



Top of the Food Chain (Apex Predators)

Teacher Lesson Plan

Lesson Time: 45 minutes – 1 hour

Game: 30-45 minutes

Introduction: Apex predators play a vital role in any ecosystem. What would happen if they were taken away? This lesson plan helps students discover the important balance of predators and prey. We will focus on the apex predators that are here at Turpentine Creek Wildlife Refuge, and what would happen to their ecosystem if they were to disappear.

Background: Turpentine Creek Wildlife Refuge's mission is to provide lifetime refuge for abandoned, abused, and neglected big cats with an emphasis on tigers, lions, leopards, and cougars. Being born into captivity, these animals can never be released back into the wild. They not been taught to survive in the wild by their mothers, and also cannot manage to find territory, mates, or food due to human interference. By learning about the importance of the food chain, we can protect predators and the balance of the entire ecosystem in the natural world.

Theme: Apex predators are at the top at the food chain, so they affect everything below them. This is called a top-down regulating force. Without predators, this regulating force disappears on the environment and the trophic cascade and systematic food chain collapses. Herbivores increase, overconsuming primary producers. When these producers decline, it leads to a decline of producers and all other species that depend on them. Without apex predators, a mesopredator release can also occur, where predators in the middle of the food chain (secondary consumers) become overabundant, causing an ecological imbalance.

Objective: Students will identify the different parts of the food chain, and the importance of predators in an ecosystem. They will use their vocabulary list and associate words with the lesson plan, and identify characteristics of a predator, as well as the role they play in the food chain.

Resources: Lesson plan for appropriate grade level, printed activities, string/rope, dry erase board and marker, pictures of animals, crayons or markers, pencil.

*Note: Worksheets are for educational, classroom, or personal use only. They should not be shared publicly, reproduced, or posted Online at any time without TCWR's permission. Please contact TCWR's Education Department at: education@tcwr.org with questions or concerns.



Vocabulary List:

Apex Predator: top of the food chain. Top predator, no other creatures prey upon them.

Autotroph: produces food through photosynthesis (energy from sunlight)

Biological Diversity: variability among living organisms from all sources

Carnivore: only consumes meat, hunts or scavenges for prey

Ecosystem: biological community of interacting organisms and their physical environment

Food Chain: a series of organisms each dependent on the next as a source of food

Food Web: Unique interactions and relationships involved in the transportation of energy between living organisms

Herbivore: only consumes plants

Heterotroph: organism that cannot manufacture their own food, obtains food and energy from plants and animals

Keystone Species: a species on which other species in an ecosystem largely depend, such that if it were to disappear the ecosystem would drastically change

Mesopredator: middle of the food chain example: foxes and coyotes

Omnivore: eats both plants and meat

Primary Producer: the foundation of an ecosystem, creating food through photosynthesis or chemosynthesis

Predator: hunts and naturally preys on other animals

Prey: what predators eat, hunted and killed for food

Primary Consumers: animals that eat primary producers (herbivores)

Secondary Consumers: carnivores or omnivores, can be preyed upon by tertiary consumers

Tertiary Consumers: apex predators, at the top of the food chain, feeds upon secondary and primary consumers

Trophic cascade: triggered by the removal of apex predators, changes the ecosystem structure and nutrient cycling (negative effect).

Umbrella Species: protecting these species indirectly protects the any other species within the same ecological community



4th grade

4-LS1-1: Students will identify the different trophic levels within the food chain, and how they use their internal and external structures to support survival, growth, behavior, and reproduction. They will also identify what happens when the food chain is disrupted, and the consequences it has on a specific ecosystem.

- 1) Introduce the theme of the lesson to the class: Top of the Food Chain
 - a. What do animals at the **top of the food chain** need to survive, grow, reproduce, conduct natural behaviors, and reproduce?
 - b. What skills do they need to support their survival?
 - i. Examples: knowing how to hunt successfully, the ability to sense their surroundings and sneak up on prey, the ability to communicate with the same species, and how to sense danger around them, strong sense of smell, knowing where to find water and shelter, being solitary vs. social animals.
 - c. Which internal and external structures do animals at the top of the food chain need to survive?
 - i. Examples: Sharp claws and teeth for hunting, sharp eyesight, camouflage, whiskers to sense space, thick fur for protection, strong muscles.
- 2) Which internal and external structures does **the bottom of the food chain** need to survive, grow, reproduce, conduct natural behaviors, and reproduce?
 - a. Examples: Internal structures: ability to sense danger, find food when it is scarce, find water and shelter, being solitary vs. social animals, communication with the same species.
 - b. External: Strong muscles to run from prey, strong sense of smell, strong eye sight, camouflage.
- 3) Print one page per student or group from the predator vs. prey game. Have students identify both internal and external structures that each species uses. They may use vocabulary list to describe each species. **Use worksheets pages 11-13**
 - a. Food chain activity reading **worksheet page 4, worksheet pages 5-6**
 - i. arrange each species from primary producers to tertiary consumers.
 - ii. What would happen when you take away one of the trophic levels?
 - iii. Energy in a food chain moves from the bottom to the top
 - b. Food web activity- **Worksheet pages 7-8**
 - i. what is the difference between the food chain and the food web that you see?
 - ii. Food web shows that everything is connected, and it is not linear like the food chain.
- 4) Predator vs. Prey Game- follow procedures on **worksheet pages 9-13** and go over rules ahead of time. Use the predator vs. prey sheets for the game.
- 5) Additional Worksheets- Predator Research **page 14**, Vocabulary quiz **page 15**, Reading assignment **page 16**
- 6) Class Discussion
 - a. What happens to the rate of survival when the food web is disrupted?
 - b. How do humans harm the balance of nature?
 - c. Is there anything that we can do as people to protect the environment?
 - d. What did you learn today?

Food Chain Activity Worksheet

There are 6 different types of consumers in the animal kingdom. Read the descriptions below to learn more about feeding styles in the wild. Plants and animals have evolved to have many different survival skills to adapt to their surroundings. Plants and animals can have more than one feeding type.

Decomposer- an organism that decomposes organic material (dead things) and help recycle them back into their environment for plants to use.



Producer- plants make their own food, and use energy from the sun, carbon dioxide (CO₂) from the air, and water to make glucose (sugar) and produce oxygen.



Consumer- Animals are called consumers because they cannot create their own energy, and they must eat something to survive. There are 3 different types:

Herbivores- only eat plants



Omnivores- eat plants and animals



Carnivores- only eat animals

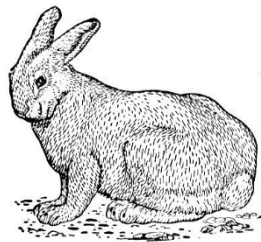
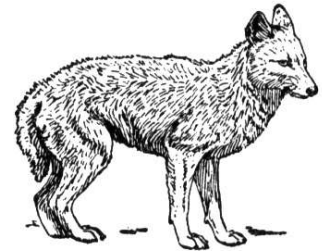
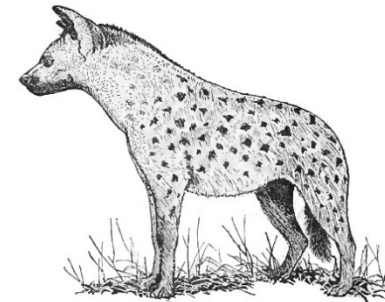
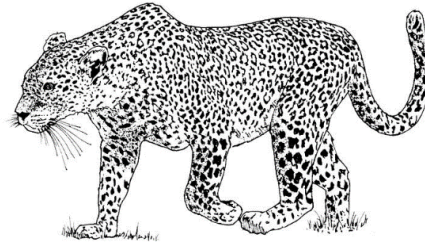
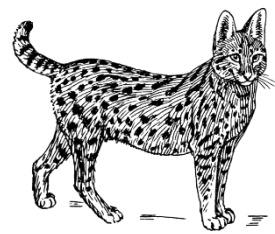
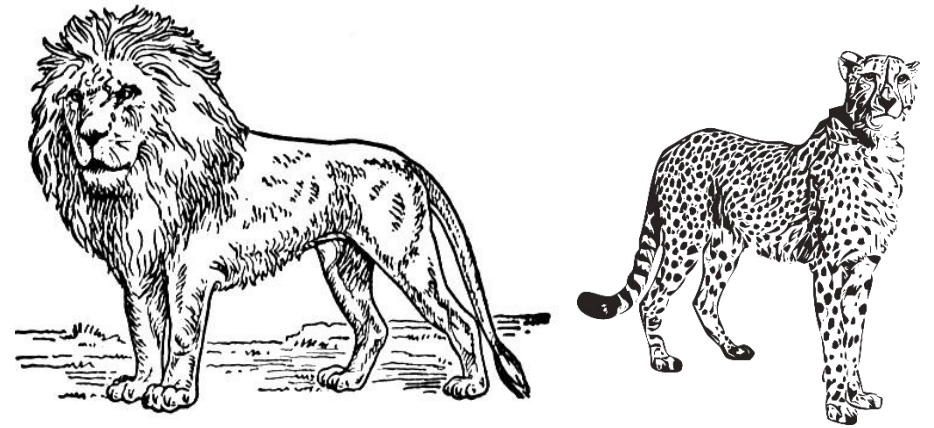


Now, draw a red circle around all of the predators. Draw a blue circle around all of the prey. Draw a green circle around all the producers. Draw a brown circle around the decomposers. There can be more than one for any type of animal.



African Savanna Food Chain Activity:

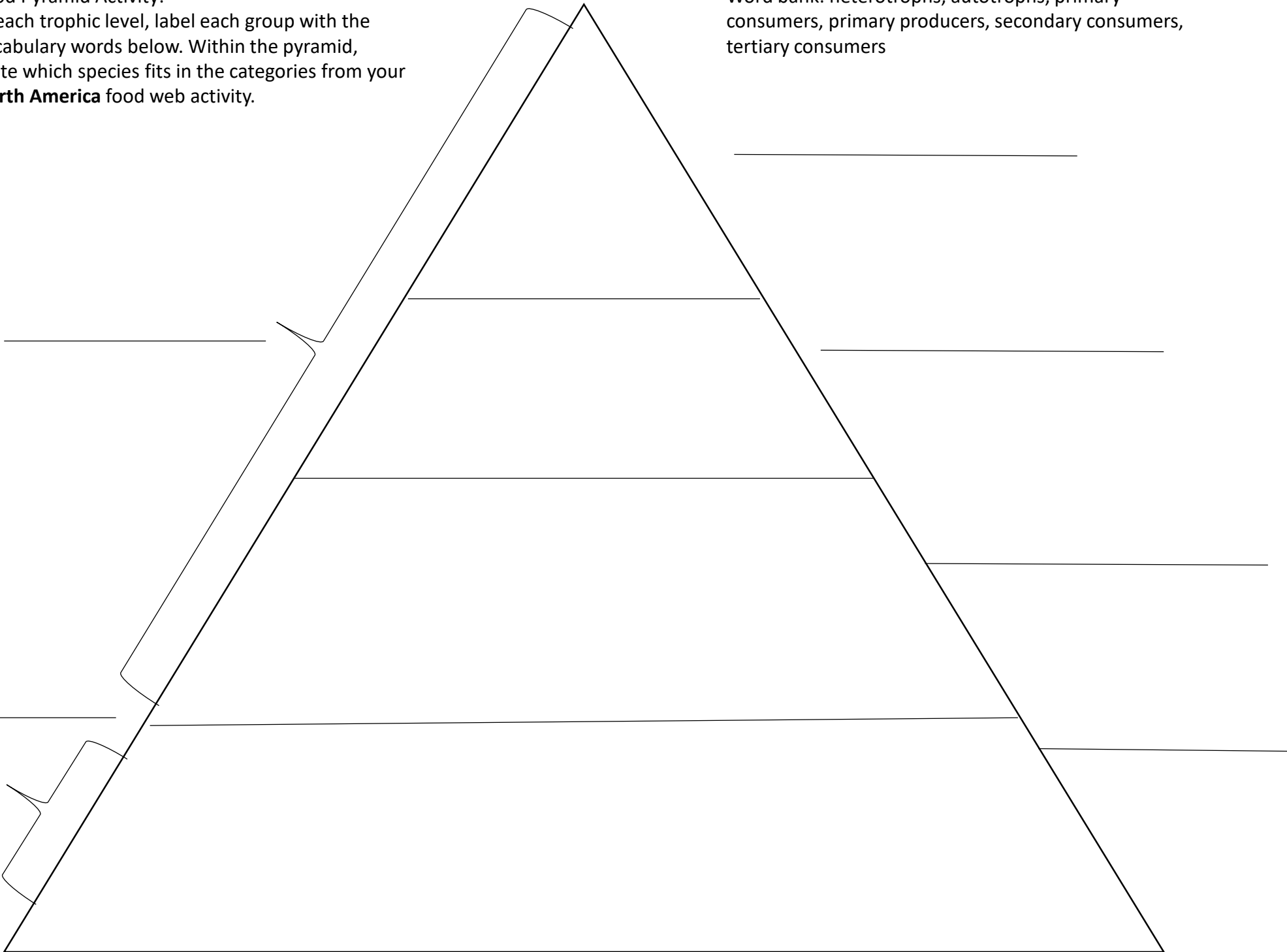
- Draw a line from each organism to what they eat. Then label the pictures using vocabulary words below:
Tertiary Consumer, Secondary Consumer, Primary Consumer, Primary Producer
- Circle which animals live in groups



Food Pyramid Activity:

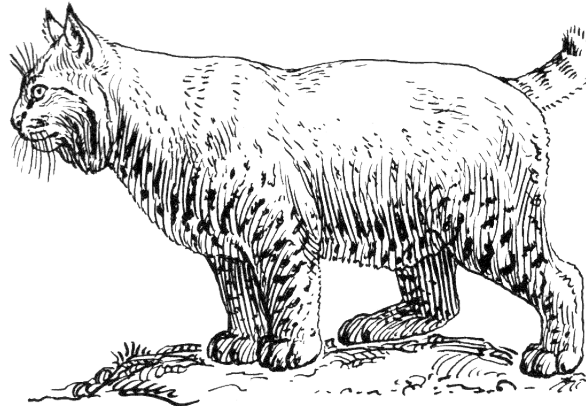
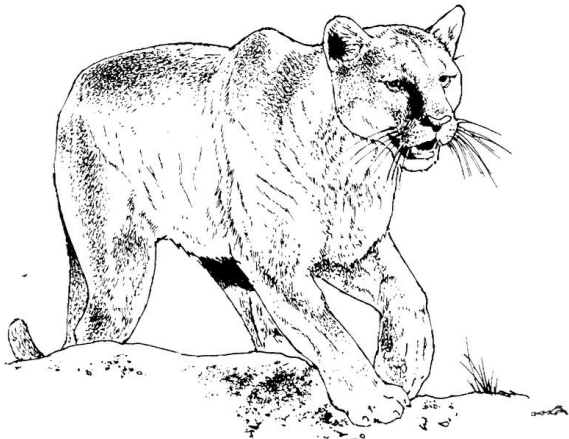
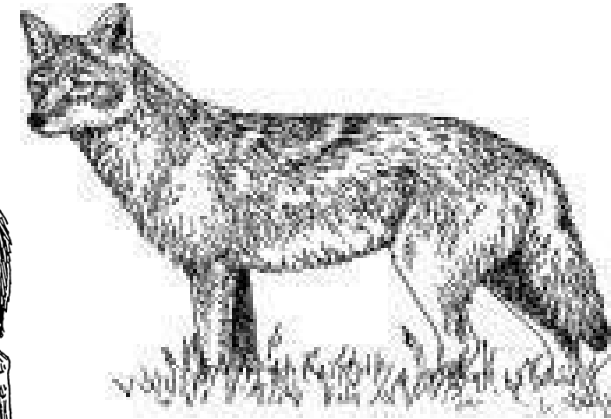
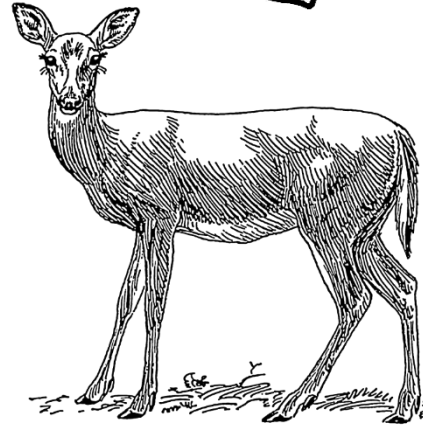
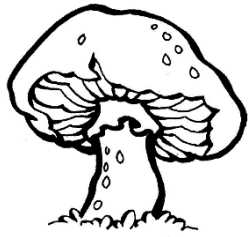
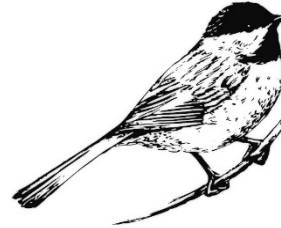
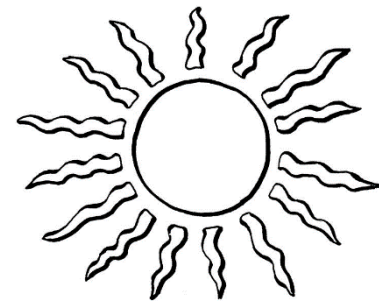
In each trophic level, label each group with the vocabulary words below. Within the pyramid, write which species fits in the categories from your **North America** food web activity.

Word bank: heterotrophs, autotrophs, primary consumers, primary producers, secondary consumers, tertiary consumers



North America Food Web Activity:

- 1) Draw an arrow to each plant or animal and what it consumes. Color predators red, prey blue, plants green, and decomposers brown.
- 2) After you have labeled and circled all of your feeding types, draw a smiley face on the food web where you think humans will go, and make them a part of your food chain by drawing lines to what they would eat





Food Web Discussion Questions Sheet:

1) Can a predator also become prey? What are some examples from your worksheet?

2) What do you think would happen if all the predators disappeared from the food web?

3) What about if all of the prey disappeared?

4) Do pollinators like bees, flies, and butterflies play an important role in the food web?

5) How would losing parts of the food web impact you?

6) Brainstorm 3 different ways that a food web can be disturbed:

- a. 1) _____
- b. 2) _____
- c. 3) _____

7) Brainstorm 3 different ways that you can help protect the ecosystem balance:

- a. 1) _____
- b. 2) _____
- c. 3) _____

Everything on the Earth is connected both living and non-living. It is important that we make good choices that keep a healthy ecosystem, and provide balance for the planet. If a food web is broken, it can cause animals to go extinct, but also threatened the survival of humans. Share with your class ways that you can help protect the environment for the future.

Predator vs. Prey Game (K-5)

This program allows students to understand the importance of the food web, and the species within them. It is also a great way to get students outside and active.

Getting Ready:

- Use tags of animal species and cut them out. Print two pages of each species page, so there is a variety for the game.
- You may laminate them to use them multiple times, or allow the students to color them and make a food chain afterwards.
- Making necklaces out of the animal cards makes it easier to play the game, hands free, or they can be taped on.

Procedure:

- 1) Assign each student an animal from the pictures, and ask them to identify what that animal eats, or how it gets its energy (if a plant). They can draw their animal and try and guess what they eat before the game.
- 2) Take the students to an open field or gym to play the game. Have them stand in a circle and state what kind of animal or plant they are, and what they would eat?
- 3) How to play: Students can chase their prey and what they eat in a game of tag. When they catch their prey, have them say "I ATE YOU". Emphasize that there is no shoving or pushing, that it is a friendly game of tag.
- 4) Students should keep track of how many times they tagged someone, they do not need to keep track of them being tagged.
- 5) After 10 minutes, have the students go back into a circle, and say how many times they got to eat. If they were only something that were eaten, would they have survived?
- 6) You may repeat the game multiple times, switching up which animals the students are. You can also add more prey items and less predators, or all predators and no prey. Change up the balance of the species in different rounds. The last round, students have fun choosing which species they would like to be.

Discussion Questions:

- 1) Why is it important that there is a variety between predators and prey?
- 2) What happens when you take away predators?
- 3) What happens if there are too many predators?
- 4) What happens when there is not enough prey?
- 5) How does the food web affect humans?
- 6) What if we took away your animal from the food web, how would it affect the other species?
- 7) Can we help protect wildlife? How?
- 8) What did you learn from this activity?



What Will I Eat?

Vulture- carnivore- small prey items, large freshly dead animals, insects, fish, amphibians, birds, mammals, reptiles

Frog- carnivore- insects, worms, small prey, reptiles, mammals

Coyote- omnivore, small and large prey, mammals, berries, nuts, insects, bird eggs

Cougar- carnivore- main diet is deer, but will go after medium sized prey, rabbits, coyotes

Chipmunk- herbivore- nuts, berries, mushrooms

Earthworm- decomposers- breaks down grasses, plants, dead leaves, mushrooms

Butterfly- herbivore- feeds on nectar from plants, berries, grasses

Deer-herbivore- grasses, acorns, leaves, nuts

Bobcat-carnivore- small prey, rabbits, amphibians, birds, chipmunks, mice, squirrels

Chickadee (bird)-omnivore, insects, seeds, berries, worms, nuts

Fish- herbivores, omnivores, or carnivores- insects, worms, berries, plants, nuts

Grasshopper-herbivore- plants (leaves and grasses)

Rabbit-herbivore- plants, nuts, mushrooms, berries

Mosquito-parasite/carnivore- feeds off of animal blood

Bear-omnivore- plants, mushrooms, fish, rabbits, deer, insects, worms, berries, nuts (fun fact: bears are 90% vegetarian, and forage for most of their food).

Snake-carnivore-small prey, squirrels, rabbits, mice, insects, worms, birds

Owl-carnivore- small prey, mice, squirrels, snakes, fish, frogs, chipmunks, worms, insects

Squirrel-herbivore- nuts, berries, plants

Hawk-carnivore- small prey, birds, mammals, amphibians, reptiles, fish

Mouse- herbivore or omnivore, opportunistic feeders- plants, nuts, mushrooms, berries, insects, worms

Eagle-carnivore- small prey, birds, mammals, amphibians, reptiles, fish

Fly-omnivore- decaying matter (anything that has died), plants and animals

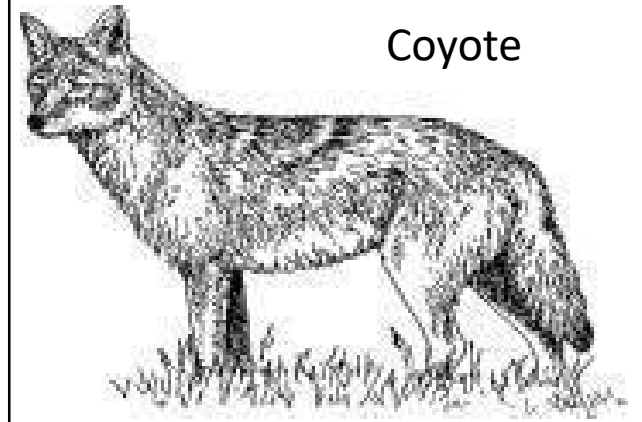




Vulture



Frog

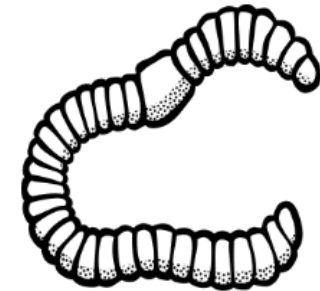


Coyote

Cougar

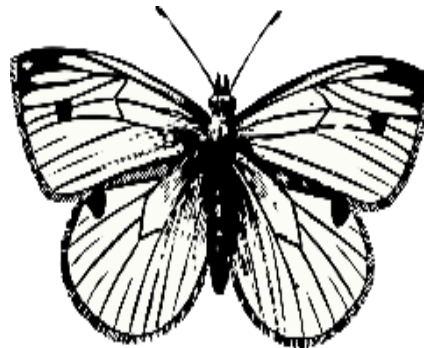


Chipmunk



Earth Worm

Berries

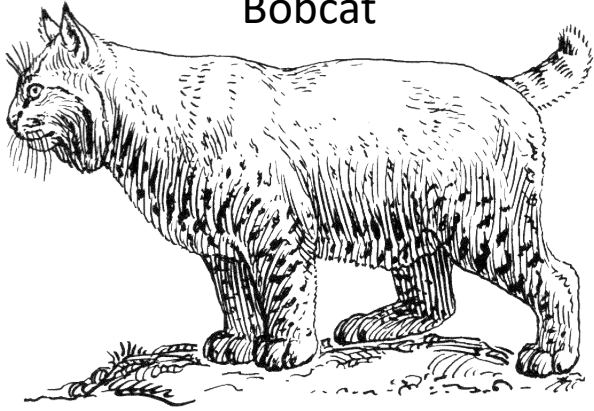


Butterfly

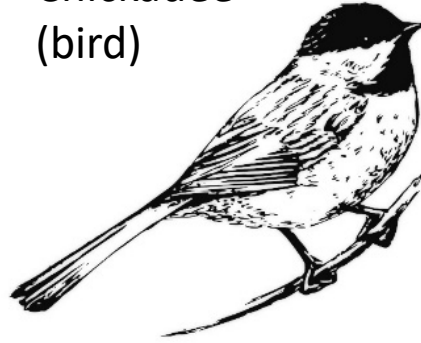


Deer

Bobcat

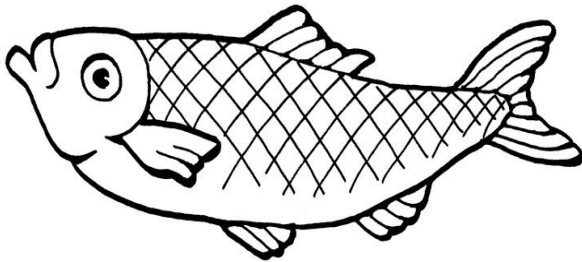


Chickadee
(bird)

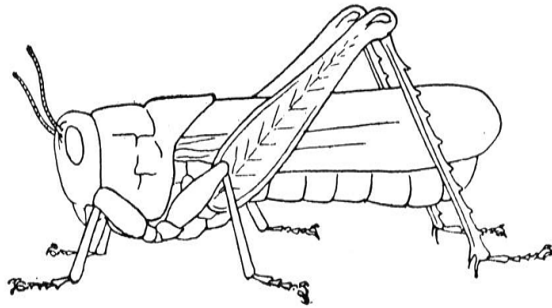


Acorn

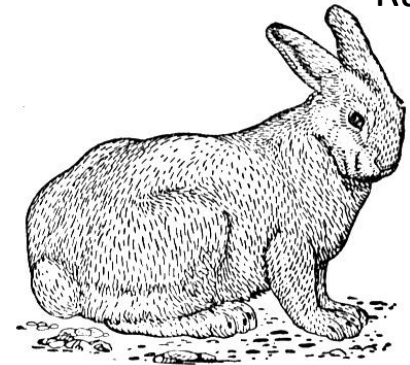
Fish



Grasshopper



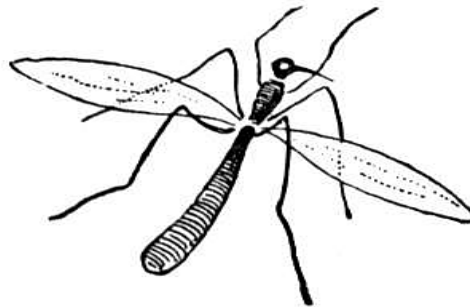
Rabbit



Mushroom



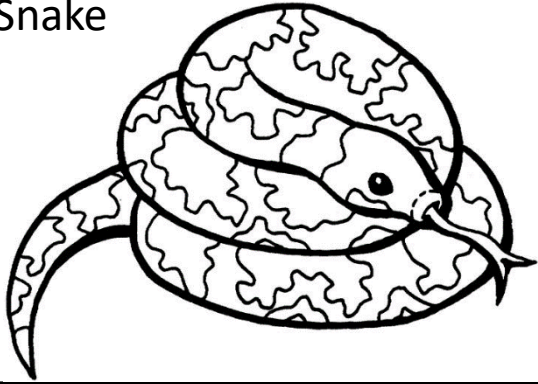
Mosquito



Bear



Snake



Owl



Leaf



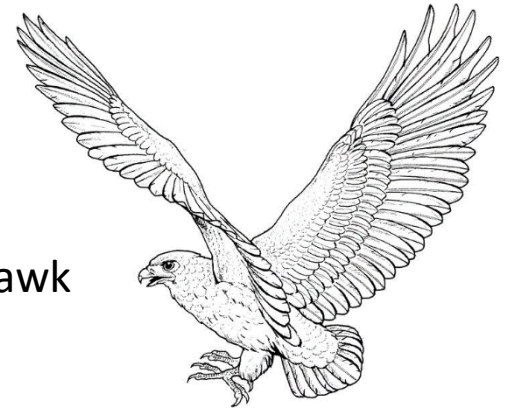
Grass



Squirrel



Hawk



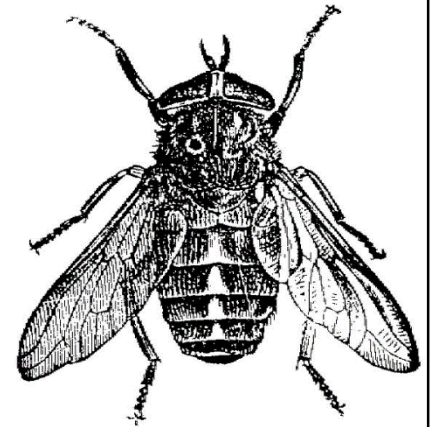
Mouse



Eagle



Fly



Top of the Food Chain: Research Activity



Species Name: _____

Location Species is found: _____

Trophic level: _____

Feeding style: _____

What does it eat?

How does it gain energy?

Does it get eaten? By which species?

What do you think would happen if it was removed from the ecosystem?

How can we help protect your species?

Draw a picture of your species in its environment:

Vocabulary Quiz:

- What type of animal hunts for its food? _____, what do they eat?

- A _____ only eats meat, a _____ only eats plants, and an _____ eats both plants and meat.
- Which kind of organisms cannot manufacture their own food? _____
- Which trophic level is the foundation of an ecosystem? _____
- Which organisms produce energy through photosynthesis? _____
- Variability among living organisms from all sources is called _____
- _____ are hunted for food.
- _____ consumers are at the top of the food chain.
- A series of organisms that depend on the next source as food is called a _____
- What type of consumers only eat plants? _____
- An _____ helps to protect other species within the same ecological community.
- If you remove apex predators, a _____ is triggered, changing the ecosystem structure. Does it have a positive or negative effect? _____
- _____ can be omnivores or carnivores, and can also be preyed upon by _____.
- The unique interactions and relationships involving the transportation of energy between living organisms is called a _____.
- A _____ is a species in which all other species in an ecosystem depend on. If it were to disappear, the ecosystem would drastically change.
- Biological communities of interacting organisms and their physical environment is called an _____.



Reading Assignment:

Predators are an important part of the food chain, and help maintain a healthy ecosystem. They are called a keystone species, meaning losing them in an ecosystem would drastically change the environment. When an ecosystem is in balance, this is called an equilibrium. When it is disrupted, the entire natural world is off balance. Humans play an important role in maintaining this equilibrium, although we also threaten the natural world.

The main threats that predators face are urban development such as building houses and structures where wildlife lives. This causes habitats to become scattered or fragmented, and animals cannot flow freely throughout their home to find food, shelter, and mates. As the human population grows, we continue to push wildlife and predators into smaller and smaller habitats.

Over hunting is also an extreme threat to predators. They are hunted for their furs, and also because of fear. Many farmers may lose livestock due to living in areas that have predators, and they will illegally shoot them to protect their animals. Human and wildlife conflict is a great threat to the natural world. When we lose predators in these areas, the amount of herbivores increase because nothing is hunting them.

For example, in areas where wolves and cougars were once abundant, there has been an extreme decrease due to over hunting of these predators. They hunt deer, keeping the populations in a healthy balance. When deer have nothing eating them, their populations are too high, causing diseases such as chronic wasting disease, which is easily spread and the deer die.

Where predators have been re-introduced, studies have shown that the balance of the ecosystem or equilibrium is put back in to place. A great example is the reintroduction of gray wolves into Yellowstone National Park. These predators have helped re-balance coyote and elk populations, also helping rebound the aspen population in the park.

With predator loss some species will become more abundant, the majority of all species (including humans) will suffer loss due to ecological changes. Climate change majorly affects all aspects of life because of the drastic changes to the ecosystem. Polar bears are an example of this. They are apex predators and at the top of the food chain, and help regulate prey populations. With the ice caps melting, they no longer have access to vital hunting grounds, and are starving.

By managing and restoring apex predators into formerly occupied ranges can help restore balance and ecosystems. Managing the landscape for apex predators ensures that all of the other flora and fauna (plants and animals) in that area will also be protected in that region. That means that predators are an umbrella species, or protecting the ecosystem around them.

25% of all species in the Order Carnivora have a “Vulnerable” or greater designation on the International Union of the Conservation of Nature red list of endangered and threatened species. 10% are “Near Threatened”.

Conclusion: As human populations continue to reduce predator populations, the ecological balance is lost and herbivores become overpopulated. By protecting apex predators, we will be able to preserve biodiversity.



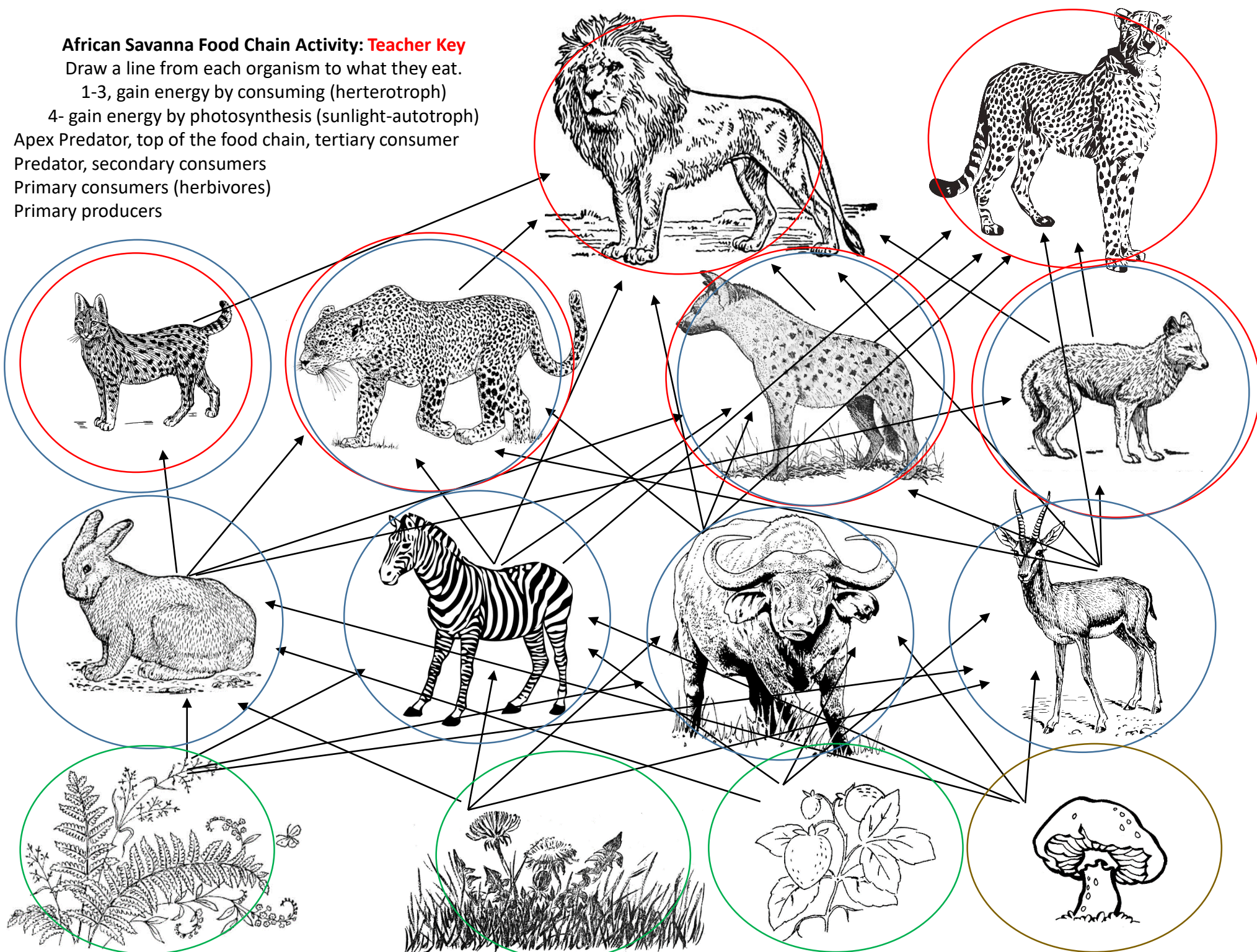
African Savanna Food Chain Activity: **Teacher Key**

Draw a line from each organism to what they eat.

1-3, gain energy by consuming (herterotroph)

4- gain energy by photosynthesis (sunlight-autotroph)

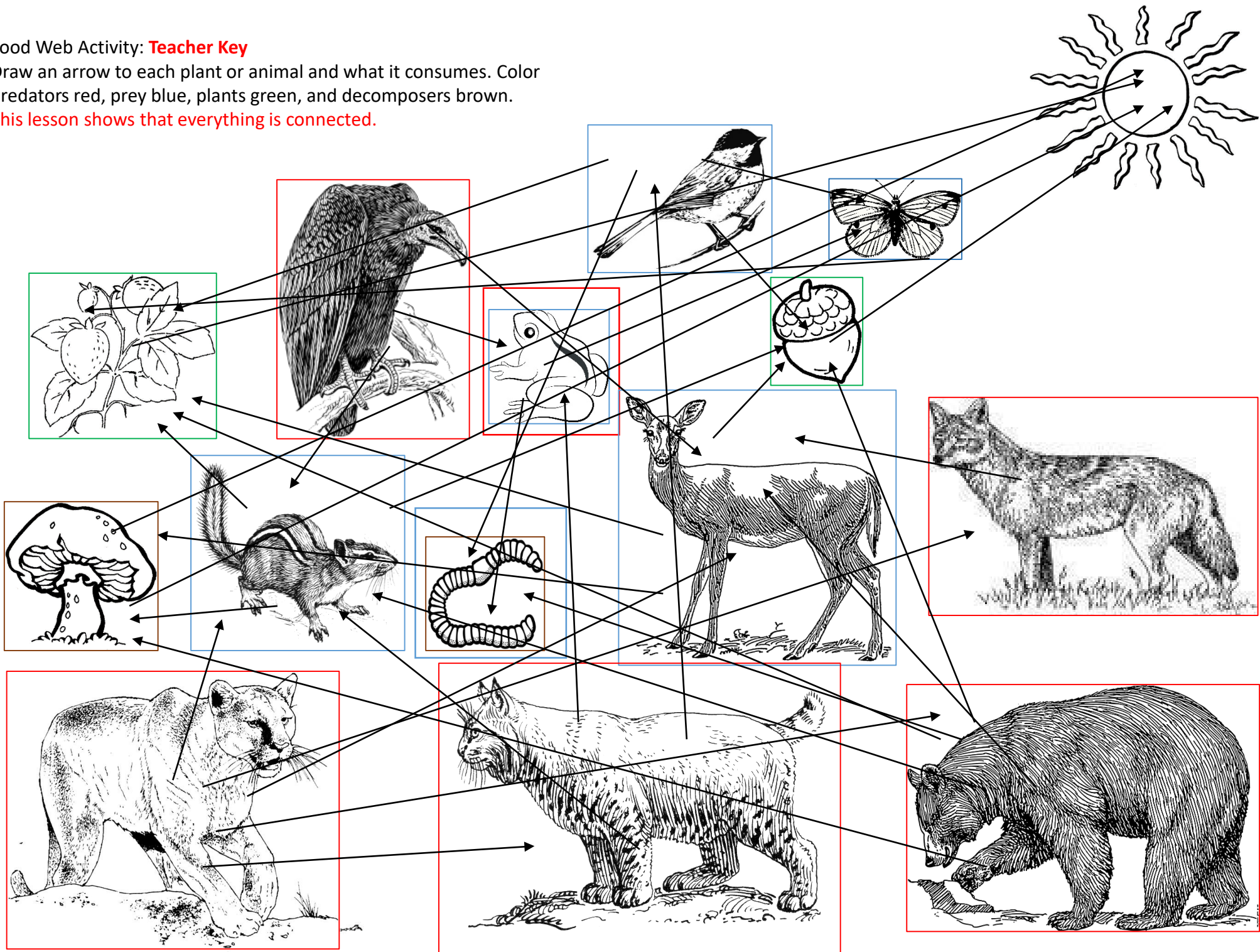
- 1) Apex Predator, top of the food chain, tertiary consumer
- 2) Predator, secondary consumers
- 3) Primary consumers (herbivores)
- 4) Primary producers



Food Web Activity: **Teacher Key**

Draw an arrow to each plant or animal and what it consumes. Color predators red, prey blue, plants green, and decomposers brown.

This lesson shows that everything is connected.



Food Pyramid Activity: **Teacher Key**

In each trophic level, label each group with the vocabulary words below. Within the pyramid, write which species fits in the categories from your food web activity.

Word bank: heterotrophs, autotrophs, primary consumers, primary producers, secondary consumers, tertiary consumers

