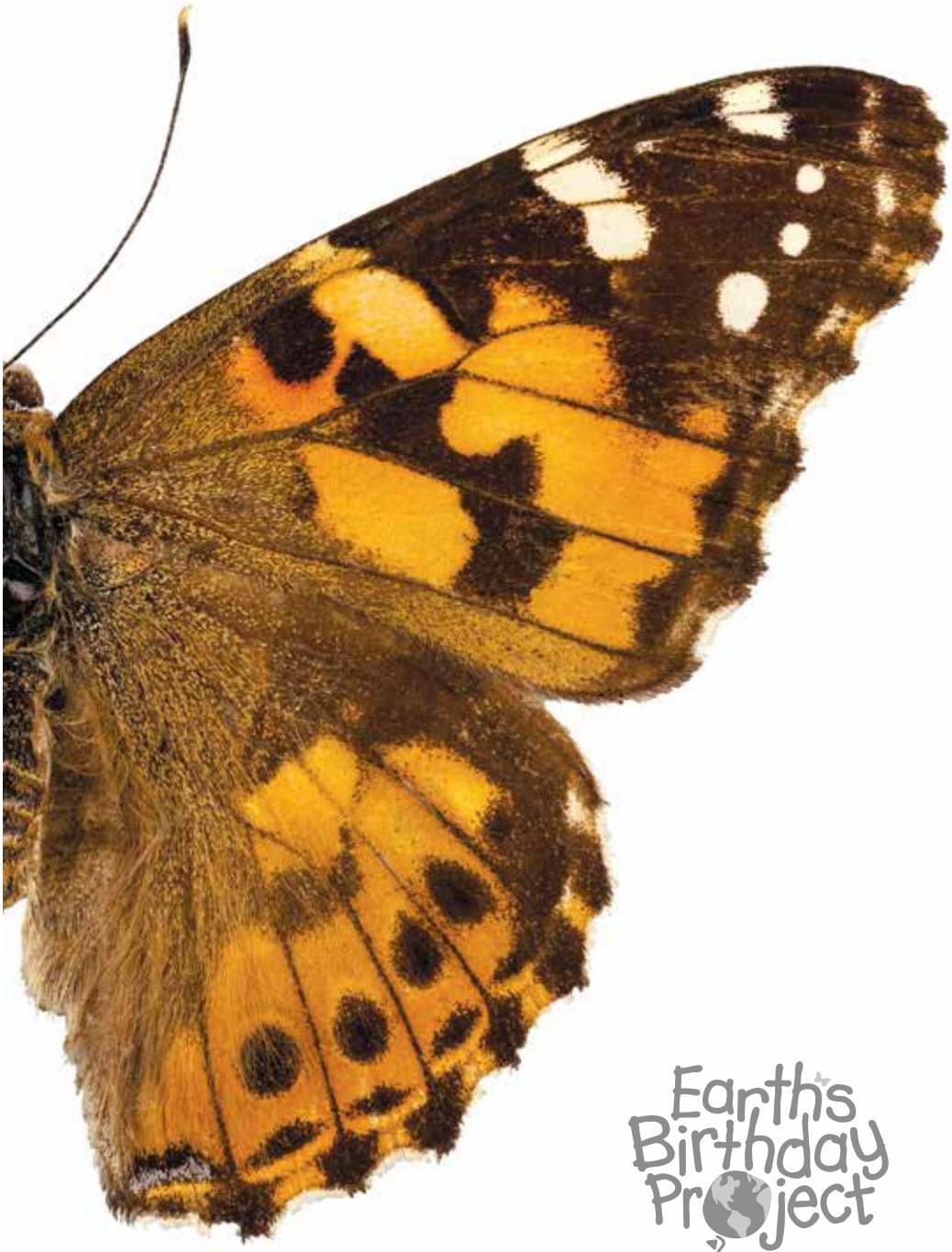
BUTTERFLIES & FOOD WEBS

Teacher's Guide
5th Grade Science Unit



BUTTERFLY LAB

Earth's Birthday Project
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BUTTERFLY LAB

Acknowledgements

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Earth's Birthday Project cultivates hope for the future by inspiring wonder, learning & care of the natural world in children, teachers & parents.

Since 1989, more than 15 million children have delighted in raising butterflies, learning about the natural world & supporting conservation. Our work empowers students to initiate environmentally responsible actions in school & at home.

BUTTERFLY LAB

Contents

BUTTERFLY LAB

INTRO

Goal
Students will understand food chains and food webs, along with the role of caterpillars and butterflies in them. Based on the Next Generation Science Standards.

Objectives
Students will:
- Develop skills in observation, measurement and recording as they follow the development of the painted lady butterflies
- Become familiar with the concept of food chains and food webs through readings and observation of the painted lady life cycle

Evaluation
Handouts are a primary evaluation method. In the handouts, students will fill in diagrams, record observations and compare food chains. They will also build and present models of food chains. A final essay will demonstrate how these concepts are understood.

Before Caterpillars Arrive
1. Review the Teacher's Guide
2. Check materials needed for the unit
3. Make copies of all handouts in advance

Caterpillars Have Arrived!
1. Review caterpillar care information
2. Begin close observation and measurement of the caterpillars
3. Read about food chains
4. Play games and drill to build science vocabulary

Chrysalises Are Formed
1. Build food chain pyramids
2. Analyze the caterpillar data using graphs

Butterflies Emerge
1. Link multiple food chains into a food web
2. Write an individual essay comparing food webs
3. Release the butterflies on a sunny day! Celebrate life on Earth!

BUTTERFLY LAB

Standards Rubric: 5th Grade

5TH GRADE Common Core: English Language Arts Standards Reading: Informational Text	
Key Ideas and Details:	
CCSS.ELA-Literacy.RI.5.1	Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS.ELA-Literacy.RI.5.2	Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
CCSS.ELA-Literacy.RI.5.3	Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
Craft and Structure:	
CCSS.ELA-Literacy.RI.5.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.
CCSS.ELA-Literacy.RI.5.5	Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.
Integration of Knowledge and Ideas:	
CCSS.ELA-Literacy.RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
Range of Reading and Level of Text Complexity:	
CCSS.ELA-Literacy.RI.5.10	By the end of the year, read and comprehend informational texts, including science, and technical texts, at the high end of the grades 4-5 text complexity band independently and proficiently.
Research to Build and Present Knowledge:	
CCSS.ELA-Literacy.W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
CCSS.ELA-Literacy.W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
CCSS.ELA-Literacy.W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
Presentation of Knowledge and Ideas:	
CCSS.ELA-Literacy.SL.5.4	Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
CCSS.ELA-Literacy.SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
Next Generation Science Standards	
5-LS1	Ecosystems: Interactions, Energy, and Dynamics
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	
LS2.A	Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as "decomposers."

Caring for Caterpillars, Caring for the Earth

Children understand what it means to be a good friend. Talk with them about being a good friend. Write their suggestions on the board. How do you treat good friends? Can caterpillars, other animals and plants be our friends? Is the Earth that gives us so much - air, water, food, beauty - our friend? How might the Earth like to be treated? What can we do to help the Earth and all her creatures?

Caring for living things in the classroom is a wonderful opportunity to learn:

- **all living things have needs**
- **what are the needs of other living things**
- **how to help with the needs of others**

1 - All living things have needs.
Every child understands their own need for food, shelter and care. And every living thing also has needs. We are all connected.

2 - What are the needs of other living things.
Caring for living things teaches your students that we all have unique needs. Not everyone's needs are the same. What is good for a child might not be good for a plant. The care of a seedling is different than the care of an insect.

3 - How to help with the needs of others.
Students want to interact and be involved with the living things around them. Checking to see if plants need water or if the caterpillars are becoming chrysalises builds a child's confidence and understanding. They learn about responding to what is needed and offering to help.

Teaching Students How to Care for Caterpillars
Observing caterpillars in your classroom is a great way to teach children about the pollinators that we depend on for food. Day by day, they observe how the caterpillars grow and change. They can see them eating their food. The children can check that the cup is not in the sun. The students will learn to respect the caterpillars by not shaking or dropping the cup. This is practical experience in understanding the needs of others and learning how to help.

DATA & OBSERVATION

Recording Data & Observations

20 minute introduction / 5-10 minutes day-to-day
Whole Class

Objectives
To practice close observation of a living organism
To practice measuring to the 1/10th of a centimeter
To calculate the mean of multiple measurements
To measure how much food the caterpillars consume over time
To compare caterpillar growth and food consumption

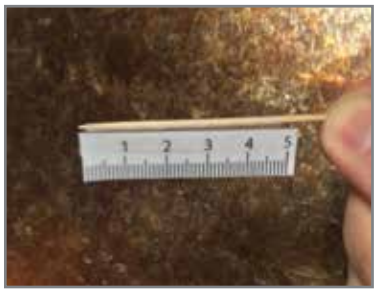
Materials
Student Folders: *Data & Observations*
1 cup of live caterpillars
Toothpicks for use as a measuring tool

Documentation
This is a good opportunity to let the students use their interests and talents to document the insects with scientific illustrations, photographs and video. Perhaps 1 or 2 students in the class can creatively document the anatomy and life cycle of the insect. Their visual record can be incorporated into presentations or a bulletin board about the butterflies.

1. Review Care Instructions with the Students
• Always handle the cup of caterpillars gently.
• DO NOT REMOVE THE LID. The food on the bottom of the cup is all the caterpillars need.
• There should be 4 to 6 caterpillars in the cup, ¼ to 1 inch long.
• Allow caterpillars at least 24 hours to become active. They should start growing quickly within a few days.
• Stand the cup upright at all times; keep it OUT OF DIRECT SUNLIGHT.

2. Make a Measuring Tool (one per student)
A toothpick makes a simple tool that is easy to use for measuring the caterpillars.

Use the ruler cutout sheet. One cutout and toothpick per student. Tape cutout to the toothpick. One end of the cutout should align with the left end of the toothpick.



Note: As the caterpillars grow, encourage the students to look for more details of the external anatomy and share those observations with the rest of the class.

DATA & OBSERVATION

Recording *continued*

3. Recording Data & Observations
DO NOT TAKE OFF THE LID! HANDLE THE CUP GENTLY!

Four times over 7-10 days, the students in groups of 5 will measure the length of the caterpillars and the depth of food in the cup.

In the groups of 5, each student will measure:
- 1 caterpillar and
- depth of the food at 1 marked point
- and write a short observation.

In the group, the measurements of the 5 caterpillars and the 5 depths will be shared.

Recommended Measurement Days:

First Measurement - Day 1 - the day the cup arrives, usually Thursday or Friday.

> *Note: To help measure the depth of food, mark 5 points - 1, 2, 3, 4 & 5 - at the bottom of the cup. For the first measurement, all 5 points should be at a depth of 1.0 cm, meaning almost no food has been consumed.*

Second Measurement - Day 5 - Monday after the first measurement

> *Note: After a few days, the frass or excrement will build up in the bottom of the cup. Clarify that the students are measuring the depth of the solid food from the bottom of the cup and not the balls of frass that has accumulated.*

Third Measurement - Day 7 - Wednesday

Fourth Measurement - Day 8 or 9 - when 1-2 caterpillars pupate, take the final measurements

Data & Observation Form

- Day (for example: if Friday is Day 2, then Monday will be Day 5)
- Date
- Length of the caterpillars in the cups to the 1/10th of a centimeter using the toothpick
- Calculate the mean length. The mean is the average of a set of numbers. For example, in the set - 6, 5, 6, 5, 5 - the value 5.4 is the mean. Add up the numbers and divide by how many numbers there are. The mean length will be used on a graph.
- Measure the depth of the food to the 1/10th of a centimeter at the 5 points on the cup using the toothpick. Record in *depth of food*. Subtract the 5 depths from the starting depth of 1.0 cm and write the decimal in *food consumed*.
- Calculate the mean food consumption. Add up the numbers in *food consumed* and divide the total by how many numbers are in the set. The mean food consumption will be used on a graph.
- Write a 1-2 sentence observation of the organism, their behavior and environment.

Data & Observations

EXAMPLE Day 5 Date April 22

Length of caterpillars
to 0.1 cm

1. **2.1** 2. **2.0** 3. **2.0** 4. **1.9** 5. **2.0**

Total length **10.0 cm**

Food Consumption
food depth to 0.1 cm

1. **0.8** 2. **0.7** 3. **1.0** 4. **1.0** 5. **1.0**

subtract each depth from 1.0 cm
food consumed to 0.1 cm

1. **0.2** 2. **0.3** 3. **0.0** 4. **0.0** 5. **0.0**

Total consumed **0.5 cm**

$\frac{\text{Total length}}{\text{\# of Cat.}} = \frac{10.0}{5} =$ **2.0 cm** Mean length

$\frac{\text{Total consumed}}{\text{\# of Cat.}} = \frac{0.5}{5} =$ **0.1 cm** Mean consumption

Observation: **The caterpillars are tiny. They are crawling all around the cup, maybe exploring for food.**

FIRST MEASUREMENT Day ____ Date _____

Length of caterpillars
to 0.1 cm

1. ___ 2. __ 3. ___ 4. ___ 5. ___

Total length ___ cm

Food Consumption
depth of food to 0.1 cm

1. ___ 2. __ 3. ___ 4. ___ 5. ___

subtract each depth from 1.0 cm
food consumed to 0.1 cm

1. ___ 2. __ 3. ___ 4. ___ 5. ___

Total consumed __ cm

$\frac{\text{Total length}}{\text{\# of Cat.}} =$ ____ = **____ cm** Mean length

$\frac{\text{Total consumed}}{\text{\# of Cat.}} =$ ____ = **____ cm** Mean consumption

Observation: _____

_____

CLASS RESULTS Write down the mean length & mean consumed for each group. Add up each column & divide by the number of groups.

	Day		Day		Day		Day	
Group Name	Length	Consumed	Length	Consumed	Length	Consumed	Length	Consumed
Totals								
Means								

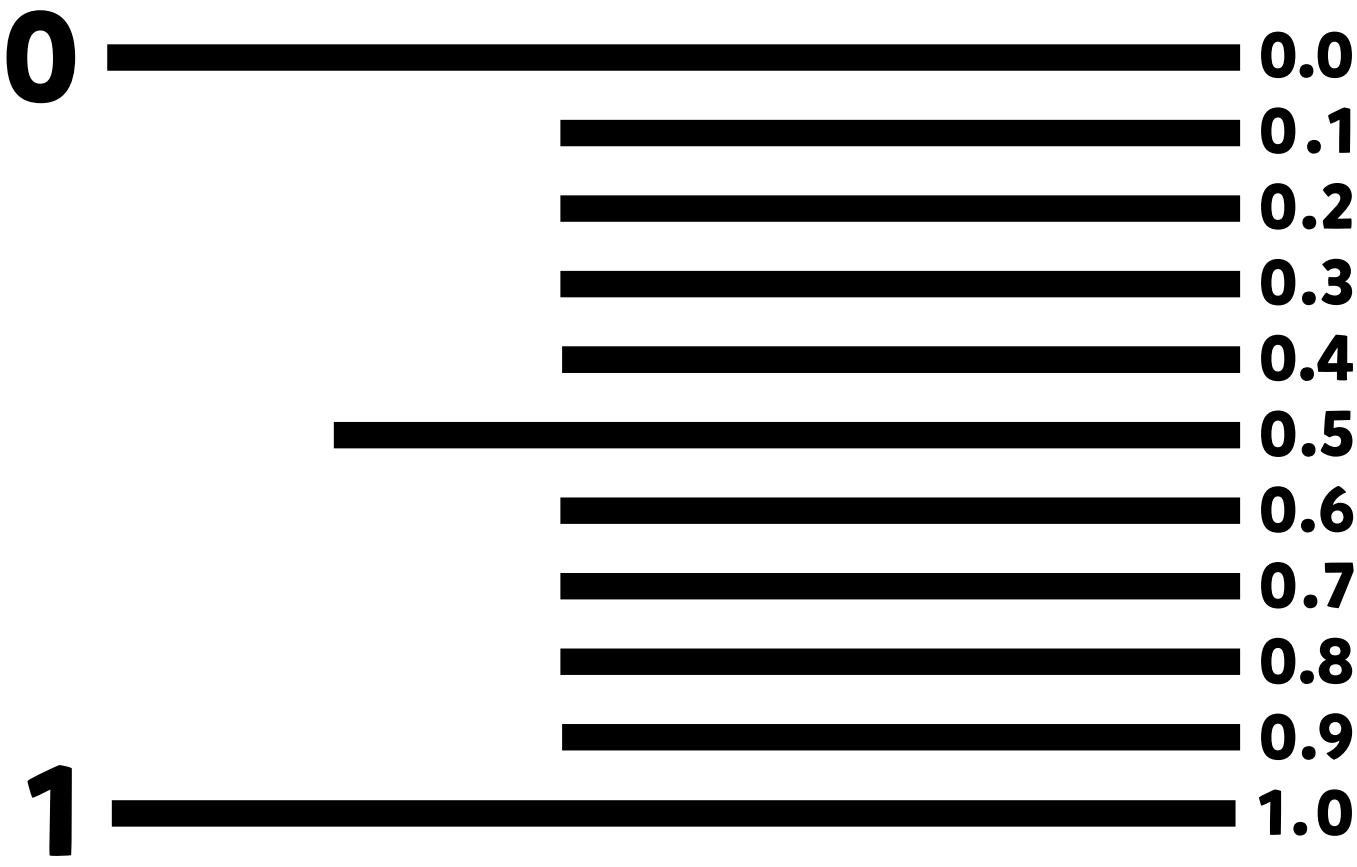
DATA & OBSERVATION

Ruler Cutouts

DATA & OBSERVATION

Calculating 1/10th of a Centimeter

Post this as a guide to help the students convert centimeter measurements to decimals.



SCIENCE READING
Who Eats What? & Food Chain Diagram

20 minute introduction / 5-10 minutes day-to-day
Whole Class

Objectives
To learn about food chains and feeding relationships
To practice reading comprehension of scientific information
To practice understanding visual information in diagrams

Materials
Handouts: *Who Eats What & QUIZ: Food Chain*

Step One
Handout the science reading *Who Eats What*. Give the students approximately 20 minutes to read the essay and review the vocabulary words.

Step Two
Depending on your students' skills, you may want to review the *KEY: Food Chain* as a class, clarifying each stage and its associated vocabulary. Or handout the *QUIZ: Food Chain* as a review of the science reading.

SCIENCE READING

Who Eats What?

Plants and animals are connected in a cycle of life.

The sun is the source of energy for life on earth. The energy of the sun transfers as food from organism to organism. This is called a **food chain**.

Green plants absorb the solar energy and produce their own food. Plants are called **producers** in the food chain. Plants use the energy from the sun along with carbon from the air and water from the soil to produce sugar for food. This process is called photosynthesis. The plants use the sugar to build roots, stems, leaves, flowers and seeds.

Female butterflies lay their eggs on host plants. A host plant is the preferred food of the caterpillar, the larval stage of the butterfly. Caterpillars are made to eat, eat, eat! When they hatch from the eggs, they consume the leaves of the host plant and grow bigger every day. Caterpillars and other animals that eat plants are called **primary consumers** in the food chain.

In the cup of live caterpillars, at the bottom of the cup, is a mixture of leaves that has been ground up for the caterpillars to eat. There is enough food for the caterpillars to grow until they form chrysalises. As animals that mainly eat plants, caterpillars are called **herbivores**. Other animals that mainly eat plants are deer, rabbits, cows, grasshoppers and bees.

Caterpillars have many predators like ants, yellow jackets, birds and reptiles. They are an ideal food for rodents like mice. Mice find slow-moving caterpillars in trees, on plants and also crawling on the ground. Mice will usually consume anything they can find, both plants and animals. These animals are called **omnivores**. Omnivores include raccoons, bears, coyotes and many birds like robins and jays. Humans are also omnivores. Animals that eat herbivores in the food chain are **secondary consumers**.

A mouse is a **predator** because it eats other animals. It is also the **prey** of many other predators. A high-flying hawk can see a mouse down on the ground and swoop down to catch it. Animals like hawks that mainly eat other animals are called **carnivores**. Carnivores include birds of prey, snakes, spiders and felines like bobcats and cougars. At the top of the food chain, they are called apex predators. As the third link of this food chain, they are **tertiary consumers**.

A group of organisms called **decomposers** are the final link in the food chain. They are bacteria and fungi that break down dead plants and animals and return the nutrients to the soil. The nutrients help the plants grow.

In summary, a food chain is a diagram that shows how food energy transfers from organism to organism in a specific environment. The energy of the sun is absorbed by plants to make food. Plants are consumed by an animal like a caterpillar. The caterpillar is eaten by a mouse. The mouse is caught and eaten by an apex predator like a hawk. When any of these organisms die, their bodies are broken down by decomposers. Life on earth is connected in a cycle of who eats what.

SCIENCE READING

Vocabulary: Who Eats What?

carnivore
Animals that eat mainly animals. Examples of carnivores include birds of prey like hawks, herons and eagles, snakes, spiders, frogs and felines like bobcats and cougars.

consumer
Animals are called consumers. They do not make their own food, instead they eat or consume plants and/or animals to survive.

decomposer
Fungi and bacteria break down or decompose the dead material of plants and animals. They return the nutrients to the soil, which plants use to grow.

food chain
A diagram that shows how food energy transfers from organism to organism in a specific environment. Food energy moves along the food chain when one organism eats another.

food web
A food web consists of many interconnected food chains and is a more realistic representation of feeding relationships in an ecosystem.

herbivore
Animals that eat mainly plants. Examples of herbivores are deer, beaver, rabbits, cows, grasshoppers, caterpillars and bees.

omnivore
Animals that eat both plants and animals. Some omnivores are humans, raccoons, coyotes, bears, mice and many birds like robins, red-winged blackbirds and jays.

predator
A predator is an animal that hunts and eats other animals.

prey
An animal that is hunted and killed by another for food.

producer
Green plants are called producers. They are able to produce their own food! Producers do this by using energy from the sun, along with carbon dioxide from the air and water from the soil to produce sugars that they use for food. This process is called photosynthesis.

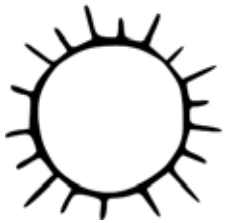
scavenger
A meat-eating animal that eats dead animals. Many carnivores will scavenge the kill of another predator or a carcass killed by a car. Small caRNIVORES LIKE INSECTS ARE PART OF THE DECOMPOSITION CYCLE.

solar energy
The energy that the earth receives from the sun, primarily as visible light. Solar energy is used by plants to grow.

QUIZ: Food Chain

Name _____

Date _____



_____

Instructions: Fill in the blanks with the 5 correct vocabulary words.

A diagram that shows how food energy transfers from organism to organism in a specific environment. Food energy moves along the food chain when one organism eats another.

thistle

caterpillar

mouse

hawk

_____ **PRIMARY** _____ _____ **TERTIARY**

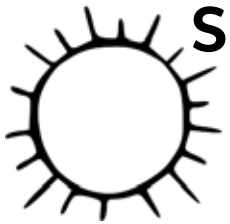
CONSUMERS **CONSUMERS**

nutrients in the soil

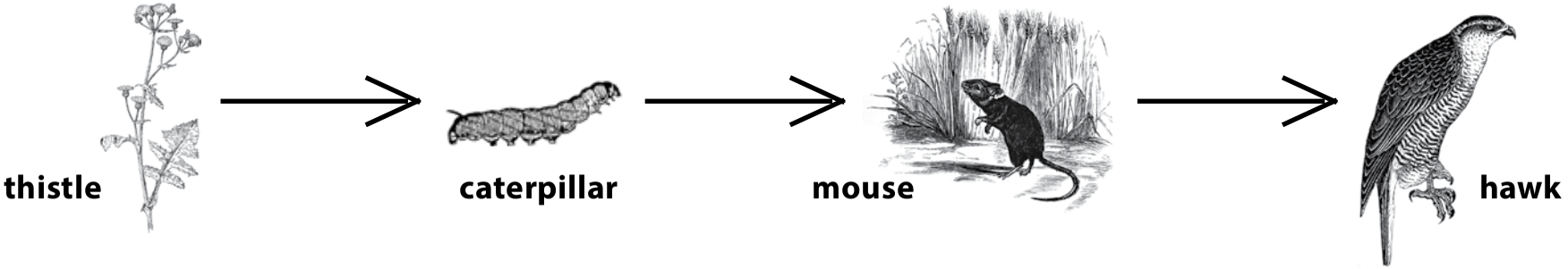
_____

fungi, bacteria & insects in the soil

KEY: Food Chain

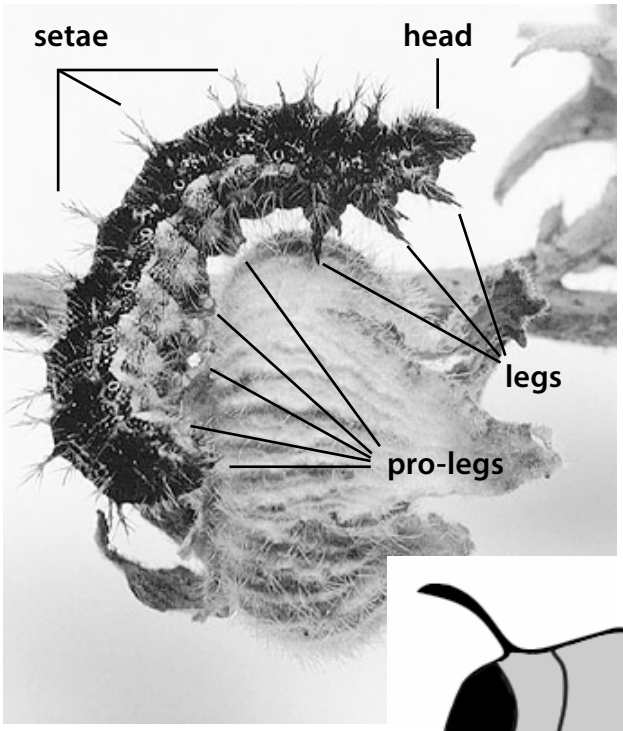


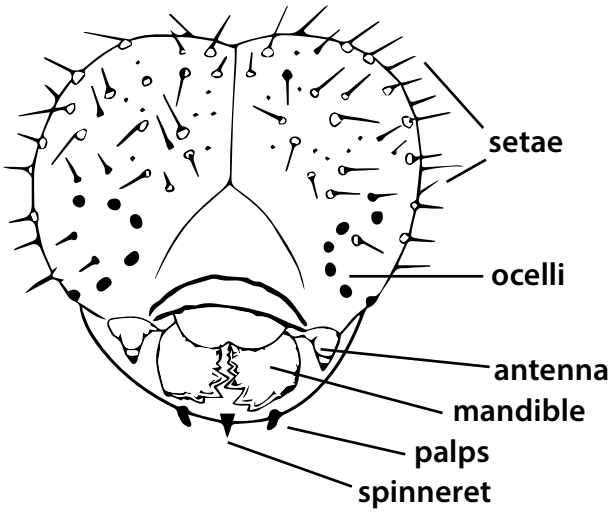
A diagram that shows how food energy transfers from organism to organism in a specific environment. Food energy moves along the food chain when one organism eats another.

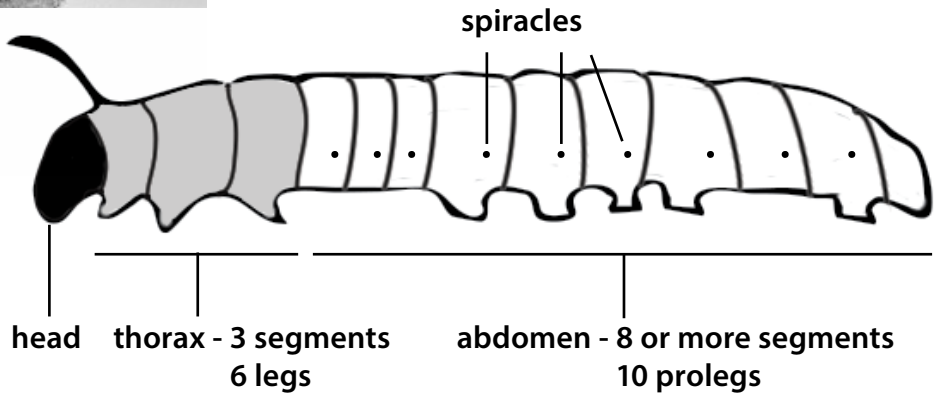


CATERPILLARS
Background: Anatomy & Vocabulary

Caterpillar or Larva







Abdomen (ab-doh-men)—the rear segment of an insect, joined to the thorax
Antennae (an-ten-ee)—a pair of organs located on the insect's head that sense taste, smell and balance
Head—the front segment of an insect that includes the mouth, antennae and ocelli
Larva—the second stage of metamorphosis, another term for caterpillar
Legs—all insects have 6 true legs with little claws that are attached to the thorax
Mandibles (man-duh-bulls)—a pair of crushing mouthparts used for biting food
Ocelli (oh-sel-eye)—a simple eye that senses light and dark
Palps—parts of the insect's mouth that smells and moves food into the mouth
Prolegs—on the abdomen, they help the larva move & climb with microscopic hooks
Setae (see-tee)—hair-like bristles all over the insect's body that sense touch
Spinneret (spin-uh-ret)—an organ on the larva's head that sends out silk
Spiracles (spir-uh-kuhls)—openings along the side of its body that bring air to the cells
Thorax (thor-aks)—the middle segment of the insect where the legs and wings are attached

Background: The Butterfly Life Cycle

There are four stages in the life cycle of the Painted Lady Butterfly.

The Egg (3-5 days)

Female butterflies lay their eggs on plants that Painted Lady caterpillars like to eat, like thistle or hollyhock. The eggs are the size of a pin head, each one containing a caterpillar beginning to grow.

The Larva or Caterpillar Hatches! (5-10 days)

The hungry caterpillar uses its strong jaws to munch through leaves, eating constantly and growing quickly. As it eats, the caterpillar's skin gets tighter. Soon it sheds this tight skin, emerging with new skin underneath. Each caterpillar sheds its skin four times before it's fully grown. When this hairy, black and yellow caterpillar stops growing, it's almost 2 inches long!

The Pupa Inside the Chrysalis (7-10 days)

The caterpillar finds a safe place to rest. With a silk thread that comes out of a hole just below its mouth (spinneret), the caterpillar spins a silk pad to attach to. The caterpillar hangs from this pad. Soon, the caterpillars' skin splits open, from head to abdomen, revealing a dull, brownish case underneath called the chrysalis.

What is happening in the chrysalis? Inside the chrysalis, the larva is becoming completely liquid and reforming itself into a butterfly. Then the butterfly pushes from inside until the case splits open, and it slowly struggles out.

The Adult Butterfly Emerges! (2 weeks)

When the butterfly first emerges from the chrysalis, its wings are soft and crumpled. The tired butterfly rests, and then slowly unfolds its wings to dry.

After a few hours, the butterfly will be ready to fly. The Painted Lady will live for approximately 2 weeks. During that time, its main goal is to mate and lay eggs so the cycle can begin again!

FOOD CHAINS
Food Chain Cards

Food chains have a lot of new science vocabulary for the students to learn and understand. These vocabulary games should help the students work together to memorize the words, their definitions, pronunciation and spelling. If your students are already familiar with other memorization games, please use them.

Objectives
1. Students learn the vocabulary of food chains by sorting the task cards in different ways
2. Students work individually and together to review the food chain concepts and vocabulary

Make Food Chain Cards
1. Make copies of the food chain cards. 2-4 sets would be useful. There are 3 types of cards - organism cards, vocabulary/definition cards and task cards.
2. Copy on card stock or glue onto tag board, index cards or old file folders. Separate them into sets of organism cards, WILD cards, vocabulary/definition cards and task cards.
3. If there is a question about the definition, please refer to the science reading vocabulary.

What If the Students Have Questions
Review all of the organisms with the class. Is everyone familiar with them? Do they know what they eat? Do they know their habitats?

As a class, make a list of questions that the students have about these organisms and food chains. When the class has time on the internet or in the school library, assign one question to a student and have them bring back an answer to share with the class.

Add Organisms to the Cards
Once the class is familiar with the initial set of cards, assign the class to do some research - each student can add one organism to the cards. The organism must be native to North America and live in woodland/grassland/desert or freshwater habitat. Assign a specific type to each student - carnivore, omnivore or herbivore. The student should write the organism's name, feeding type and 2-3 favorite foods on an index card. Bonus points for an illustration or photo.

As a Class or Small Group
Working with the whole class or in small groups, use the organism cards to review food chain concepts and vocabulary.

For example:
- Make 4 food chains with the organism cards in the correct order - ask the students to identify the producer, primary consumer, secondary consumer and tertiary consumer.
- Make 4 food chains in a mixed-up sequence - ask the students to arrange the organisms in the correct order.
- Select 3-4 herbivore, carnivore or omnivore cards - ask what the cards have in common.
- Select 4-5 cards, perhaps 4 omnivores and 1 herbivore - ask which organism does not belong.

FOOD CHAINS
Food Chain Cards

As Pairs or Individuals

- Students can create a variety of food chains that include a producer, a primary consumer, a secondary consumer and a tertiary consumer.
- Using the vocabulary/definition cards, they can match each term with its definition.
- Using the task cards, students can make stacks of each feeding type.
- Using the vocabulary and organism cards, students can match a word with organisms of that type.

Food Chain Draw

For 2-3 players

The players are working together to build one food chain.

1. Place the Producer cards in the center of the table, face down. Shuffle the remaining cards, including the Wild Cards, and deal 5 cards to each player.

2. The first player turns over a Producer card. Then, from the player's own hand, a Consumer card is chosen and placed next to the Producer. If the other players decide that animal would not eat that plant, the player must try again.

3. If a player cannot play a card, they pass their turn. Or a Decomposer card in the hand can be played as an ace-up-your-sleeve, ending the food chain with the decompostion of all the organisms.

4. The next player continues the food chain by playing a card.

5. Keep playing until no one can continue the food chain any longer. Each player gets a point for each card they play. Shuffle the cards and deal them again.

6. Let another player start the next round by choosing a Producer to start the food chain.

7. Wild Cards can be used in place of any Consumer - the player can choose any Consumer that will fit in the chain.

9. The player with the most points wins the game.

ANSWER KEY: Food Chain Cards

Carnivores: hawks - herons - snakes - frogs - fish

Omnivores: coyotes - robins - raccoons - red-winged blackbirds - mice - fish

Herbivores: caterpillars - grasshoppers - deer - beavers - fish

Producers: thistle - berries - grasses - algae - cattails - cottonwood trees

Decomposers: fungi - bacteria

Predators: hawks - coyotes - herons - robins - snakes - raccoons - red-winged blackbirds - frogs - mice - fish

Hawk
carnivore - predator
rodents, smaller birds, reptiles

Coyote
omnivore - predator
almost anything

Heron
carnivore - predator
fish

Robin
omnivore - predator
insects, worms, reptiles, fruits

Snake
carnivore - predator
insects, eggs, amphibians, reptiles

Raccoon
omnivore - predator
almost anything

Red-winged Blackbird
omnivore - predator
seeds, insects

Frog (tadpoles are herbivores)
carnivore - predator
insects

Caterpillar
herbivore
host plants

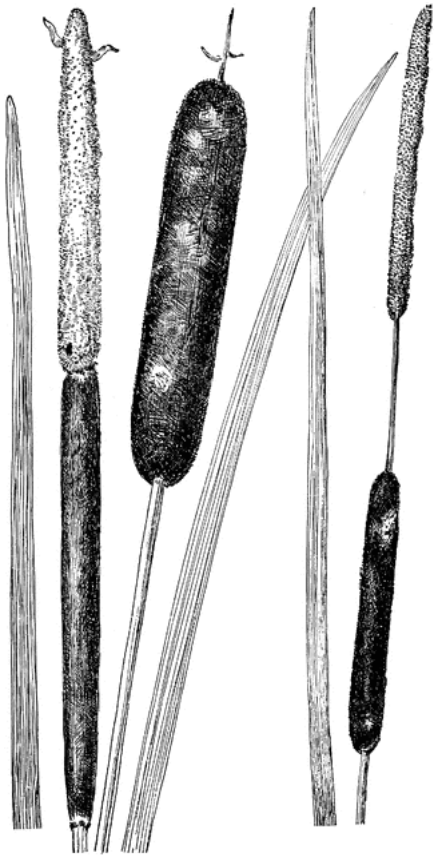
Mouse
omnivore - predator
seeds, fruit, insects

Grasshopper
herbivore
grasses, leaves

Deer
herbivore
grasses, leaves

Beaver
herbivore
tree bark, twigs, aquatic plants

Fish
omnivore - carnivore - herbivore
depends on size and habitat

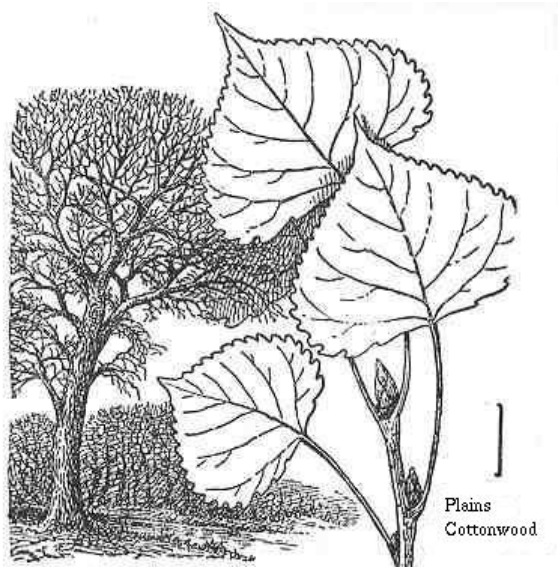


cattail

thistle

algae

berries

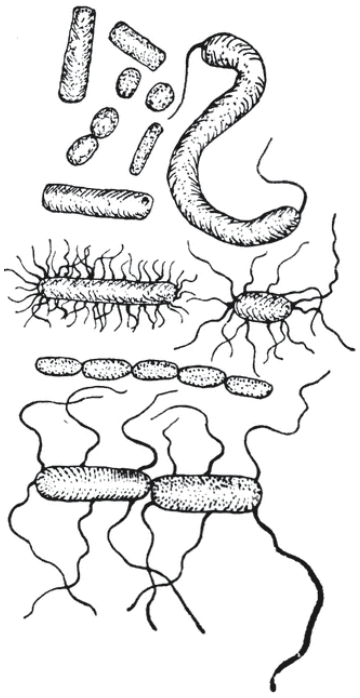


cottonwood tree

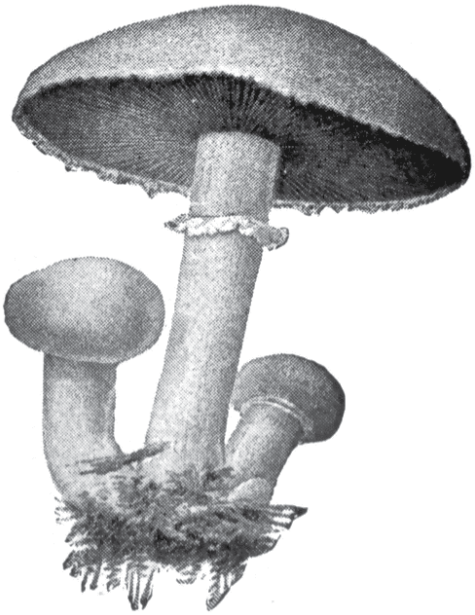
grasses

sunflower

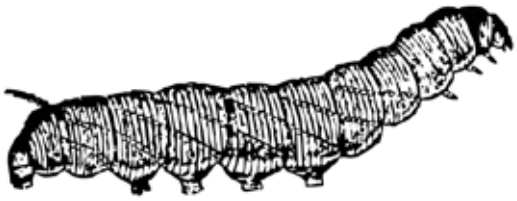
dandelion



bacteria

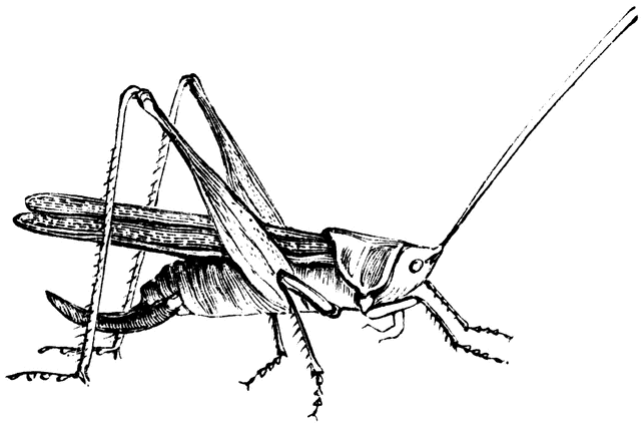


fungi

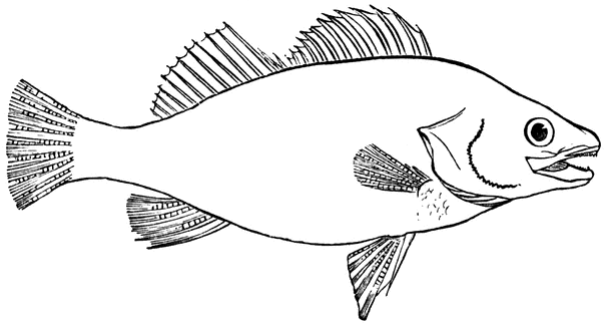


caterpillar

mouse



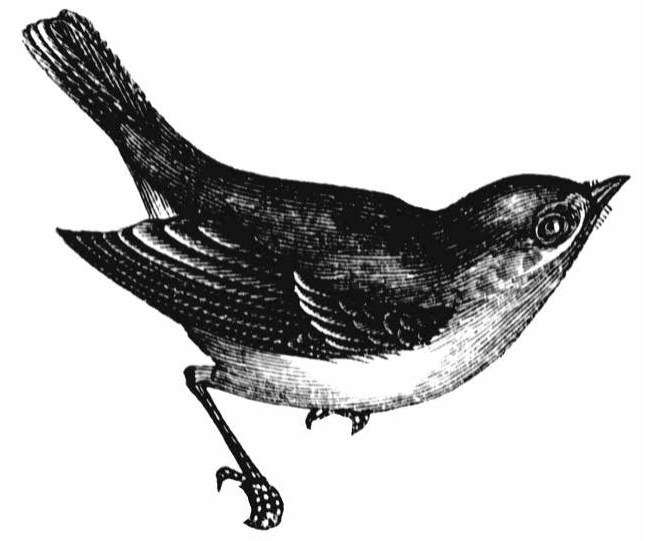
grasshopper



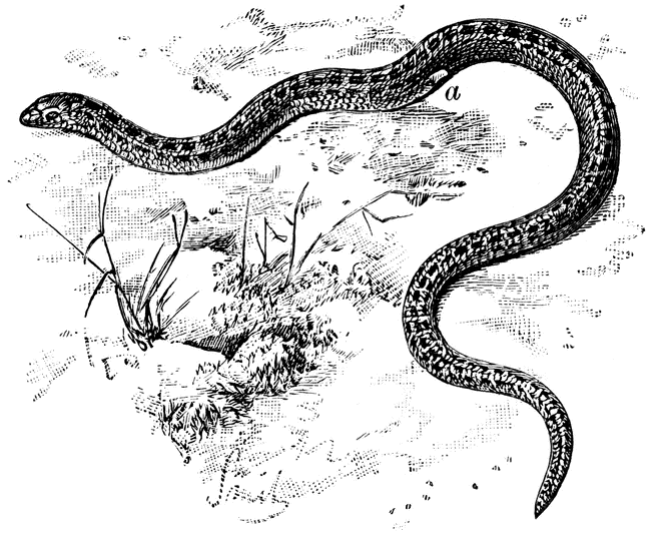
fish

beaver

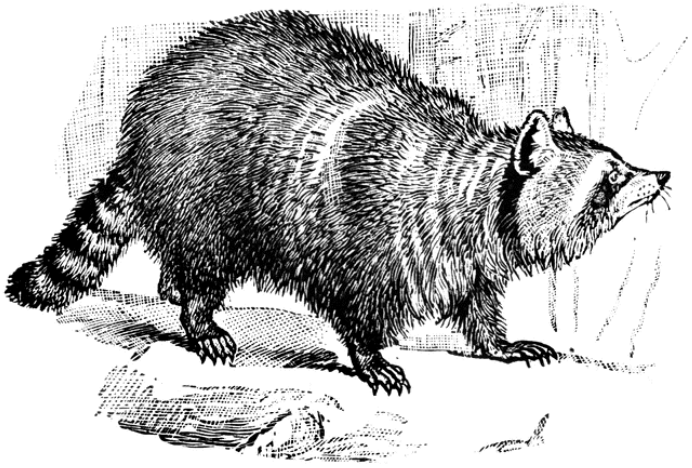
deer



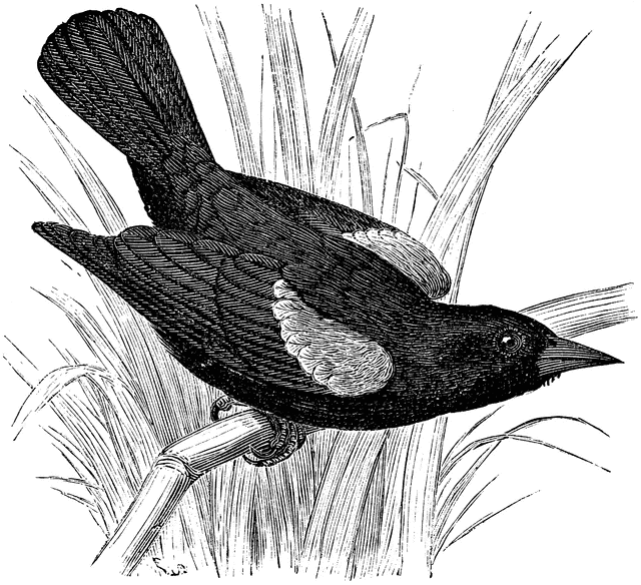
robin



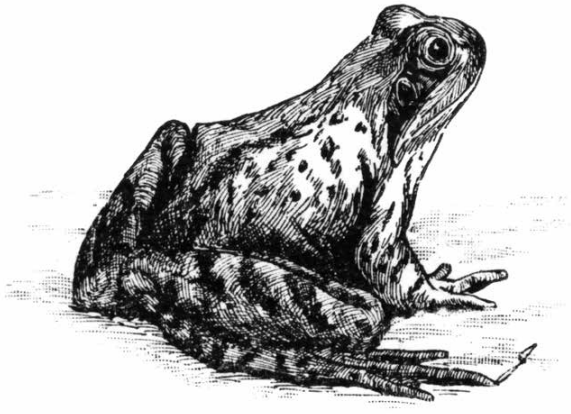
snake



raccoon



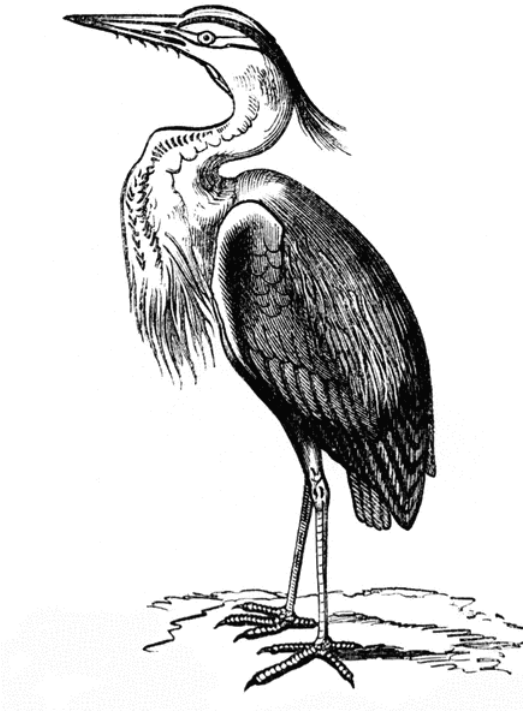
red-winged blackbird



frog

coyote

hawk



heron

human

butterfly

WILD CARD!

WILD CARD!

WILD CARD!

WILD CARD!

WILD CARD!

WILD CARD!

carnivore

Animals that eat mainly animals. Examples of carnivores include birds of prey like hawks, herons & eagles, snakes, spiders, frogs and felines like cougars.

consumer

Animals that eat other organisms are called consumers. They do not make their own food, but instead they consume plants or animals to survive.

decomposer

Fungi and bacteria break down the dead material of plants and animals. They return the nutrients to the soil, which plants use to grow.

food chain

A diagram that shows how food energy transfers from organism to organism in a specific environment. Food energy moves along the food chain when one organism eats another.

food web

A food web consists of many interconnected food chains and is a more realistic representation of an ecosystem.

herbivore

Animals that eat mainly plants. Examples of herbivores are deer, beaver, rabbits, cows, grasshoppers, caterpillars and bees.

omnivore

Animals that eat both plants and animals. Some omnivores are humans, racoons, coyotes, bears, mice and many birds like robins, red-winged balckbirds and bluejays.

predator

A predator is an animal that hunts and eats other animals.

prey

An animal that is hunted and killed by another for food.

producer

Green plants are called producers. They produce their own food!

scavenger

A meat-eating animal that eats dead animals. Many carnivores will scavenge the kill of another predator or a carcass killed by a car.

solar energy

The energy that the earth receives from the sun, primarily as visible light. Solar energy is used by plants to grow.

TASK
make a stack
of carnivores

TASK
make a stack
of herbivores

TASK
make 4 food chains -
identify the producer,
primary consumer,
seconday consumer &
tertiary consumer

TASK
make a stack
of omnivores

TASK
make a stack of
apex predators

TASK
make a stack
of producers

TASK
make a stack
of consumers

TASK
make a stack
of decomposers

RESEARCH & MODEL
Building a Food Chain Pyramid

Multiple class sessions
Several groups of 3-4

Objectives
Students will practice team work
Conduct independent research to further their understanding
Build models to demonstrate their learning and for presention to the class

Materials
Copies of *Food Chain Pyramid Template* on cardstock, 2 for each group (have several extra)
Access to the library, reference books and the internet
Markers, crayons & colored pencils, tape, glue, photos from old magazines

Directions
In groups of 3-4, the students will research the **food chains of specific ecosystems.** Each group will build 2 food chain pyramids using the template provided. The finished pyramids will be displayed for the class and the small groups will give a brief presentation about the food chains, unique organisms and ecosystems they researched.

Research
1. Divide the students into small groups of 3-4 students. Write each ecosystem on a slip of paper, if you have more than 8 groups, repeat a couple of subjects. Put the slips in a box or bag so that each group can draw a topic.

2. Tell the students that each group will be building 2 food chain pyramids with organisms from a unique ecosystem. They will research and select 2 producers, 2 primary consumers, 2 secondary consumers and 2 apex consumers in the ecosystem. They should know the name, preferred habitat and preferred diet of each organism. The group should know about the ecosystem as well - location, weather and characteristics of the landscape.

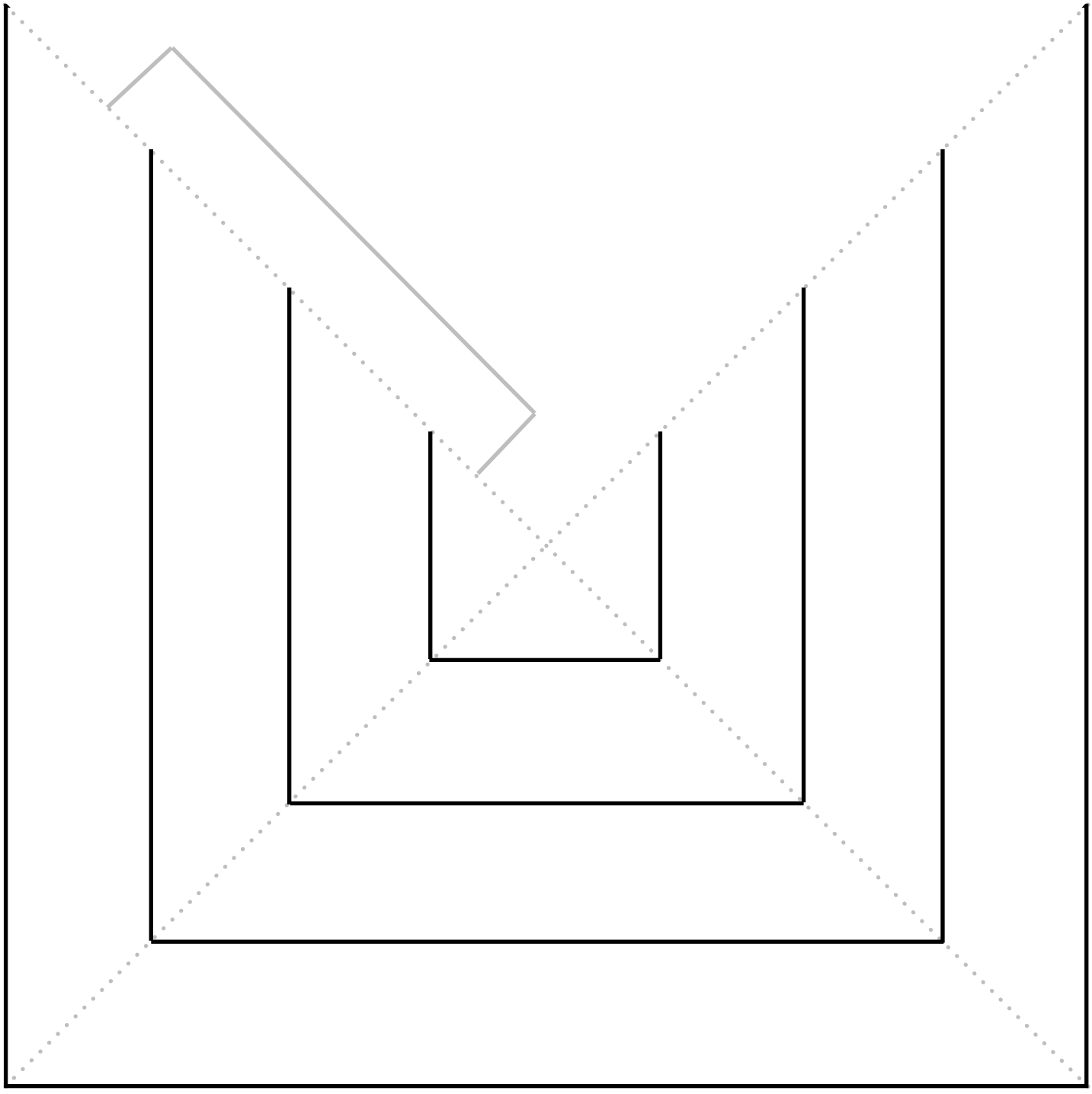
- MARINE OR OCEAN
- ALASKAN ARTIC OR TUNDRA
- AFRICAN SAVANNAH
- AMAZON RAINFOREST
- SONORAN DESERT
- FLORIDA EVERGLADES
- AUSTRALIAN OUTBACK
- CITIES (humans are the apex consumer)

Construction
Each group will build 2 food chain pyramids. The pyramids are 3-sided - SIDE 1 lists the role of producer, primary consumer, secondary consumer or apex, SIDE 2 lists the name of the organism and SIDE 3 is a drawing or photograph of the organism.

Presentation
Each group will make a presentation about their ecosystem - the location, weather and landscape - and about the organisms in the 2 food chains - their names, habitat and role in the food chain.

RESEARCH & MODEL

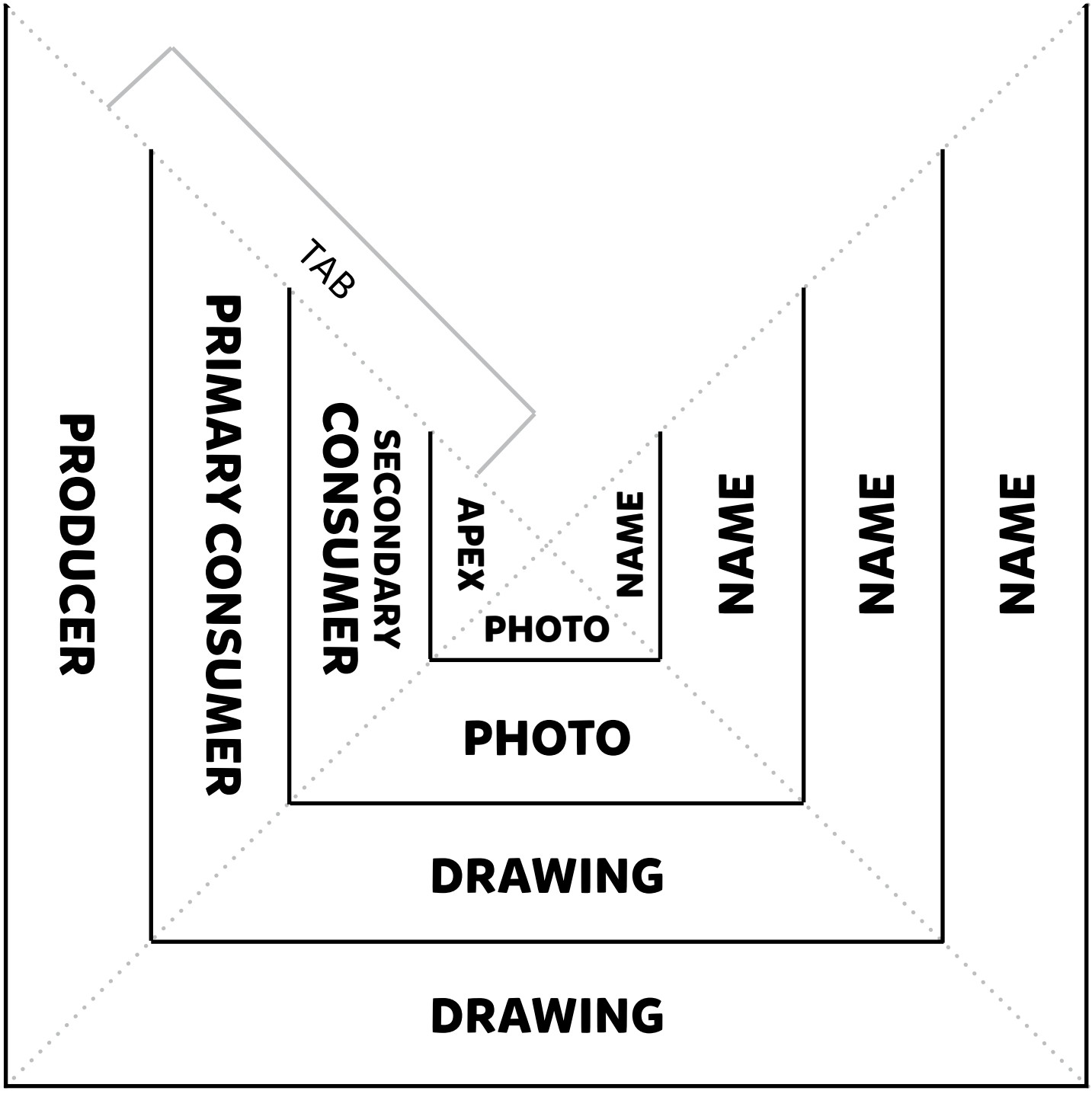
Food Chain Pyramid Template



Cut out the pyramid. Write, draw or glue information on each side.
Fold along dotted lines. Tape tab on the inside of the pyramid.

RESEARCH & MODEL

Food Chain Pyramid Example



RESULTS
Analyze the Data Using a Graph

30 minutes
Whole class

Materials

For each student
Student Folders: *Caterpillars: Rate of Growth & Food Consumed*
Based on the skill level of your students, you may want to lead them through making the graph or have them work in small groups.

Line Graph - Caterpillars: Rate of Growth

X or Horizontal axis: The horizontal axis is Day, 1 - 2- 3 - 4.

Y or Vertical axis: The vertical axis is Mean Length of Caterpillar, from 0.0 to 5.0. These units correspond to the toothpick.

Make the graph: Using the mean length recorded on *Data & Observations* for Day 1, find the length along the vertical axis and the day on the horizontal axis, mark an X at the intersection. Do this for each day. Connect all of the Xs with a line.

Line Graph - Caterpillars: Food Consumed

X or Horizontal axis: The horizontal axis is Day, 1 - 2- 3 - 4.

Y or Vertical axis: The vertical axis is Mean Food Consumed, from 0.0 to 1.0. These units correspond to the toothpick.

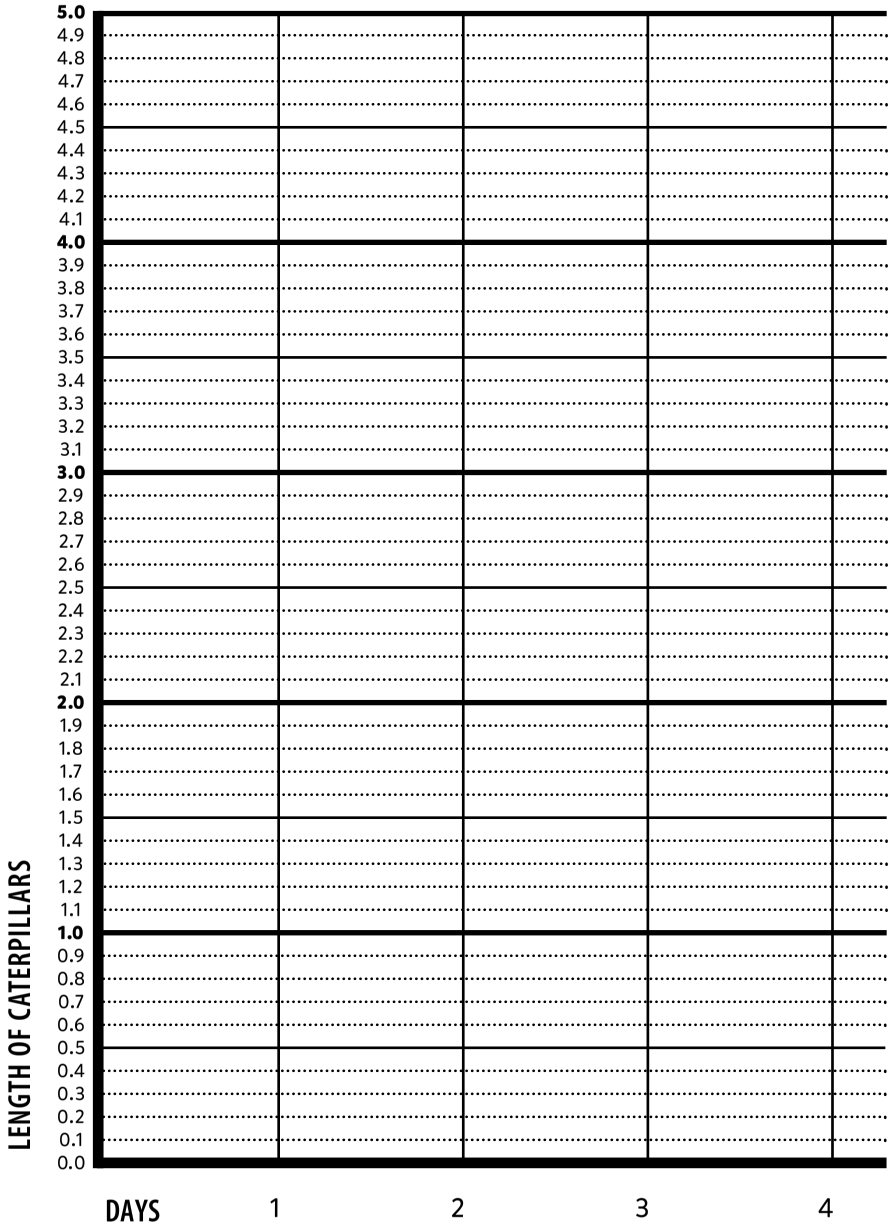
Make the graph: Using the mean food consumed recorded on *Data & Observations* for Day 1, find the amount along the vertical axis and the day on the horizontal axis, mark an X at the intersection. Do this for each day. Connect all of the Xs with a line.

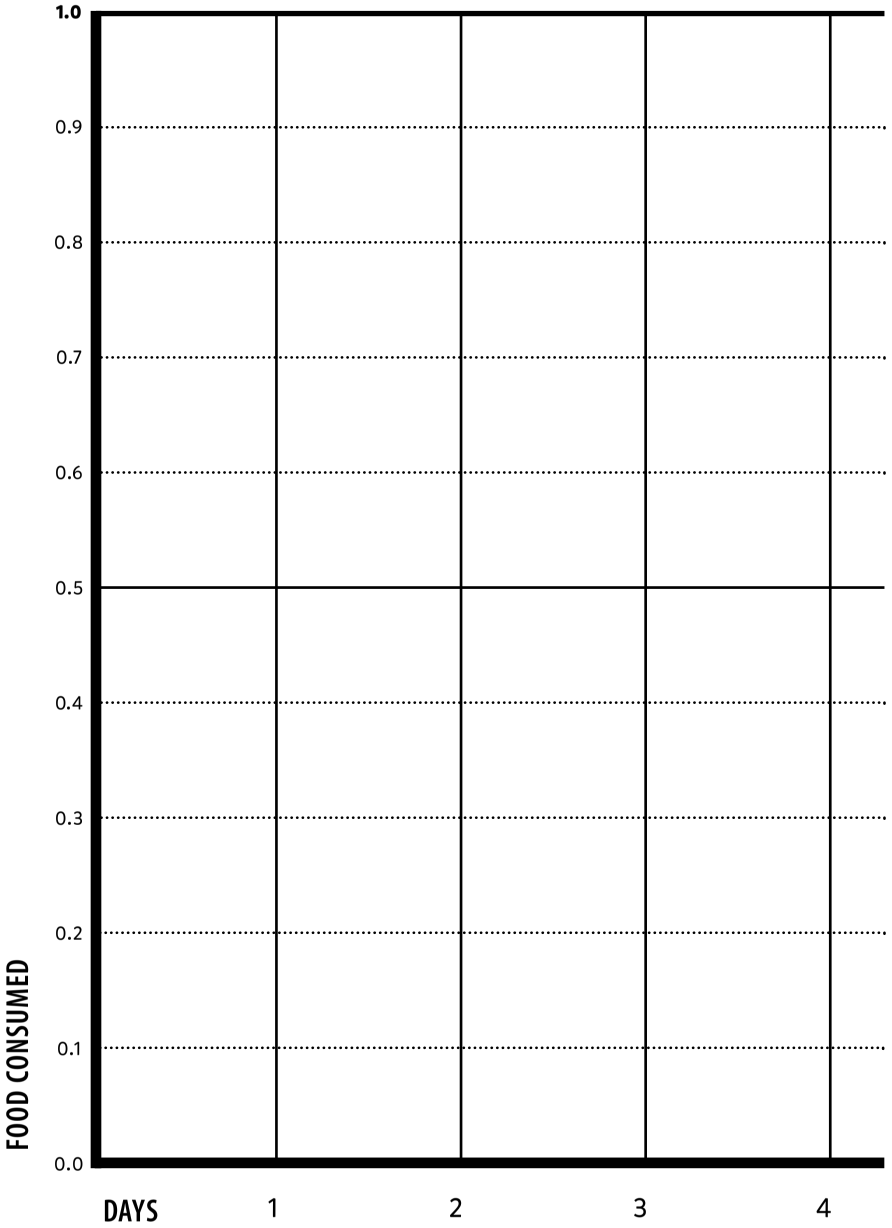
As a class, look at the completed graphs side by side. Discuss the similarities and differences.
What conclusions can you draw?
What do the graphs tell us?
How does the rate of growth and consumption of food compare?

Caterpillars: Rate of Growth & Food Consumed

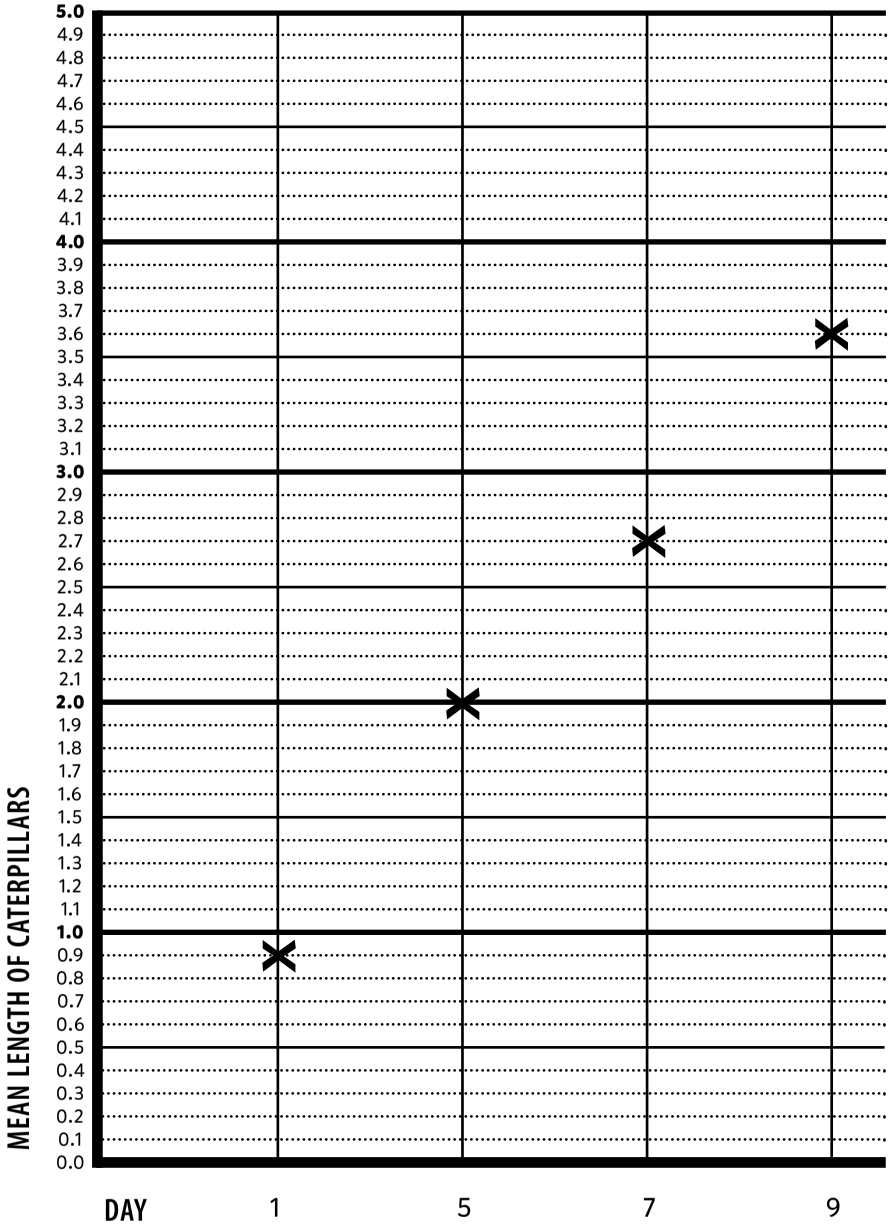
Name _____

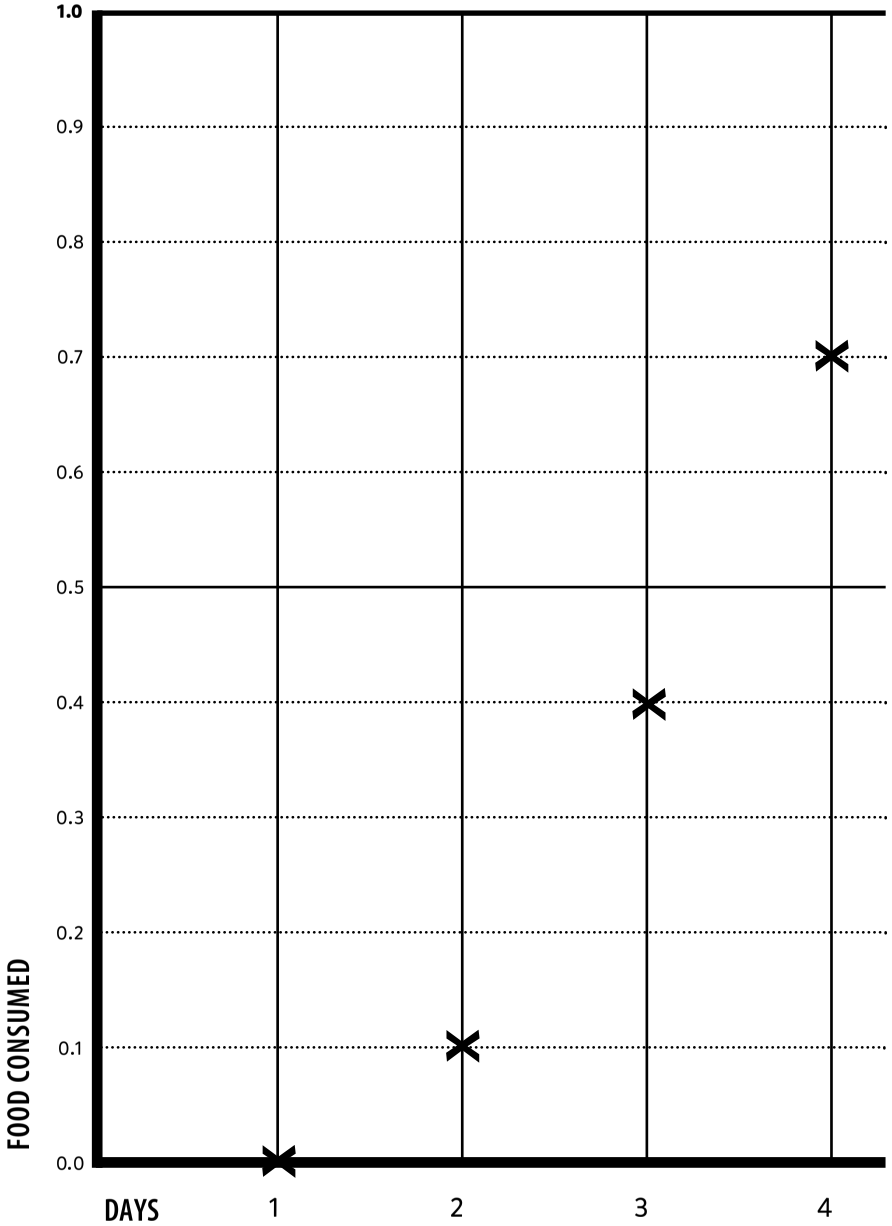
Date _____



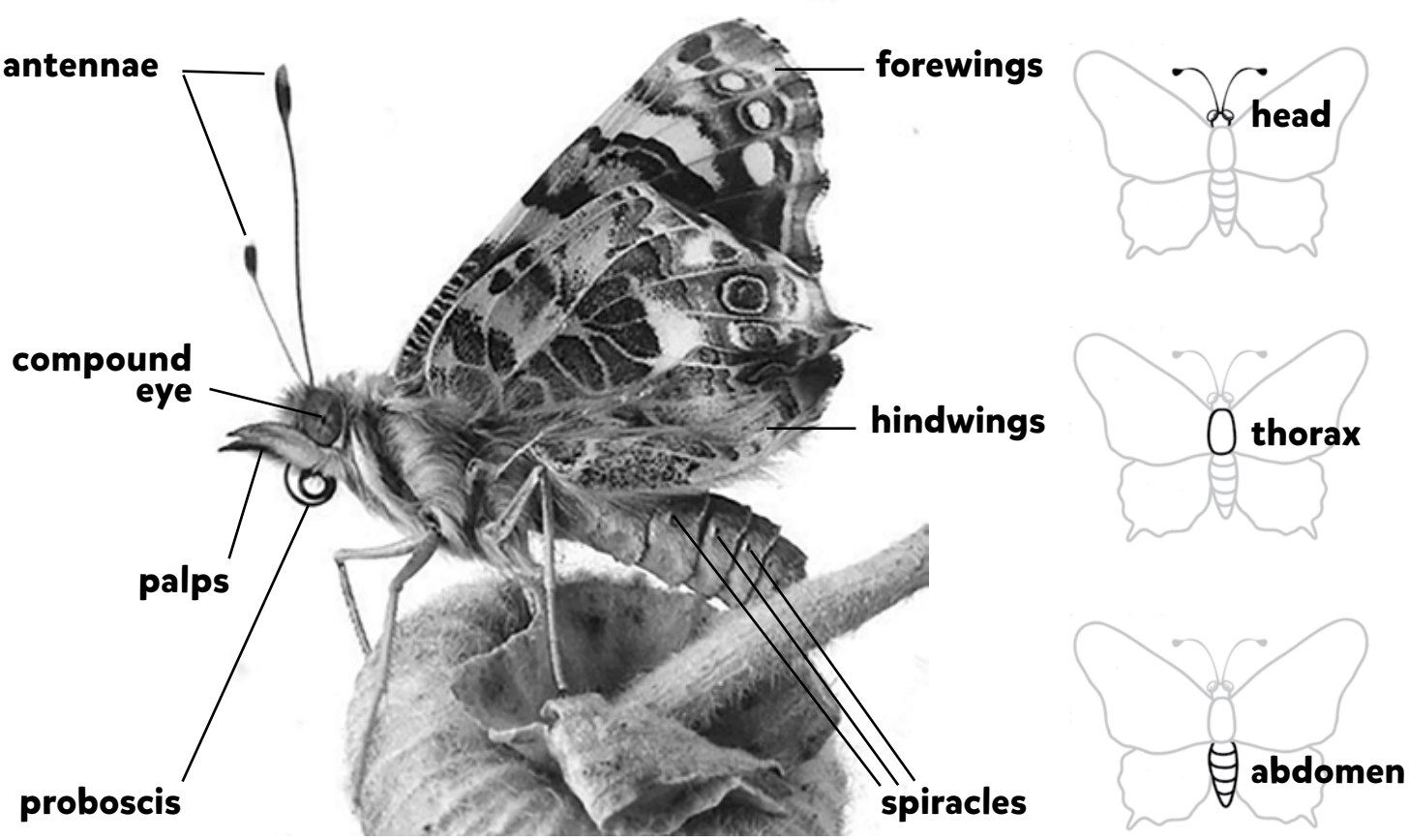


KEY: Caterpillars: Rate of Growth & Food Consumed





BUTTERFLIES
Background: Anatomy & Vocabulary



Abdomen—the hind seqment of the butterfly includes hearts, hindgut and other organs

Antennae—on the butterfly's head, used to taste the air and help with balance

Compound eyes—thousands of tiny lenses help the butterfly see in all directions

Forewings—2 wings on the front section of the thorax that allow the butterfly to fly

Head—the head includes the brain, proboscis, 2 antennae and 2 compound eyes

Palps—sense organs attached to the insect's mouth that are used for smell and to manipulate food

Proboscis—a feeding tube that works like a drinking straw

Thorax—the middle segment of the butterfly with 3 pairs of legs & 2 pairs of wings

Spiracles—tiny openings on the abdomen that let the butterfly breathe

Hindwings—2 wings on the rear section of the thorax that help the butterfly turn quickly

FOOD WEBS
Crisscrossing Food Chains

30 minutes - Whole Class

Objectives
To learn about food webs by crossing 2 or more food chains
To learn the role of butterflies in a food chain

Step One
Tell the students that you will work together to combine 2 food chains to make a simple food web. You can use the organisms on the *Crisscrossing Food Chains Diagram* as an example. You will be writing the names of the organisms on the whiteboard, and if you wish, adding the *Food Chain Card* as an illustration.

Tell the students that you'll make a food chain with 4 organisms - hawk, butterfly, thistle and robin. Ask them to tell you which one is the producer, primary consumer and so on. Write the organisms on the whiteboard and connect with arrows.

Step Two
Next, tell the students that you will make a 2nd food chain with 4 organisms - snake, mouse, dandelion and butterfly. With the students input, write the organisms on the whiteboard and connect with arrows.

Do the students notice the organism that the 2 food chains have in common?
It's the BUTTERFLY.

Ask the students to help you rearrange the words and arrows so that the 2 food chains intersect with the butterfly. It should look something like the *Crisscrossing Food Chains Diagram*. This is a simple food web.

Step Three
Ask the students to add organisms to the food web. They can select other organisms from the *Food Chain Cards*.

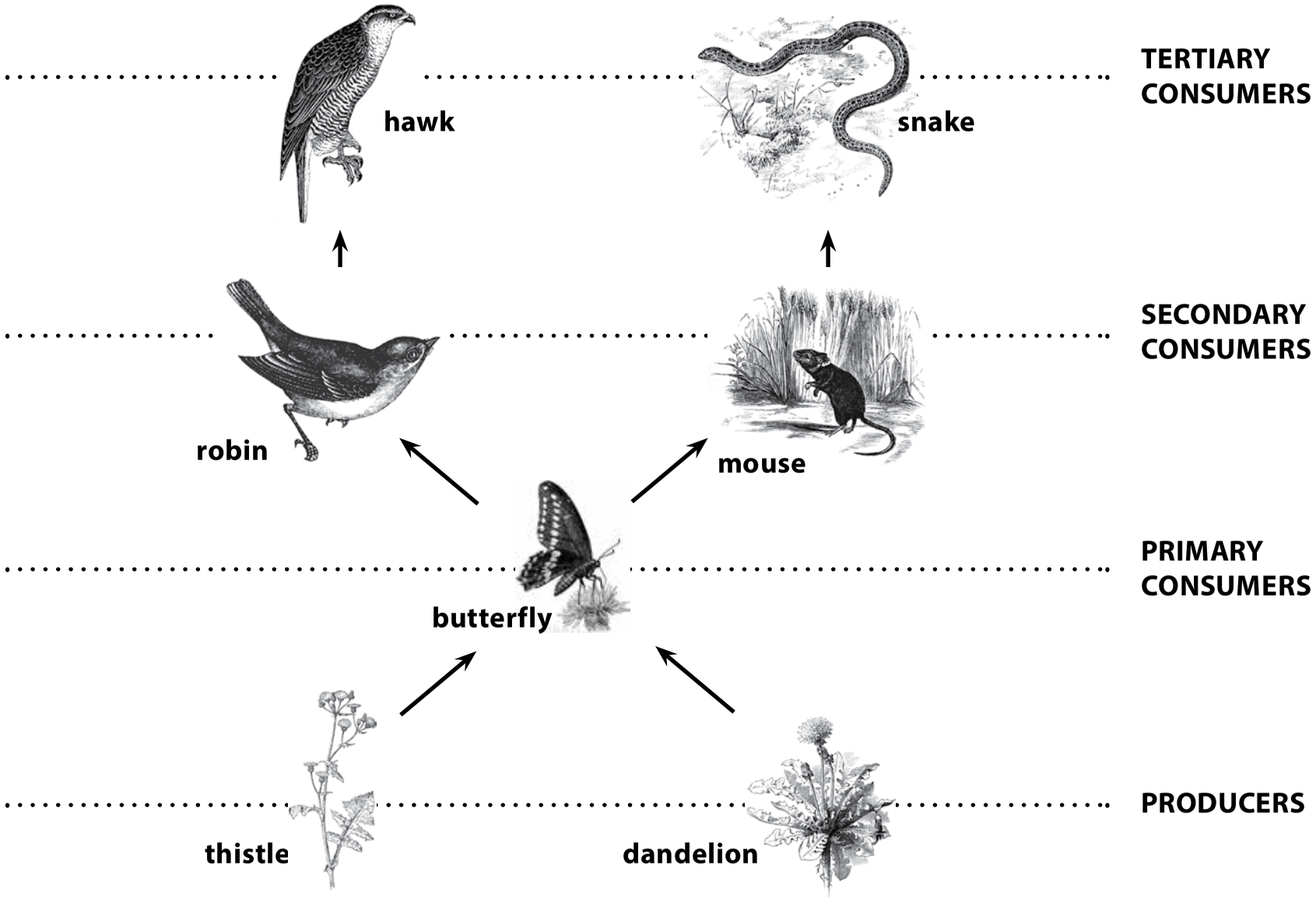
What happens when you add another Primary Consumer? Who eats what? Maybe the first suggestion doesn't work for some reason, i.e. a deer might eat the dandelion, but who would eat the deer? Add arrows based on class discussion.

What happens when you add another Secondary Consumer?

Add a few more organisms to the food web. Point out the growing complexity of the feeding relationships. Remind the students that the energy of the sun is the beginning of the food web and that all of the organisms will be consumed by Decomposers when they die, returning the nutrients to the soil.

FOOD WEBS

Crisscrossing Food Chains Diagram



FOOD WEBS

How Many Food Chains in this Food Web?

30 minutes - Whole Class

Objectives
To learn about food webs and to practice identifying food chains
To work fast and have some fun

Materials
Handout or Projection: *Food Web Diagram*
Blank paper

Step One
Handout the *Food Web Diagram* or project the diagram on the whiteboard. Tell the students that you'll be learning about food webs together.

Tell the students -
Looking at the food web diagram, they are to write down as many food chains as you can find in 10 minutes.
Write the chains like this – organism 1 > organism 2 > organism 3 > organism 4.

Step Two
Write down by name the carnivores that are in this food web.

Write down by name the herbivores.

Write down by name the omnivores.

Bonus: what do all of the food chains start with?

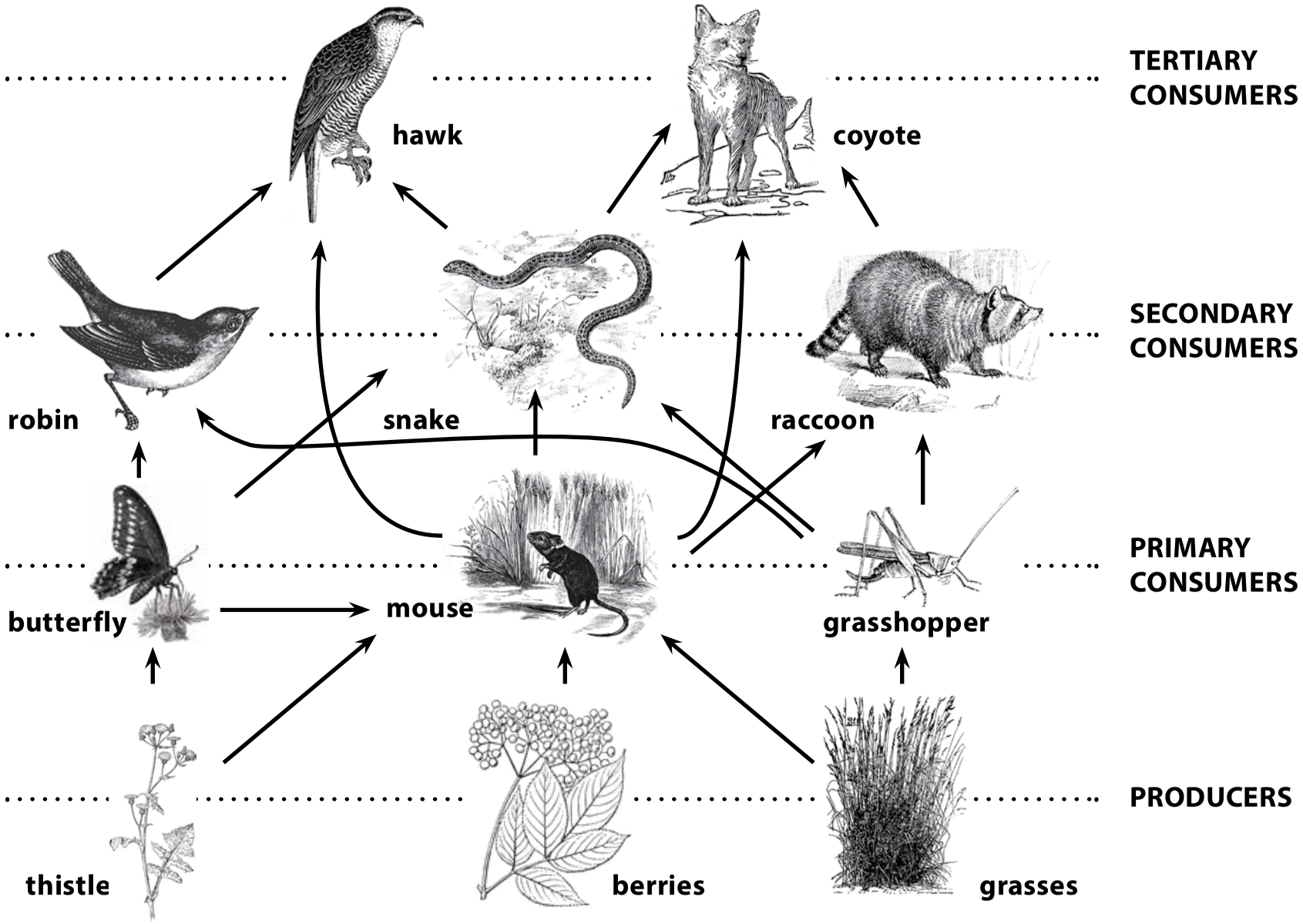
Step Three
Share your answers. Ask the students how many food chains they found?
Have several students - one at a time - say how many they found.
Did any students identify a food chain with 3 organisms?
Did any students identify a food chain with 5 organisms?
Tell them that 10 minutes was not enough time to write down all of the food chains in this one food web. There are 27 food chains identified with arrows.

Have the students - one at a time - identify a food chain that they found. Using colored markers, identify the path on the diagram and keep a count or hashmarks on the board. The teacher may want to cross off each chain on the answer key. As a class, try to identify 27.
Can the students add a possible food chain to the web? For example, add an arrow to indicate that the mouse eats the grasshopper. Identify the 5 new food chains. Or what if the snake eats the robin - how many new food chains can be found?

Share the answers to the 4 questions in Step Two.

FOOD WEBS

Food Web Diagram



FOOD WEBS

KEY: How Many Food Chains in this Food Web?

1. thistle > butterfly > robin > hawk
2. thistle > butterfly > snake > hawk
3. thistle > butterfly > snake > coyote
4. thistle > butterfly > mouse> hawk
5. thistle > butterfly > mouse > coyote
6. thistle > butterfly > mouse> snake > hawk
7. thistle > butterfly > mouse > snake > coyote
8. thistle > butterfly > mouse > raccoon > coyote

9. thistle > mouse > hawk
10. thistle > mouse > coyote
11. thistle > mouse > snake > hawk
12. thistle > mouse > snake > coyote
13. thistle > mouse > raccoon > coyote

14. berries > mouse > hawk
15. berries > mouse > coyote
16. berries > mouse > snake > hawk
17. berries > mouse > snake > coyote
18. berries> mouse > raccoon > coyote

19. grasses > mouse > hawk
20. grasses > mouse > coyote
21. grasses > mouse > snake > hawk
22. grasses > mouse > snake > coyote
23. grasses> mouse > raccoon > coyote

24. grasses> grasshopper > robin > hawk
25. grasses> grasshopper > snake > hawk
26. grasses> grasshopper > snake > coyote
27. grasses> grasshopper > raccoon > coyote

How many carnivores? 3. Hawk, coyote and snake.

How many herbivores? 2. Butterfly and grasshopper.

How many omnivores? 3. Robin, raccoon and mouse.

What do all of the food chains start with? The sun.

INDIVIDUAL ASSESSMENT

Comparing Food Webs

Assign a creative writing composition for each student comparing the food webs of the ecosystem that they researched for the *Food Chain Pyramid* activity with their choice of the food webs of another ecosystem.

Questions to consider:
How are the producers similar or different? How have they adapted to the environment?
Do herbivores, carnivores and omnivores feed on similar organisms or very different ones?
Are the herbivores, carnivores and omnivores similar organisms, i.e. rodents, insects, birds, etc?
Look at the apex consumers - Are they similar sizes? What are their habitats and behaviors?

The composition should be either:

- An adventure story about a traveler who must survive moving through both ecosystems
- A dialog between organisms in the 2 ecosystems, comparing their differences and similarities

Use at least 10 vocabulary words or names of organisms in context.
Formatting of the composition should be the same that's been used throughout the year.

BUTTERFLY LAB

Celebrate the Earth!

Each school celebrates the Earth's Birthday a little differently, bringing their own unique ideas and interests to the event. Get creative!

Many schools choose a day close to the end of the school year, when the weather's warm, to celebrate by planting seeds, releasing butterflies and demonstrating ways to care for our home planet.

Your celebration is a special gift from the children to the Earth!

Here are some activities for your classrooms to share:

- Sharing a song that students learned in the Butterfly Lab
- Planting seeds in a school garden
- Creating an art project from recycled materials
- Releasing Painted Lady butterflies
- Students can draw pictures of their favorite animal, flower or tree
- Students reporting on ways to care for the earth like saving water, feeding birds, growing vegetables and more

At the close of your celebration, please remember to take the **Earth's Birthday Pledge**!

No job is too big,
No action too small
For the care of the Earth
Is the task of us all!

CLIMATE SCIENCE

Climate Science & Butterflies

Overview
This lesson introduces the concept of climate change and how it relates to plants and insects. This lesson builds off of the students' knowledge from the Butterfly Lab by heightening their understanding of the needs of the plant and how those needs are impacted by the environment. Students will learn the meaning of climate change, and what they can do to help.

Use the script below to engage the students. Write their answers to your questions on the board.

What does a caterpillar need to survive?
- Water (Rain)
- Light (Sun)
- Food (Plants)
- Air
- Soil

What other things might affect butterflies?
- Weather (wind, rain, snow, heat)
- Extreme Weather (drought, floods, hurricanes, tornadoes, fires)
- Climate (long periods of high or low temperatures)
- Plant Bloom Period
- Pollution
- Plant Pests
- Disease

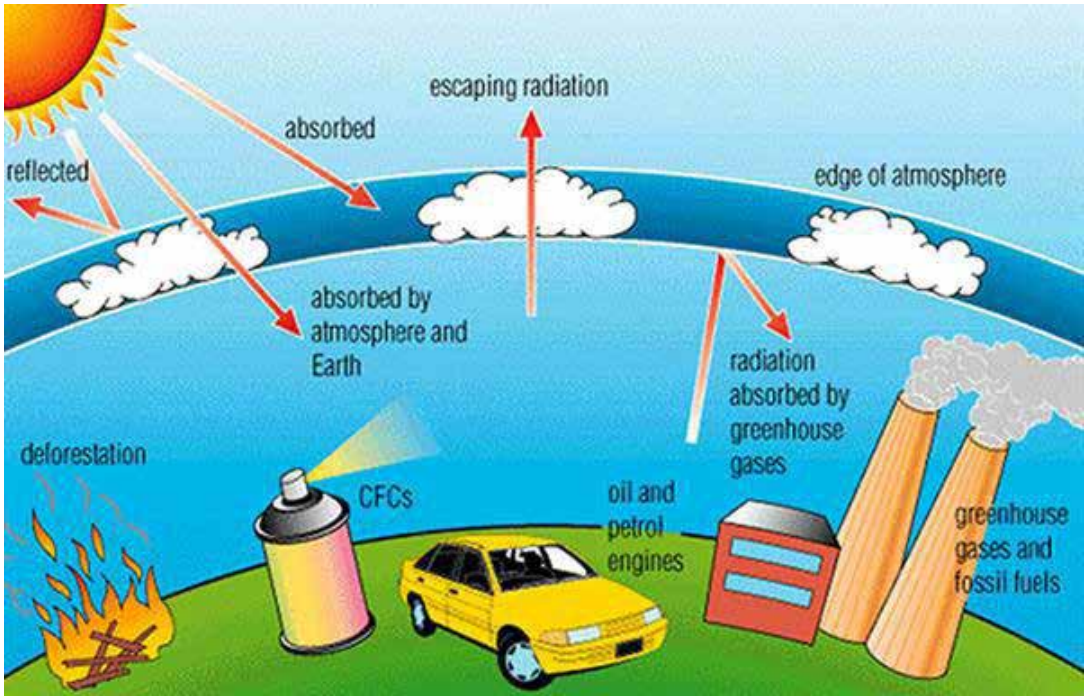
Has anyone heard of Climate Change? What is Climate Change?
Climate change is a long-term change in the average weather patterns of the entire planet. To understand this, it is important to know the difference between climate and weather. Weather is local and temporary, it's what happens at a particular time and place. Weather is rain, snow, wind, hurricanes, heat waves, etc. Climate is the big picture of weather. If an area like a desert has weather that is extremely hot with very little rain each year, it has a dry climate. If an area like a rainforest is warm and gets lots of rain, it has a tropical climate. We are seeing the average temperatures across the entire planet get higher and higher each year at a faster rate than we've ever seen before. The higher temperatures will change the climate all over the world, making dry areas dryer and wet areas wetter. We also expect climate change to cause more extreme weather events by changing the timing, frequency and duration of precipitation and unusual temperatures. This will affect the plants, animals, and humans living there.

What is causing Climate Change?
Climate change is caused by humans burning fossil fuels. Humans burn fossil fuels when we use electricity, drive our cars, fly in planes, etc. When we do these things, we release tiny molecules of pollution into the air, called greenhouse gases. There are different types of greenhouse gases, but the most common greenhouse gas is carbon dioxide (Other greenhouse gases are methane, nitrous oxide, ozone, and water vapor). Over time, these tiny, invisible molecules build up and act as a blanket over the planet that traps heat trying to escape into space. This heat trapping blanket will cause the Earth to have a fever that changes the average climate and weather of the planet.

Climate Science & Butterflies

How is climate change affecting plants?
Imagine you are a flower and you lived your whole life on a snowy mountain. You would be used to living in a cold climate, right? Now imagine that the climate of your home has changed over time to be much, much hotter. How would you like that? Do you think that might affect your life as a flower? A hotter climate might mean less water available because there is less rain or because more water will evaporate out of the soil before the plants can use it.

Many humans, like us, are lucky enough to be able to cool off by going in the shade, changing our clothes, drinking lots of water, or going into an air conditioned room. But do you think a flower can just pull out its roots and walk somewhere else? No. Flowers and many other plants and animals will struggle and have to adapt to dryer conditions to survive.

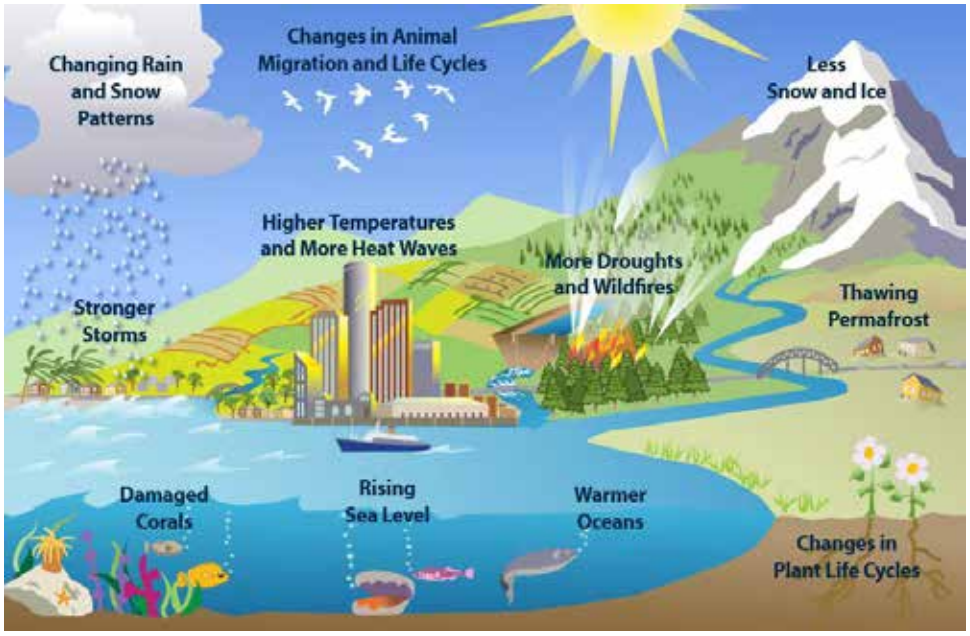


Climate change can also change the life cycle of a plant or animal all together. If the Earth's temperature is warming, flowers will bloom earlier in the year. A lot of flowers bloom in the spring time when there is less frost and warmer temperatures, but if the temperature is warmer earlier in the year the flowers will not bloom at the right time. If the life cycle of flowers is changed, it will throw other species out of their seasonal routine as well. Insects count on flowers to bloom at a certain time so they can gather nectar from the flowers, but if the flowers bloom earlier than usual, the insects might have to migrate somewhere else to find nectar.

In the Butterfly Lab, we saw that temperature affects the rate of metamorphosis in butterflies. As our climate gets warmer, this could cause butterflies to reach adulthood faster than usual and might impact their migration patterns and/or interactions with other species.

Climate Science & Butterflies

This interaction is called phenology.
Phenology is an essential aspect to life on earth. Think of it as nature's calendar that dictates the seasonal changes in plants and animals from year to year. Plants and animals count on certain patterns to take place at certain times of the year. Local climate dictates the timing of these natural events. For example, flowers bloom, birds migrate, bears hibernate, and butterflies go through metamorphosis all based on their local climate.



Phenology and Climate Change
If a local climate changes due to climate change, it will alter the natural cycle and disrupt interactions between different species. Since all species in an ecosystem are connected to each other, any increase or decrease in a species population could impact the entire ecosystem.

This could even affect humans. Farmers depend on insects to pollinate their crops. Farmers need insects to develop into adults around the same time that their crops are flowering, but a change in local climate could cause the crops to flower before the insects are old enough to pollinate them. This could impact a farmer's livelihood and our food sources.

As we can see, climate change is a big factor that can impact plants and insects. We know that it's important for us to care for our fellow humans, but it is also important for us to care for our friends, plants and animals. Can we brainstorm ideas to help save plants and animals from climate change?

Hang up the *10 Things I Can Do to Help* Poster in Your Classroom

1. Use Less Electricity
2. Save Water
3. Recycle
4. Pick Up Trash
5. Walk or Ride Your Bike
6. Choose Reusable Bags and Water Bottles
7. Eat Your Veggies
8. Grow Plants for the Bees, Butterflies, and Birds
9. Read More About Climate Change and Share What You Learn
10. Start an Earth-Friendly Project with your Friends and Family

Climate Kids in Action!

10 things I can do to help

1. USE LESS ELECTRICITY
2. SAVE WATER
3. RECYCLE
4. PICK UP TRASH
5. WALK OR RIDE YOUR BIKE
6. CHOOSE REUSABLE BAGS AND WATER BOTTLES
7. EAT YOUR VEGGIES
8. GROW PLANTS FOR THE BEES, BUTTERFLIES AND BIRDS
9. READ MORE ABOUT CLIMATE CHANGE AND SHARE WHAT YOU LEARN
10. START AN EARTH-FRIENDLY PROJECT WITH YOUR FRIENDS AND FAMILY

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CLIMATE SCIENCE ALLIANCE

FEEDBACK
Tell Us What You Think

Name _____

School _____

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Please send your feedback to:
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Email :: info@EarthsBirthday.org Fax :: 505-984-9176

Thank You!