

BIOMASS BASICS

Energy is stored chemically in a variety of biomass resources around us. Idaho National Laboratory and national labs around the country are developing technologies to harvest and convert this energy to a usable form to meet US needs and provide the US with economic opportunity.

GRADE LEVELS: K-9

VOCABULARY

BETO- The U.S. Department of Energy Bioenergy Technologies Office.

BIOENERGY- an energy produced from biomass that includes biofuels, biobased products, and biopower.

BIOMASS- an energy resource derived from plant and animal-based material. It includes agricultural residues (waste from food crop and animal manures) forest resources and purpose-grown energy crops such as algae, perennial grasses, and woody energy crops.

BIOENERGY PYRAMID- shows the biomass of each trophic level, and how energy moves through an ecosystem. As energy moves from producers to consumers, some energy is "lost" or given off as heat.

BIOPOWER- the use of biomass feedstocks to produce electric power or heat through direct combustion of the feedstock or other conversion processes. Power is generated with engines, turbines, fuel cells, or other equipment.

CONSUMERS- an organism that cannot make their own food and have to consume plants and/or animals for food.

ENERGY- an essential in our daily lives. We use it to fuel our cars, grow our food, heat our homes, and run our businesses.

ENERGY CROPS- a crop that is grown specifically for its fuel value.

PRODUCERS- organisms that produce their own food through photosynthesis such as trees, plants, and grasses that are the foundation of the biomass pyramid.

TROPHIC LEVELS- the place an organism (a plant or an animal) holds in a food chain -- in other words, what it eats and what eats it.

MATERIALS

- Paper, pencil, colored pencils or crayons.
 - Computer or tablet
 - Calculator
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PROCEDURE

Younger Students:

- Watch these bioenergy videos:
 - "Bioenergy: America's Energy Future " <https://www.energy.gov/eere/videos/bioenergy-america-s-energy-future>
 - "Energy 101: Biofuels" <https://www.energy.gov/eere/videos/energy-101-feedstocks-biofuels-and-more>
 -
- Print and color pages from the Bioenergy Coloring Book:
<https://www.energy.gov/eere/videos/energy-101-feedstocks-biofuels-and-more>

Older Students:

- Go around your house, calculate the amount of work done to lift different objects around the house and the power generated. Compare this to power needed for a light bulb.

F= ma (Mass of object (kilograms) x Acceleration due to Gravity)

$$(9.8 \text{ m/s}^2) = (\text{Newtons})$$

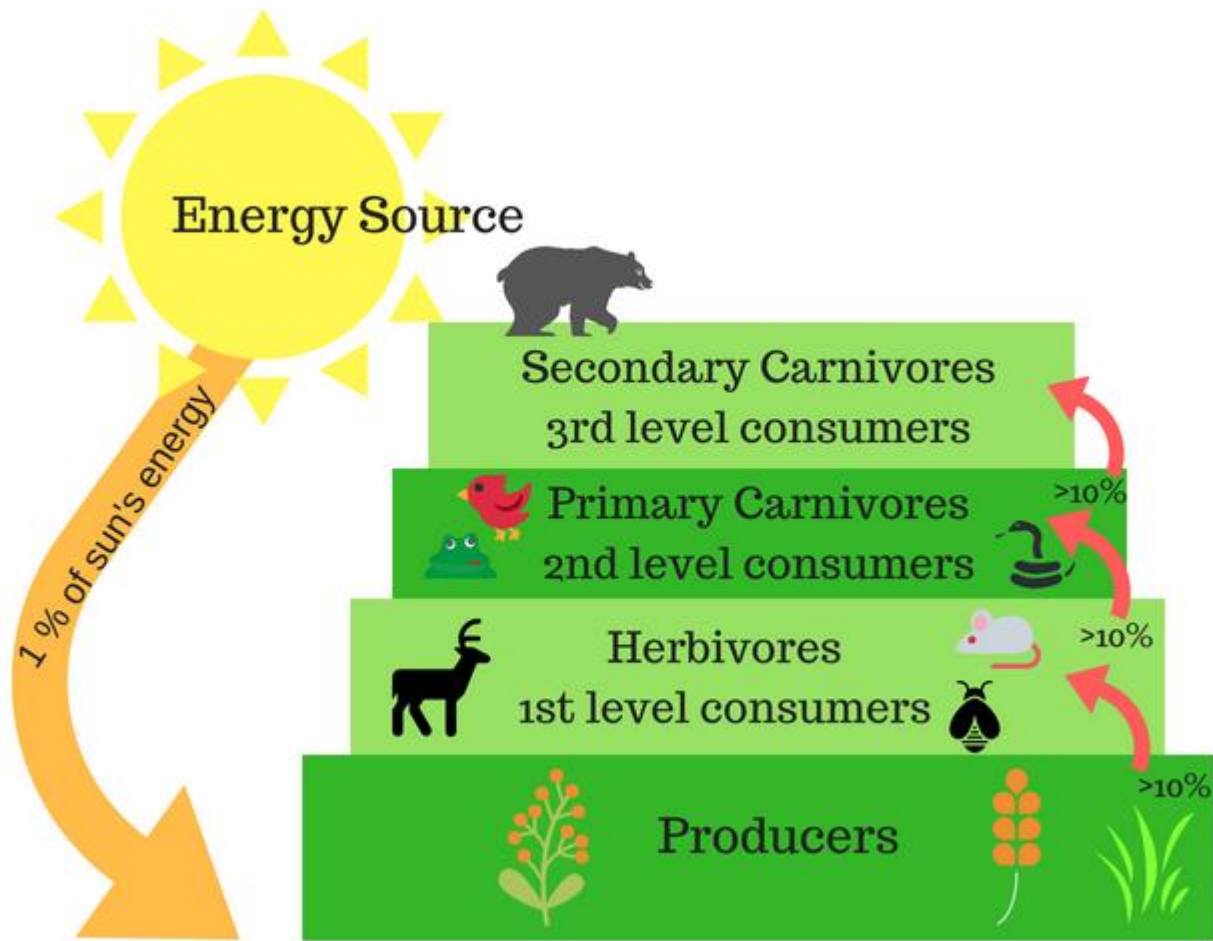
$$\text{lbs.} \div 2.2 = \text{kilograms}$$

W=Fd (Force (Newtons) x distance (m) =Joule)

P=W/t (Work (Joule) ÷ time (seconds) = Watt)

THE SCIENCE BEHIND IT

Energy is the ability to do work, which is applying a force to move an object. One of the main ideas is where energy originally comes from in an ecosystem. Use the energy pyramid to help students understand that all the "energy" on the planet comes from the sun, is converted by plants into carbohydrates that other organisms consume. It's important to note that of only 1% of the sun's energy makes it to the earth to be transformed. Each time an organism is consumed less than 10% of its energy is transferred to the next level in the pyramid.



EXTENSIONS

- Learn more about food chains and food webs by watching ["Crash Course Food Chains"](#)

Grades 6-9:

- After learning about bioenergy, take the ["Bioenergy Quiz"](#) to see how much you've learned.
- Try the ["Bioenergy Basics 101 Game"](#)

RESOURCES

- BETO Educational Resources: Bioenergy in the Classroom <https://www.energy.gov/eere/bioenergy/educational-resources-bioenergy-classroom>
- Watch "Crash Course Food Chains:" <https://youtu.be/CZhE2p46vJk>

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