order heterotroph.
8. Draw a picture of what might belong in each level:
   1st: flowers, trees, grass, algae
   2nd: caterpillars, cows, grasshoppers, beetles
   3rd: humans, birds, frogs
   4th: lions, dogs, snakes
9. Fold your pyramid on the lines radiating from the center and tape it together.
10. Answer the following questions using your pyramid:
    a. What are three terms used to describe organisms such as trees?

    b. What are three terms used to describe organisms such as cows?

    c. What are three terms used to describe organisms such as humans?

    d. What are three terms sued to describe organisms such as lions?

    e. What do the organisms in each trophic level eat?

    f. Do organisms always stay in the same level? Explain your answer.

Notes - Pyramids of Energy.pdf

What Is the Pyramid of Energy?
Student Information Pages

Student Pages

Imagine you're driving down the road in a car. As you look out the window you notice a stretch of land with plants as far as the eye can see. Grass, flowers, trees, and other plants are visible in every direction. You probably wouldn't be too shocked or surprised. But imagine looking out the window to find animals as far as the eye can see. Snakes, hawks, rabbits, and other animals so thick you'd have to step over them to take a walk!

Why does our world have so much more plant life than animal life?

One explanation is called the Pyramid of Energy. You may know that all living things need energy, from the smallest bacteria to the largest plants or mammals. You may also know that people use food chains and food webs to show how this energy is passed from the sun to *producers* (plants) and then to *consumers* (animals, fungi, bacteria, etc.). What you may not know is that **every time energy is passed from one living thing to the next, only a small portion of the energy makes it to that next living thing.** By the time you get to the end of any food chain, most of the energy that was available at the beginning is no longer available. Scientists came up with the Pyramid of Energy to explain this.

The Pyramid of Energy

The Pyramid of Energy is a model that uses a pyramid shape to show that the energy available for consumers decreases as it travels through a typical food chain or web.

Producers are at the bottom of the pyramid because they are able to transform the sun's energy into a large amount of plant energy through the process of photosynthesis. Producers are the base of energy for most food chains and food webs.

Animals that eat plants make up the next level. These animals are called *primary consumers* because they are the first level of consumers. Primary consumers rely on plants for their energy. This level of the pyramid is smaller than the producer level because most of the energy used at the producer level is used by producers for their life processes (respiration, photosynthesis, reproduction, etc.) and transformed to heat before they are consumed.

Animals that eat primary consumers make up the next level. These animals are called *secondary consumers* because they are the second level of consumers. Secondary consumers rely on primary consumers for most of their energy. This level of the pyramid is smaller than the primary consumer level because most of the energy used at the primary consumer level is used for their life processes (respiration, digestion, reproduction, etc.) and transformed to heat before these animals are consumed.

Animals that eat secondary consumers make up the next level. These animals are called *tertiary consumers* because they are the third level of consumers. Tertiary consumers rely on secondary consumers for most of their energy. This level of the pyramid is smaller than the secondary consumer level because most of the energy used at the secondary consumer level is used for their life processes and transformed to heat before these animals are consumed.

It's possible to have additional levels of consumers, but in most food chains energy runs out by the second or third level.

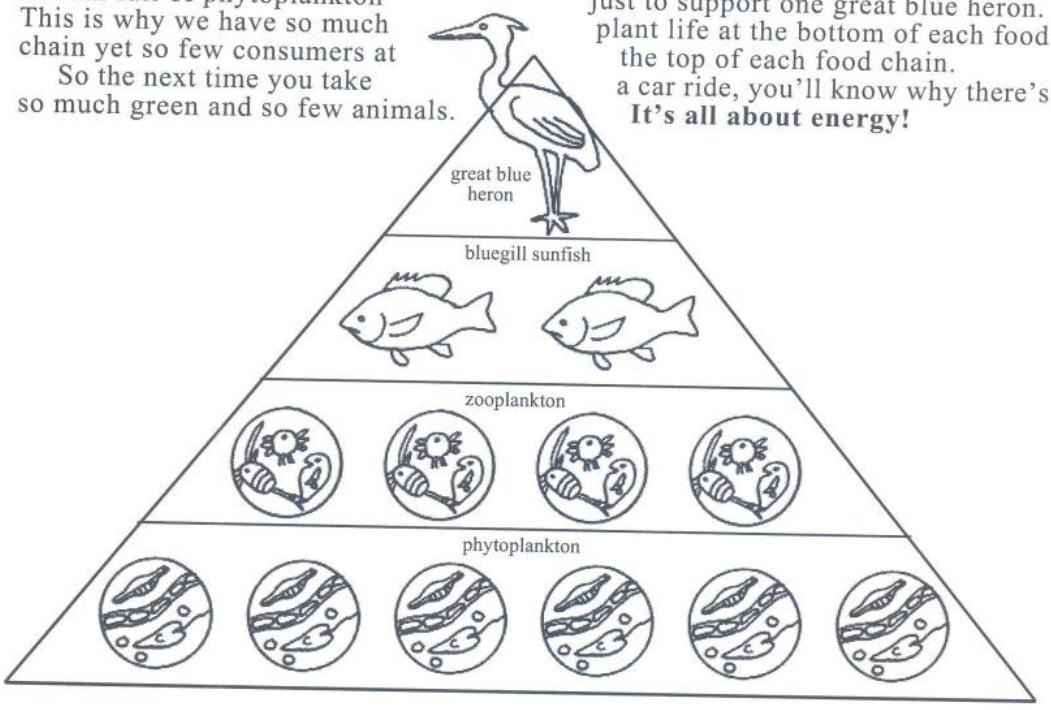
Use this page with the ***Science for Ohio*** What is thePyramid of Energy? 3D Model.

What Is the Pyramid of Energy?
Student Information Pages
(continued)

Student Pages

The Ten Percent Rule

How much energy is lost from one level to the next? Scientists say that on average 90% of the available energy is used for life processes such as respiration, photosynthesis, and reproduction and transformed to heat energy before an organism is consumed. This means **only about 10% of the original energy is left to feed the next level.** This 10% is stored in the tissues (leaves, stem, muscles, organs, fat, etc.) of the organism. To understand this more clearly, let's look at the wetland example on the Pyramid of Energy 3D Model. Here producers such as phytoplankton are producing 500,000 calories of energy from sunlight each day. If you gathered all of this phytoplankton into one spot, they might fill a space the size of a room. Since only about 10% of this energy reaches the zooplankton, this leaves about 50,000 calories of energy to support the zooplankton each day. If you gathered all of these zooplankton into one spot, they might fill a space the size of a school dumpster. Since only about 10% of this energy reaches the sunfish, this leaves about 5,000 calories of energy to support the sunfish each day. If you gathered all of these sunfish into one spot, they might fill a space the size of a trash can. Since only about 10% of this energy reaches the great blue herons, this leaves about 500 calories of energy to support herons each day. If you gathered all of the herons into one spot, **you would have only one!** Fortunately, animals don't just depend on one type of consumer to meet their energy needs. But in essence it takes the energy of a room full of phytoplankton just to support one great blue heron. This is why we have so much plant life at the bottom of each food chain yet so few consumers at the top of each food chain. So the next time you take a car ride, you'll know why there's so much green and so few animals. **It's all about energy!**



Use this page with the ***Science for Ohio*** What is thePyramid of Energy? 3D Model.

HOMEWORK...

- finish the activity
- build YOUR pyramid

Attachments

Notes - Pyramids of Energy.pdf

Activity - Energy Pyramids.pdf

Square Based Pyramid Net.pdf