

# ***Biomagnification in the Food Web***

Grade Level: 5th

Duration: 45 minutes

***Lesson Overview:*** Brief lesson description here

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Disciplinary Area:

**Ecosystems**

## **Key Concepts:**

- Ecosystem interactions
- Bioaccumulation and biomagnification
- Pollution

## Key Lesson Information

### Materials List

- Empty rainforest food web template (8)
- Animal / plant cutouts
  - o Food Chain Activity (8 of each)
    - Grass, grasshopper, frog, fox
  - o Rainforest (8 of each)
    - Python, eagle, jaguar, caiman, ocelot, capybara, scarlet macaw, sloth, grass, flowers and leaves
- Red beads (8 containers)
- PowerPoint
- Exit tickets

### NGSS Performance Standards Addressed

NGSS Disciplinary Core Idea	5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
Disciplinary Core Ideas	Interdependent Relationships in Ecosystems; Cycles of Matter and Energy Transfer in ecosystems
Performance Expectations	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

### **Big Question:**

How does biomagnification and bioaccumulation affect food webs and the environment?

### **Key Vocabulary List:**

Food chain: The sequence of living organisms in a community in which one organism consumes another organism to transfer food energy

Food web: all the food chains in an ecosystem

Producer: organisms that produce food for themselves and other organisms (plants)

Primary consumer: herbivores that eat producers (plants and algae)

Secondary consumer: carnivores that feed on primary consumers

Tertiary consumer: a carnivore at the topmost level in a food chain that feeds on other carnivores

Biomagnification: the concentration of toxins in an organism as a result of its ingesting other plants or animals in which the toxins are more widely dispersed

### **5E model part 1: Engage**

## **Introduction and Background**

In this lesson we will focus on the interactions of animals in an ecosystem in terms of their position on the food web. Using food web diagrams with beads to represent contaminants, students will observe how contaminants move through different levels of the food web, leading to a greater volume in large predators.

### **Food Chain vs Food Web:**

Ask students what they know about food chains and food webs. After the class discussion, define the terms:

- Food chain: the sequence of living organisms in a community in which one organism consumes another to transfer food energy
- Food web: all the food chains in an ecosystem

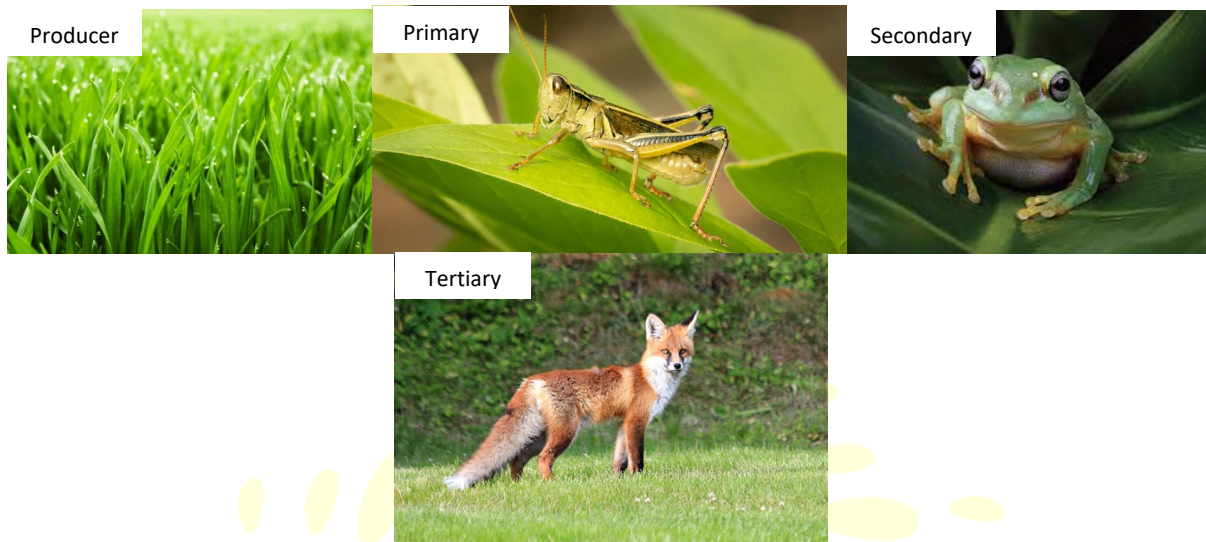
### **Levels of the Food Web:**

Students are given animals that fall into each of the four levels in a food web. With a partner, students will determine which animal belongs in which category, based off the definition they just heard.

Introduce students to the four basic levels of a food web:

- Producer: organisms that produce food for themselves and other organisms (plants)
- Primary consumer: herbivores that eat producers (plants and algae)
- Secondary consumer: carnivores that feed on primary consumers
- Tertiary consumer: a carnivore at the topmost level in a food chain that feeds on other carnivores

After students are introduced to each term, give them some time with their partner to determine which animal belongs in that group and why. Repeat at all four levels.



## 5E model part 2: Explore

### Introduce Activity

Now that we have built a food chain, let's build a food web and take a look at how contaminants move through them!

#### Activity: Name

Students will model contaminants being passed through a food web from producer, all the way up to tertiary consumer.

#### Essential Concepts

Food webs are complex systems of interconnectedness used to represent energy being passed from species to species.

Contaminants that enter the food web at lower levels make their way to higher levels through consumption, resulting in the magnification of contaminants in

### Activity Procedure

1. In small groups, students will receive a collection of animals from the same ecosystem.
2. They will then work together to create a food web of the plants and animals within their ecosystem.
3. Once the food web is complete, the class will come together and share their answers as a class, following along with the key on the presentation.

4. After the class has shared and corrected their food webs if needed, students will be given colored beads and use them to simulate a chemical getting passed through their ecosystem.  
The beads will start in producers (plants) and pass up through the food web until only predators remain, making it so that all the beads that started in primary consumers will be in tertiary consumers.

\*Food Web Keys with lesson materials

### ***5E model part 3: Explain***

## **Time to check in and recap!**

### **What is biomagnification?**

Biomagnification is the process that the students just modeled. It happens when the concentration of toxins in an organism because it consumes other plants or animals in which the toxins are more widely disbursed.

This means that large predator species like sharks, bears, and even humans are more at risk when it comes to contamination by environmental chemicals.

Play video that explains and demonstrates biomagnification:

[https://www.youtube.com/watch?v=J9i6a\\_NRahg](https://www.youtube.com/watch?v=J9i6a_NRahg)

Ask students:

Why is this important?

What will happen if this continues?

Climate change is heightening biomagnification and the stress it puts on species. With growing environmental stress, species' survivability declines and more species may become extinct.

### **Question Session**

Let students ask clarifying questions from the activity/video/demonstration

## ***Important Concept Check in: Vocabulary/Big Question***

### **Key Vocabulary List/Big Question Recap:**

#### **Big Question:**

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Biomagnification: the concentration of toxins in an organism as a result of its

***5E model part 4: Elaborate******Clarify the connection here***

Why does this matter?

Climate change is heightening the stress that biomagnification puts on large predator species.

When species are under stress their survival rates decrease leading to an increased risk of extinction.

**For example:** Orca whales are heavily impacted by biomagnification. Male orca whales have an average life span of 40-50 years while females' is twice as long at 80-100 years. This is because females can release chemicals that would normally shorten their life span through things like giving birth and breast feeding, both functions that males cannot perform. Because males are not able to release any of the contaminants that they consume from their environment, they are under higher stress and have shorter life spans.

**Activity/Discussion for Elaborate**

Ask students if they know any other animals that may be heavily impacted by biomagnification.

## Expand

What are some ways we can decrease our pollution to protect animals?

### ***5E model part 5: Evaluate***

Give students end of lesson reflection / exit ticket.

### **By the end of this Lesson**

#### **Concepts Learned:**

- What is a food web vs food chain
- Levels of the food web
- Biomagnification

#### **Connection/Evidence Gathered:**

- Environmental pollutants that are accelerating climate change contribute to biomagnification

#### **Potential resources:**

1. National Geographic: Biomagnification and Bioaccumulation Activity (6<sup>th</sup> – 8<sup>th</sup> grade) - <https://www.nationalgeographic.org/activity/biomagnification-and-bioaccumulation/#:~:text=Bioaccumulation%20takes%20place%20in%20a,higher%20concentration%20in%20apex%20predators.>
2. Conserve Energy Future: Causes, Effects and Effective Solutions to Biomagnification (Bioaccumulation) - <https://www.conserve-energy-future.com/causes-effects-solutions->



[biomagnification.php](http://biomagnification.php)

## Food Chain Activity Animals:

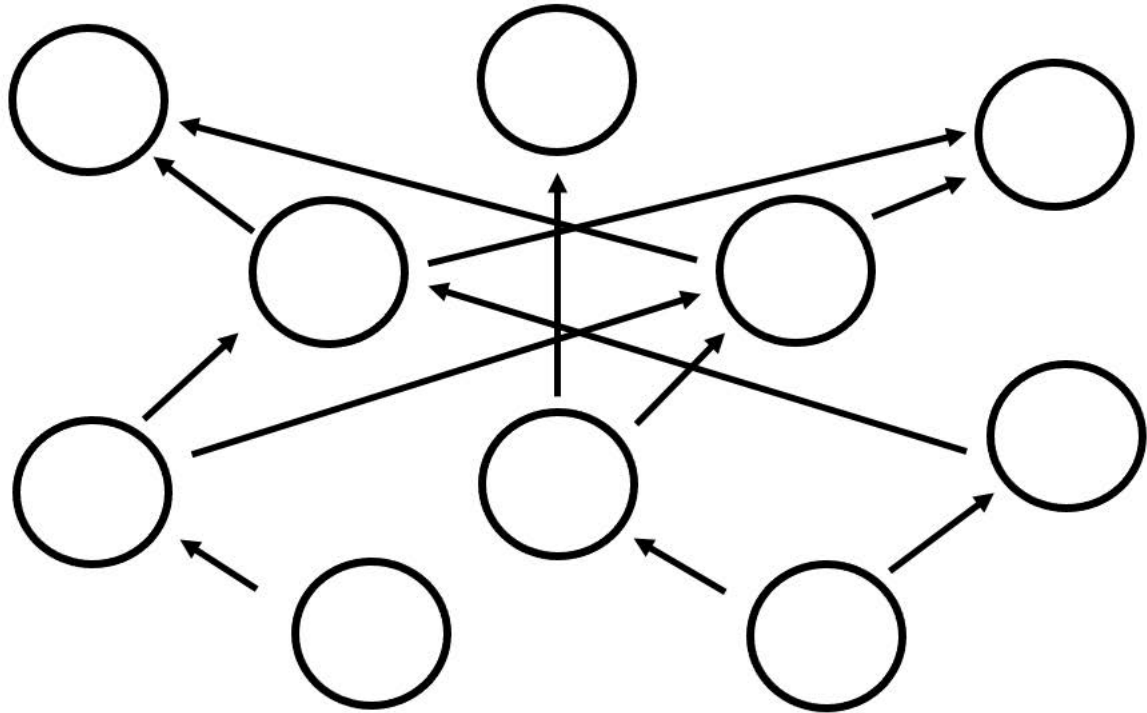




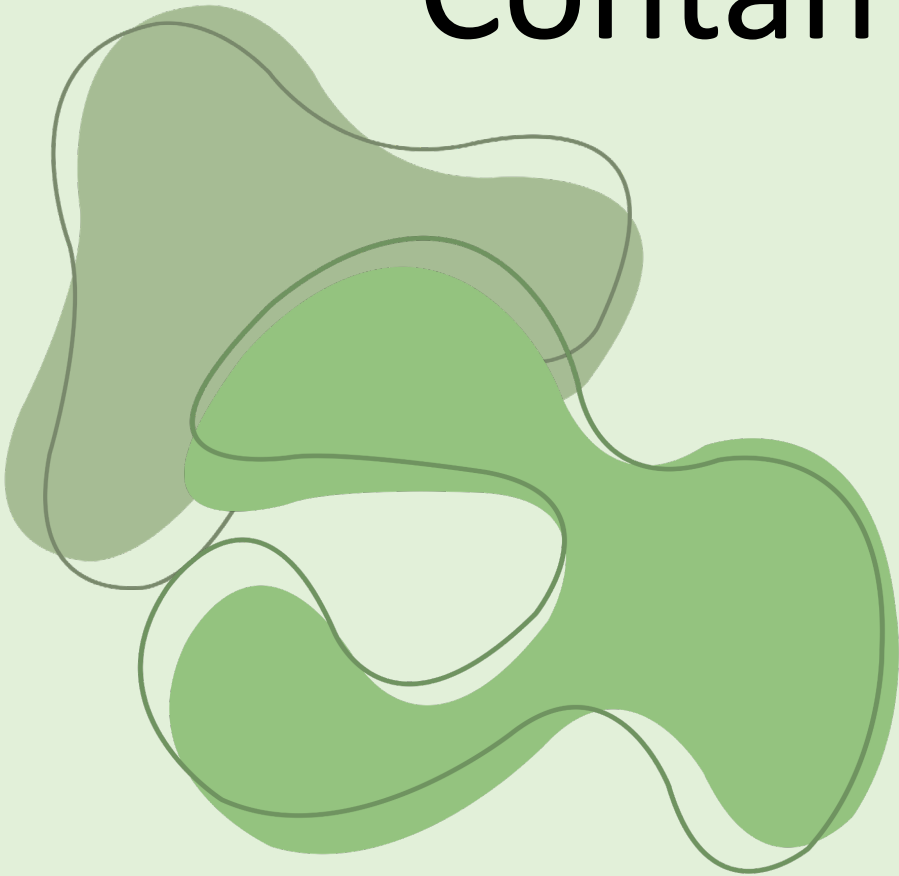
## Rainforest Ecosystem:





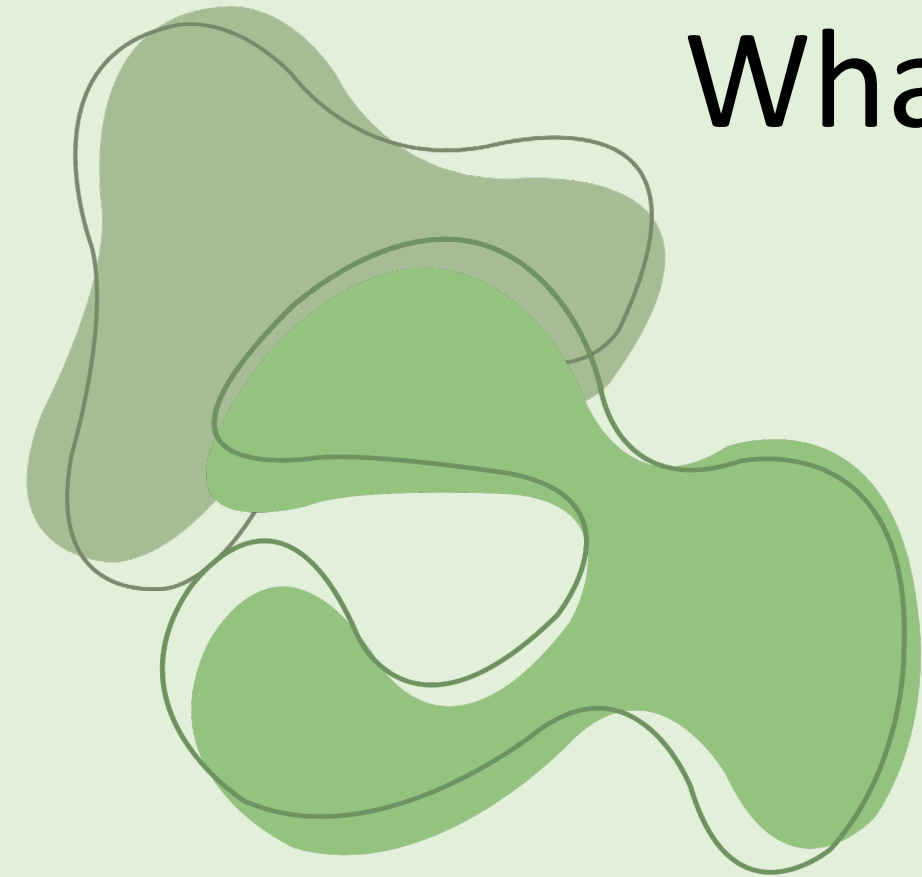


# Contaminants in the Food Web



What is a food chain?

What is a food web?



## Food Chain

the sequence of living organisms in a community in which one organism consumes another to transfer food energy

## Food Web

the connection of all the food chains in an ecosystem

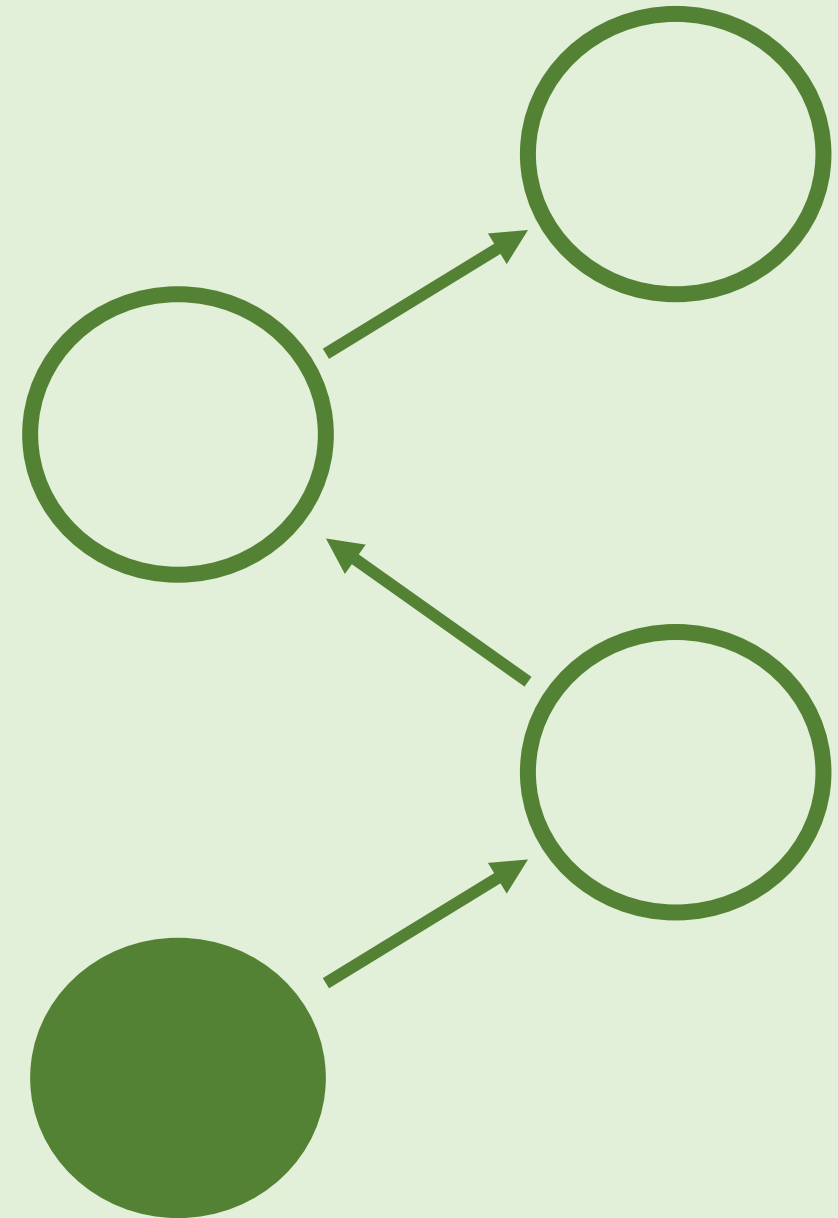


# The Four Levels of a Food Chain

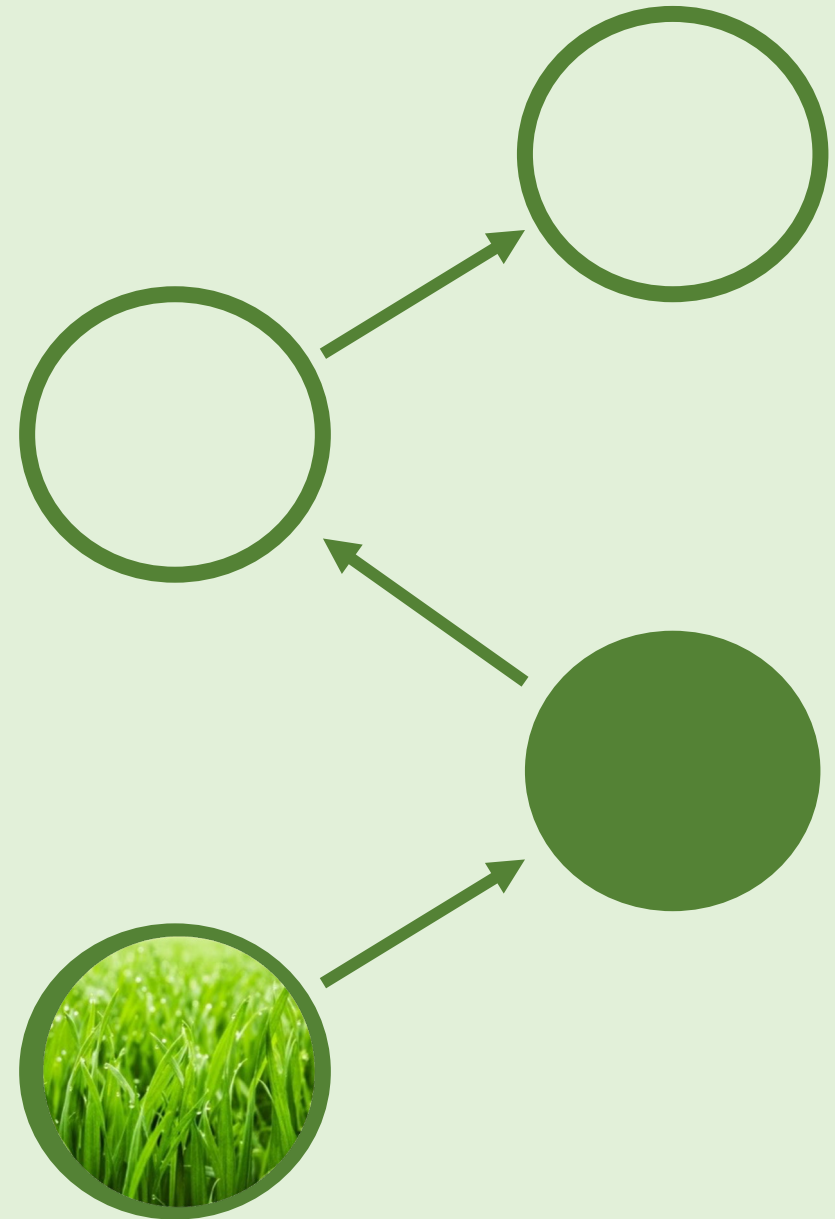




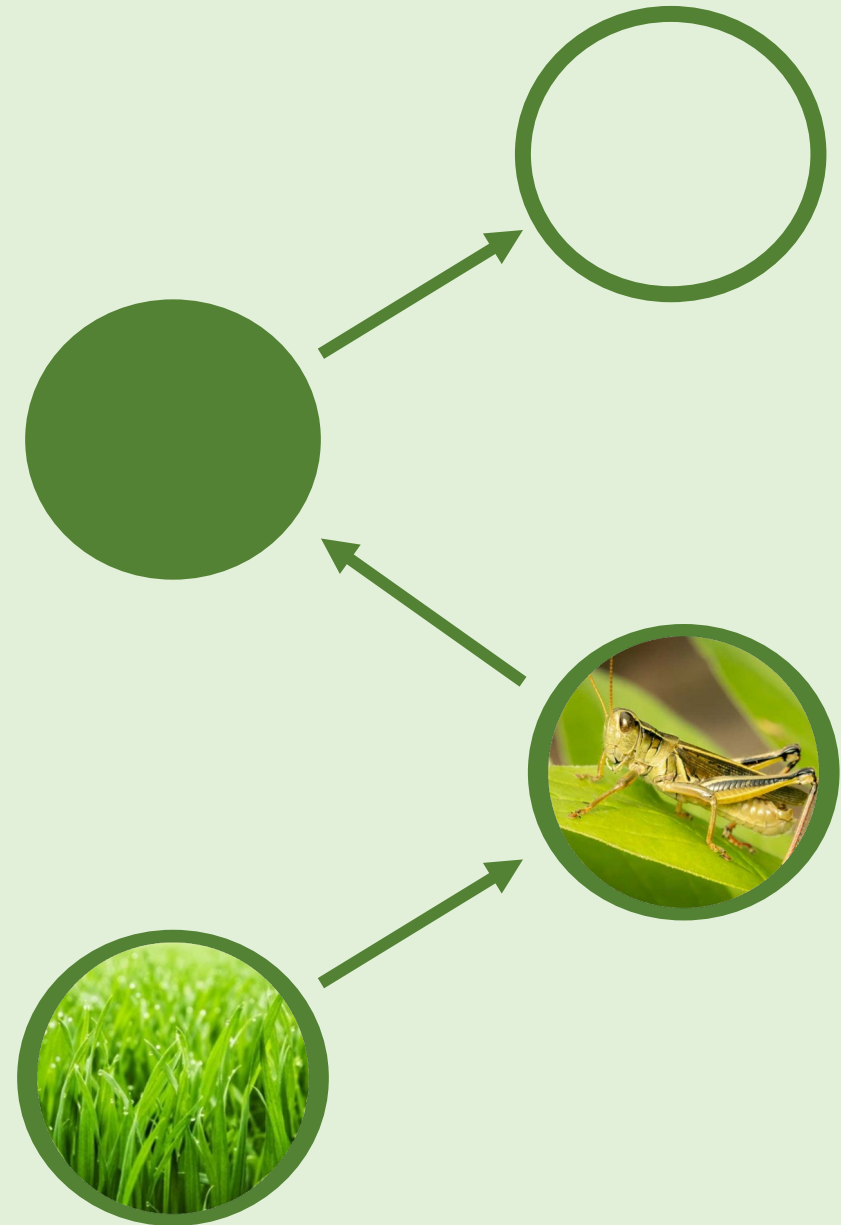
**Producer:**  
organisms that produce food for  
themselves and other organisms  
(plants)



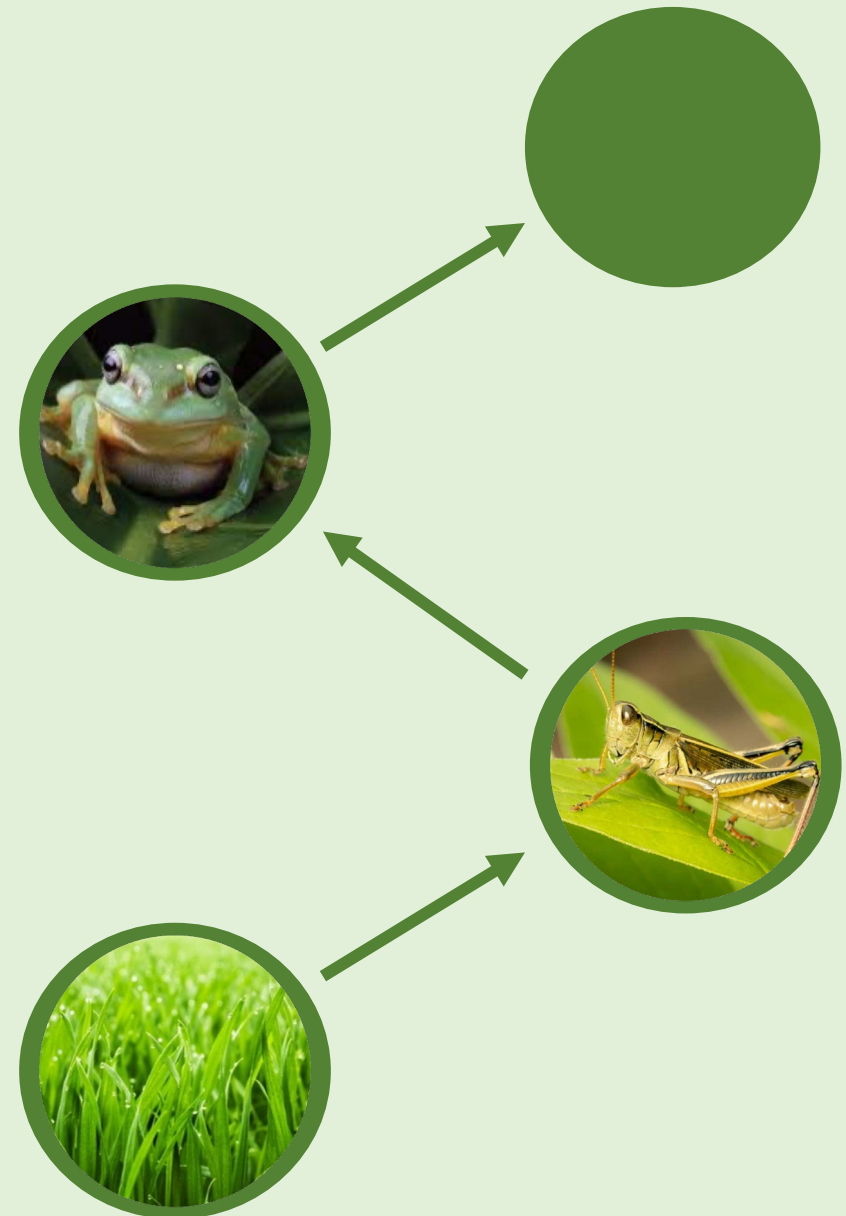
**Primary Consumer:**  
herbivores that eat producers

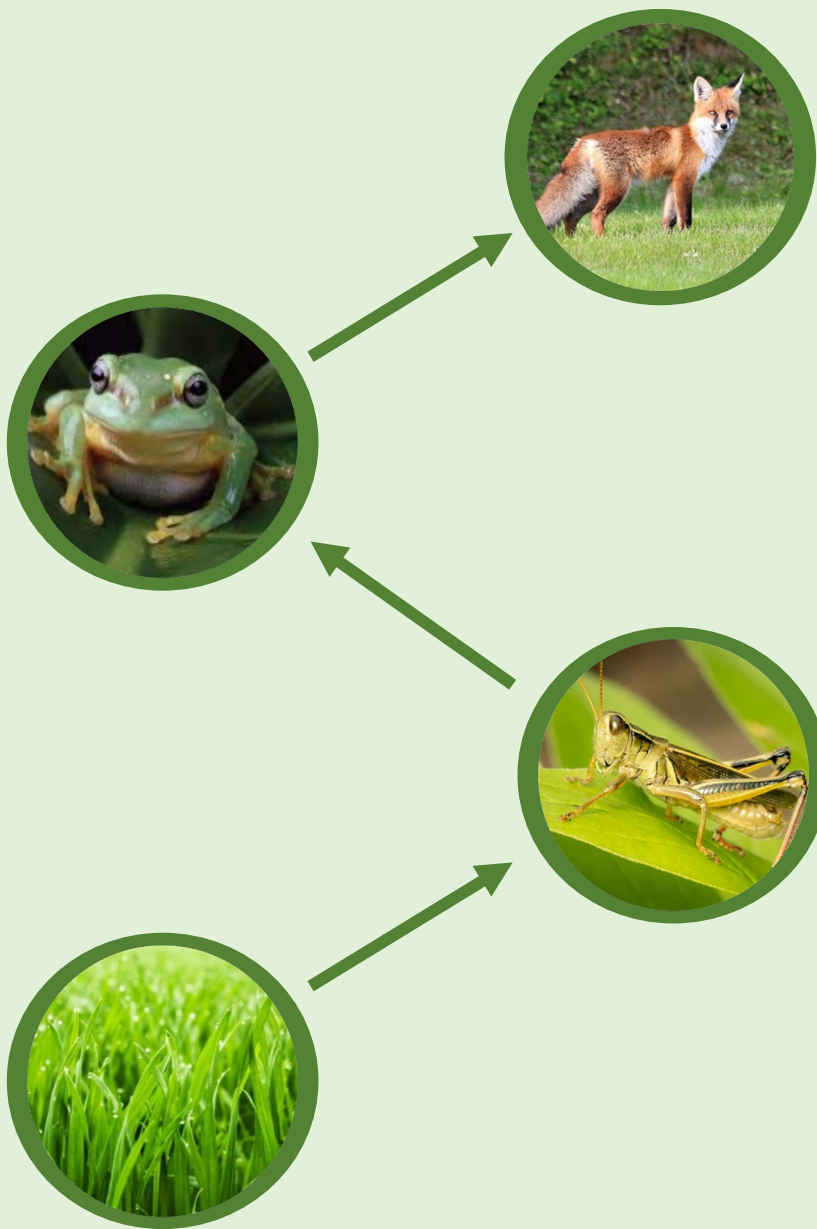


**Secondary Consumer:**  
carnivores that feed on primary  
consumers

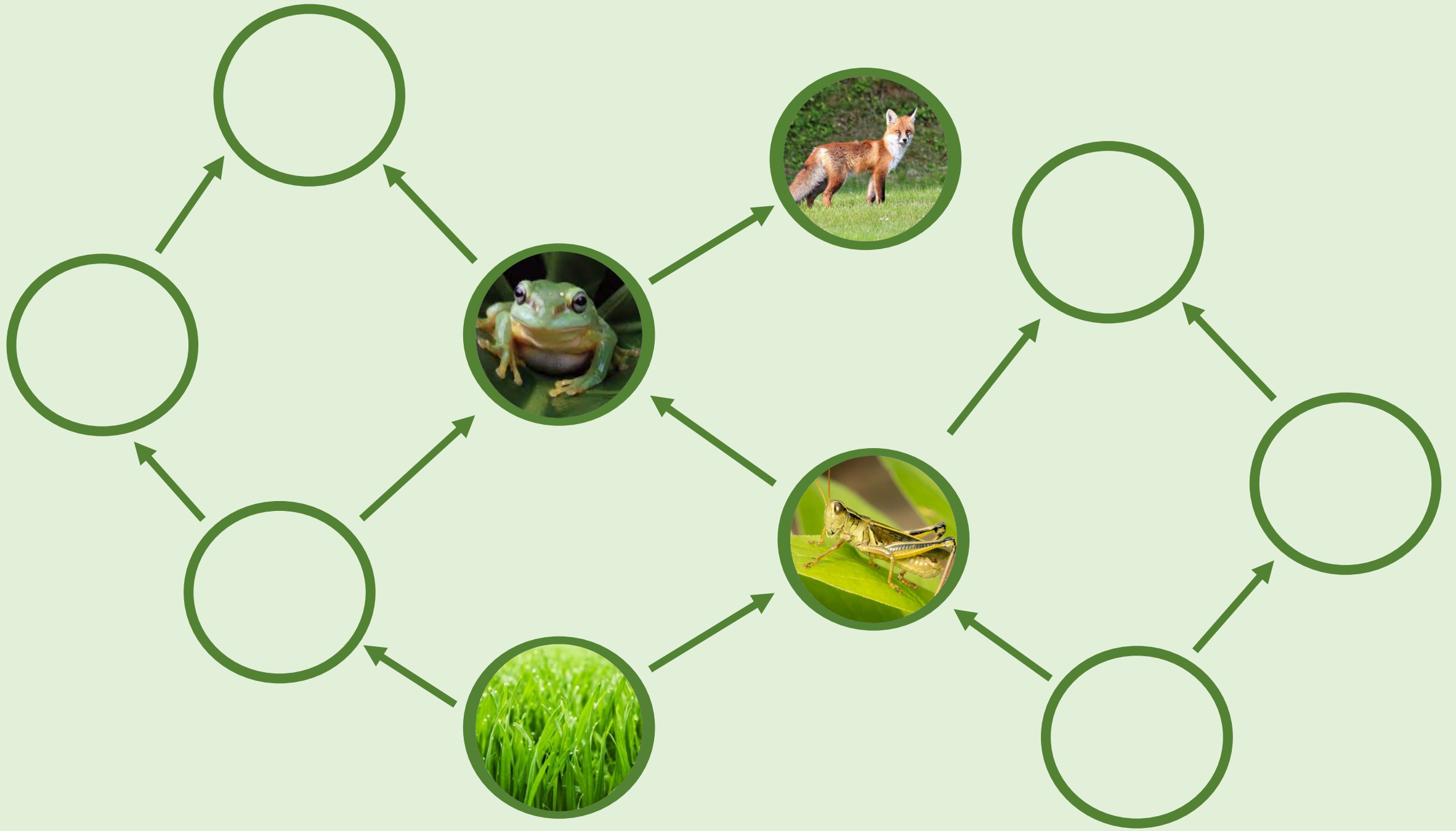


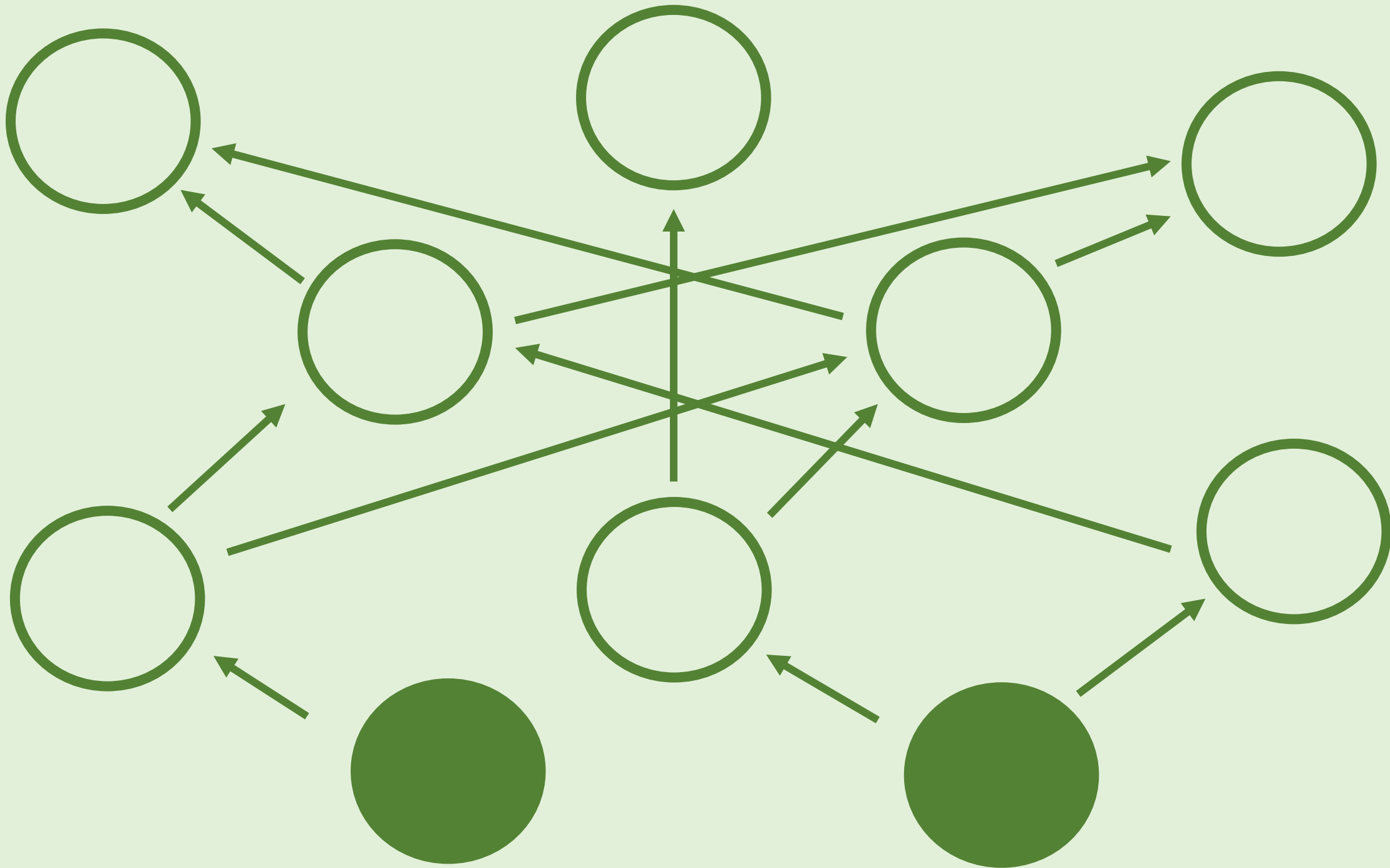
**Tertiary Consumer:**  
a carnivore at the topmost level  
in a food chain that feeds on  
other carnivores

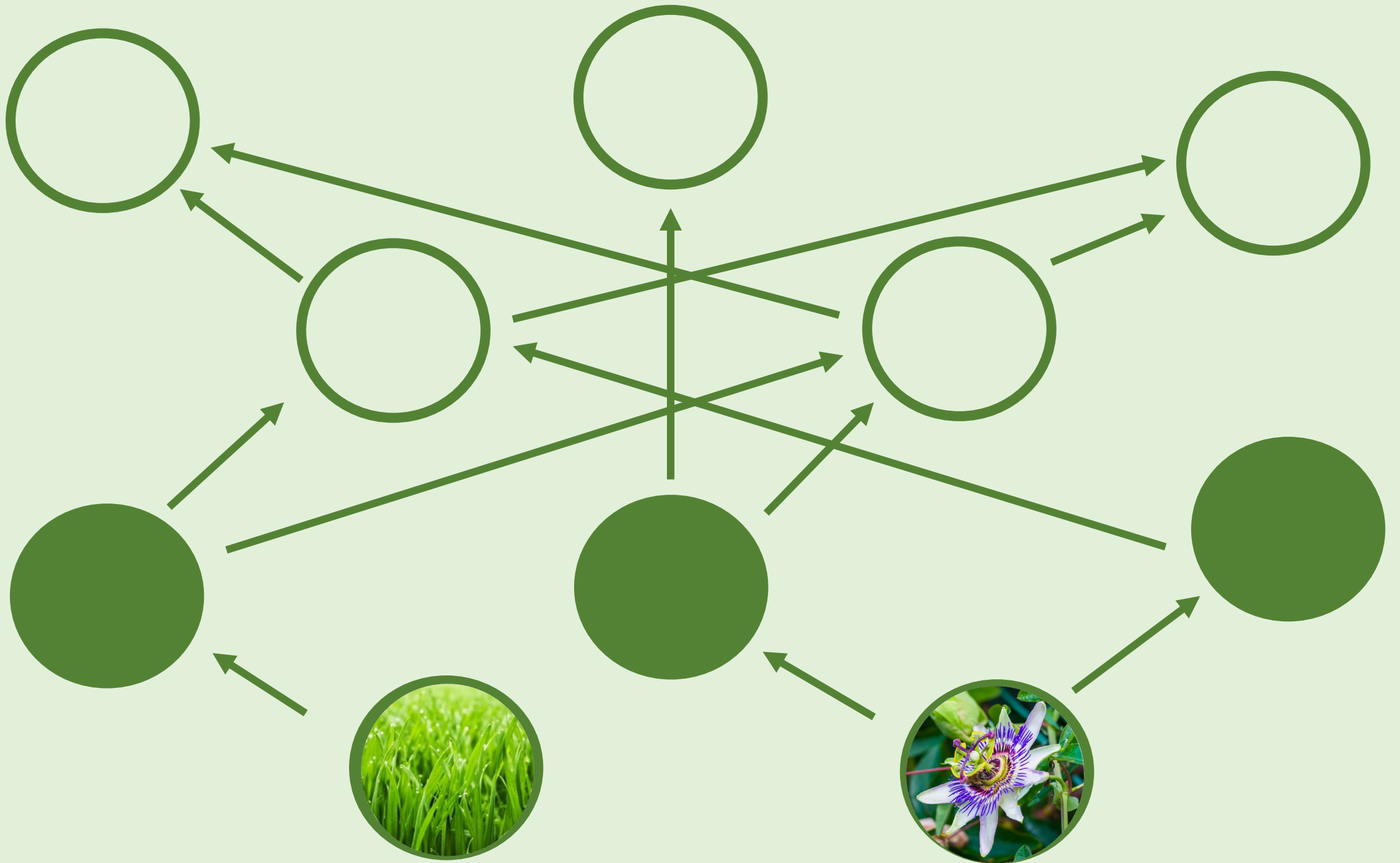


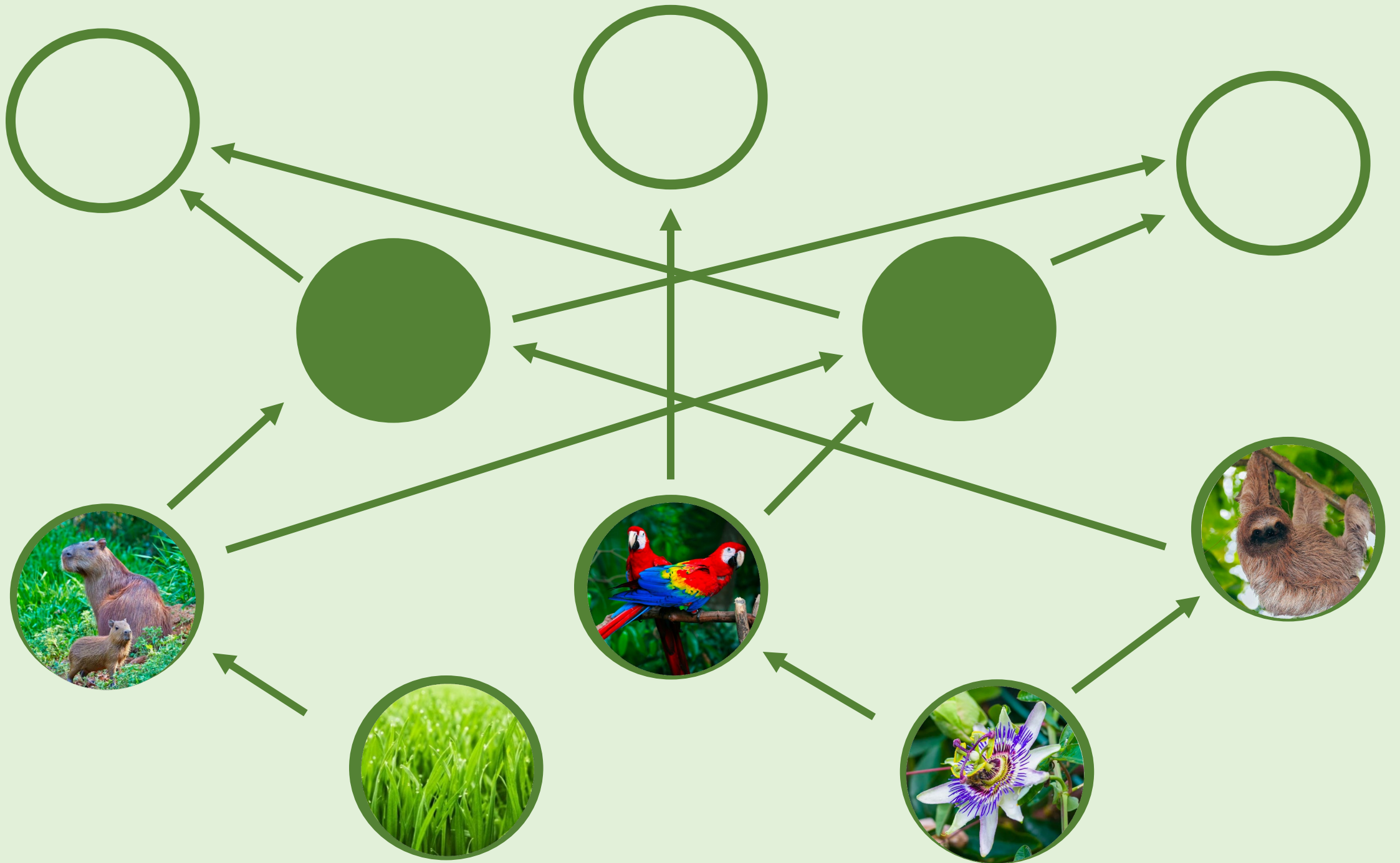


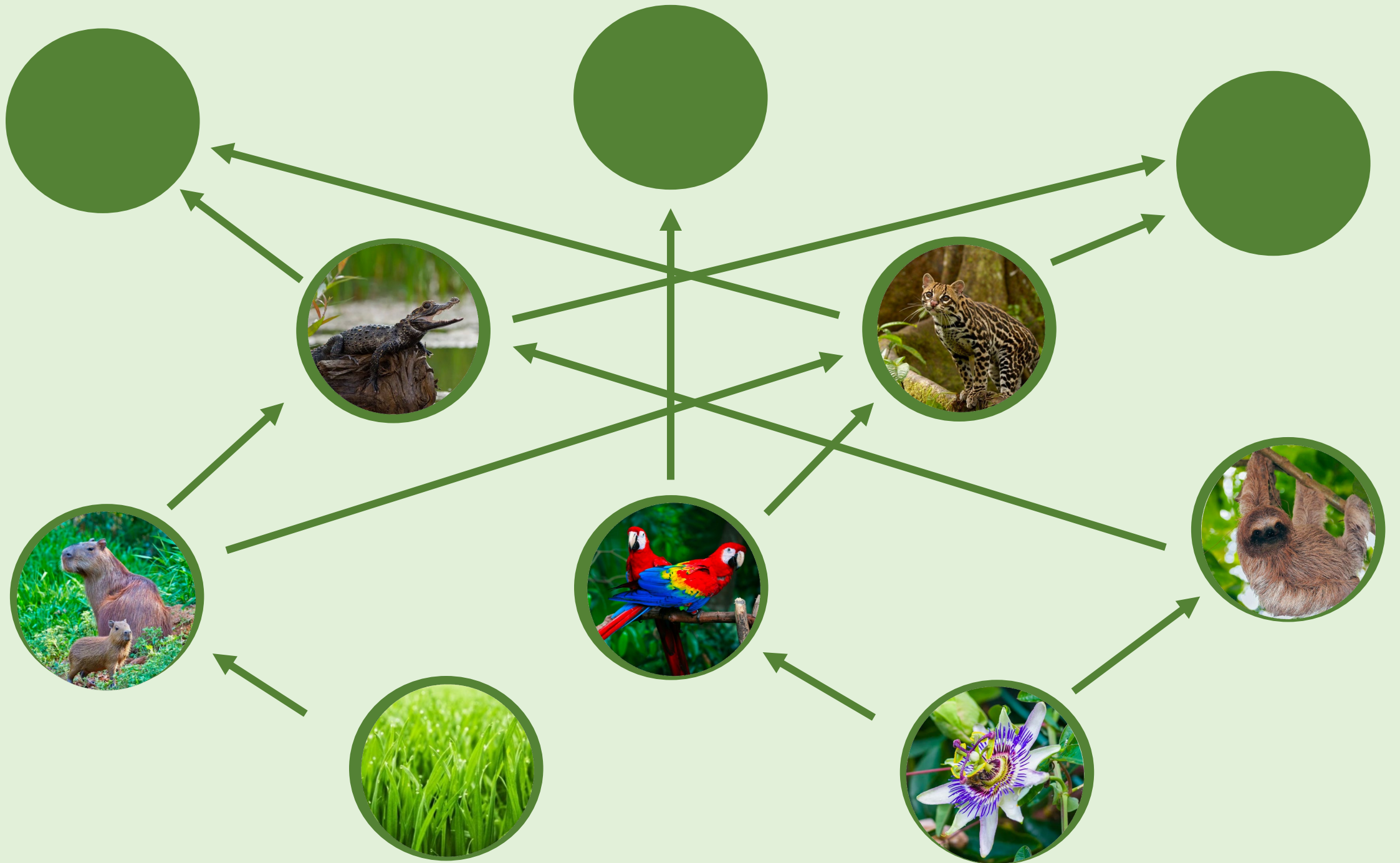




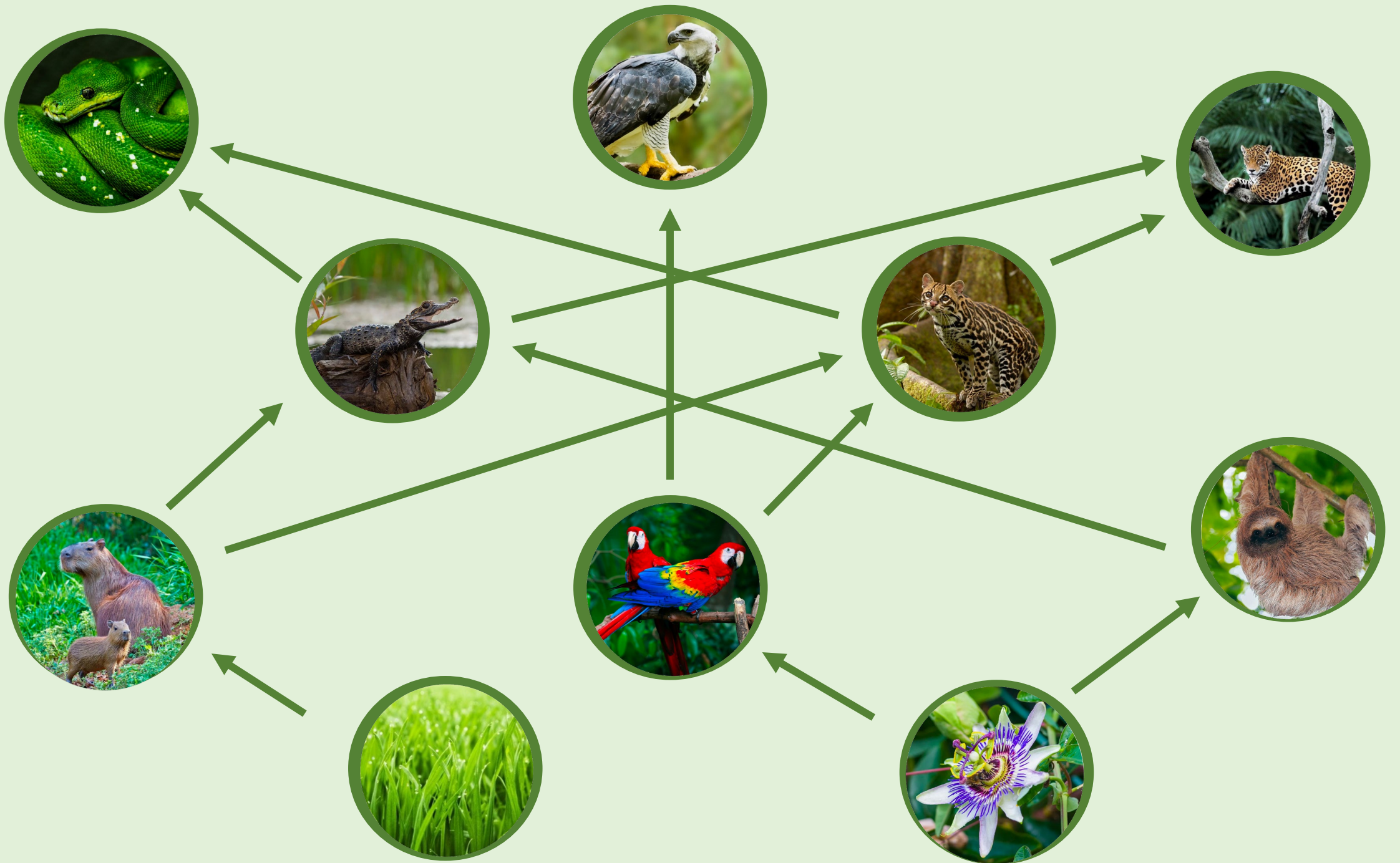






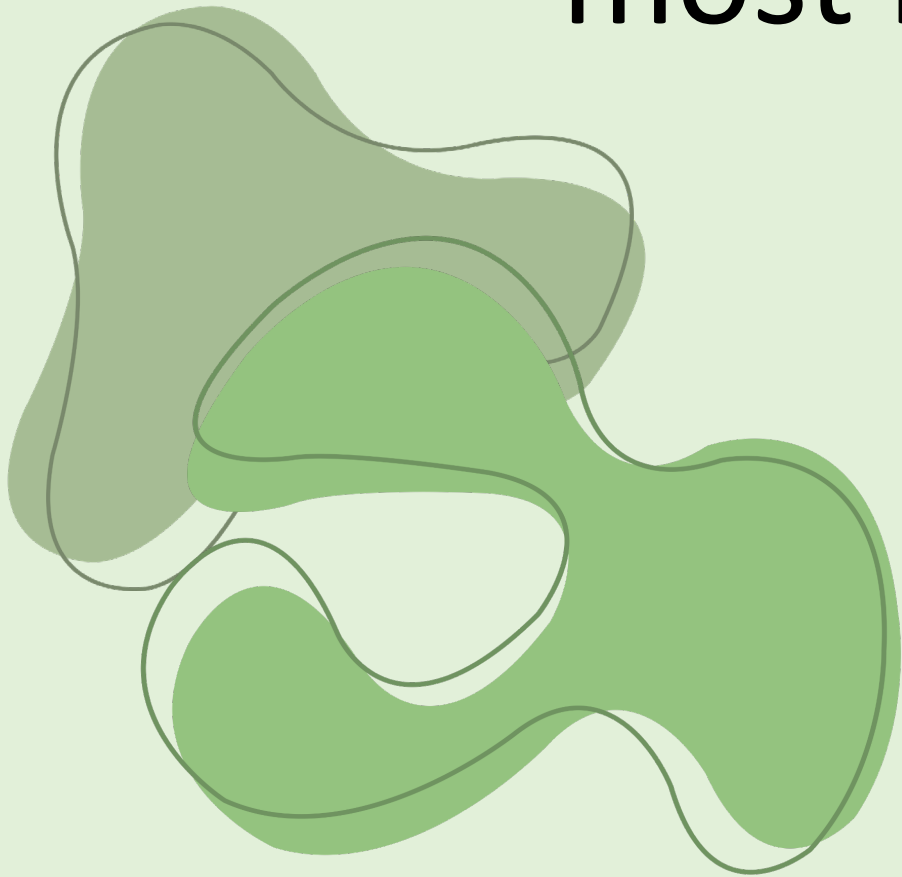








Where did the  
beads/contaminants end up the  
most in your food web?



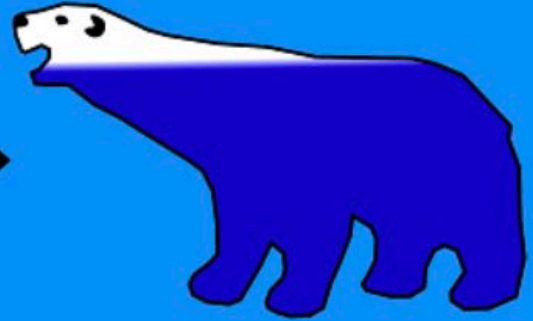
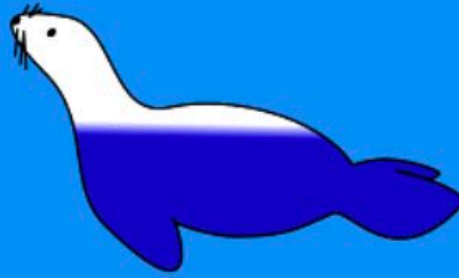
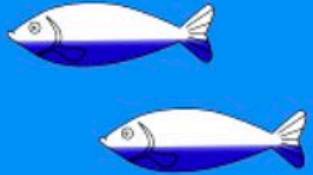
# Biomagnification

the concentration of toxins in an organism as a result consuming other plants or animals in which the toxins are more widely disbursed

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# Why is this important?





Contaminant Levels

# Biomagnification

## What we learned today:

- A food chain is the order that organisms consume each other for energy.
- A food web is the connection of all the food chains in an ecosystem.
- Food webs have four main levels.
- Biomagnification is the build up of toxins in an organism from consuming other organisms.