Energy Flow Through Ecosystems

Ecosystem Interactions
Energy Flow Through Ecosystems

• **Focus Questions:**

  ▫ How does energy flow through an ecosystem?
  
  ▫ How can we use food webs to predict the effects of particular events on an ecosystem?
Food Web

- A **Food Web** is a diagram showing the inter-relationships between organisms and the way that energy flows through an ecosystem.
Food Web Activity

• Follow the procedures on your student sheet to complete the activity
Activity REVIEW

Monitor your understanding...
How do organisms get energy?

• **Producers** - organisms that produce their own food, often by photosynthesis

• **Consumers** - organisms that must eat other organisms to obtain energy

• ** Decomposers** - organisms that consume dead organisms and keep nutrients flowing through the ecosystem
Giant Kelp

Bacteria

Cyanobacteria

Phytoplankton

Acid Kelp

Zooplankton

Pacific Herring

Rockfish

Sea Urchin

California Sheephead Fish

Sea Otter

Harbor Seal

Phytoplankton

Producers
Consumers
Decomposers

Bat Star

Cyanobacteria

Giant Kelp
Procedure Part B

- **Summary of Event:**
  - Pesticides used to kill brown moths gets into ground water

- **Short-term effect:**
  - Phytoplankton and zooplankton die

- **Long-term effect:**
  - Sea urchins, herring, rockfish and bat stars have less food and the populations decrease. Sea urchins eat more giant kelp, since they have less phytoplankton to eat, harbor seals will eat more sheephead because they have less herring and rockfish to eat

Day 3
• Summary of Event:
  ▫ New housing development built on the coast
• Short-term effect:
  ▫ Small plants die; sea urchin die
• Long-term effect:
  ▫ Sea urchins and bat stars die because they have no algae to eat. Rockfish, sheephead and sea otters have less food once the bat stars and urchins die
• Summary of Event:
  ▫ Harbor seals die off
• Short-term effect:
  ▫ Harbor seals die, rockfish and sea urchin populations grow
• Long-term effect:
  ▫ More sea urchins and rockfish eat more of the giant kelp, less kelp means that the other organisms that eat kelp will have less food and their populations will decrease
• Summary of Event:
  ▫ Nitrogen runoff causes algae blooms (eutrophication)
• Short-term effect:
  ▫ Cyanobacteria and phytoplankton populations grow rapidly
• Long-term effect:
  ▫ Kelp populations decrease because less light reaches them, populations of zooplankton and bat stars increase because they have more available food. Decomposers will have an abundance of food and will use up much of the oxygen
Trophic (feeding) Levels

- **Primary Consumers** - eat producers
- **Secondary Consumers** - eat primary consumers
- **Tertiary Consumers** - eat secondary consumers

Producer → Zooplankton → Pacific Herring → Harbor Seal
Additional Vocabulary:

- Herbivores - eat plants (producers)
- Carnivores - eat herbivores (or other carnivores)
- Omnivores - eat both plants and other consumers
So which terms are related?

- With your partner, group the similar terms:
  
  Producer
  
  Tertiary Consumer
  
  Consumer
  
  Secondary Consumer
  
  Primary Consumer
  
  Herbivore
  
  Carnivore
  
  Omnivore
  
  Heterotroph
  
  Autotroph
  
  Decomposer
Related Terms:

Producer - Autotroph

Consumers - Heterotrophs:
  Tertiary Consumer – carnivore or omnivore
  Secondary Consumer – carnivore or omnivore
  Primary Consumer - herbivore
  Decomposer
Analysis Question #1

- How is the niche of phytoplankton different from that of zooplankton in this ecosystem?
  - Phytoplankton are producers that get energy from the sun. They then provide a source of energy to the zooplankton when they are eaten.
Analysis Question #2

• Explain the role of the sun in the kelp forest ecosystem.
  ▫ The sun provides energy that is used by producers to perform photosynthesis and make food (glucose). No sun = no energy for living things
Analysis Question #3

• Describe the flow of energy in the kelp forest ecosystem.
  ▫ The sun provides energy to the producers, who convert the sun’s energy into food (glucose).
  ▫ Primary consumers get their energy by eating the producers, secondary consumers eat primary consumers, and tertiary consumers eat secondary consumers. Only 10% of the energy available to the next level.
  ▫ Decomposers feed on dead producers and consumers.
Analysis Question #4

• Explain why a pyramid is helpful for describing the amount of energy available in a food web. What happens to the energy as you move up the pyramid?
  ▫ The top of a pyramid is the smallest, the base is the largest. This shows how there is less energy available as you move up the pyramid from producers to consumers. Most of the energy is used by the organisms or lost as heat.
Crash Course Astronomy

- https://www.youtube.com/watch?v=v6ubvEJ3KM