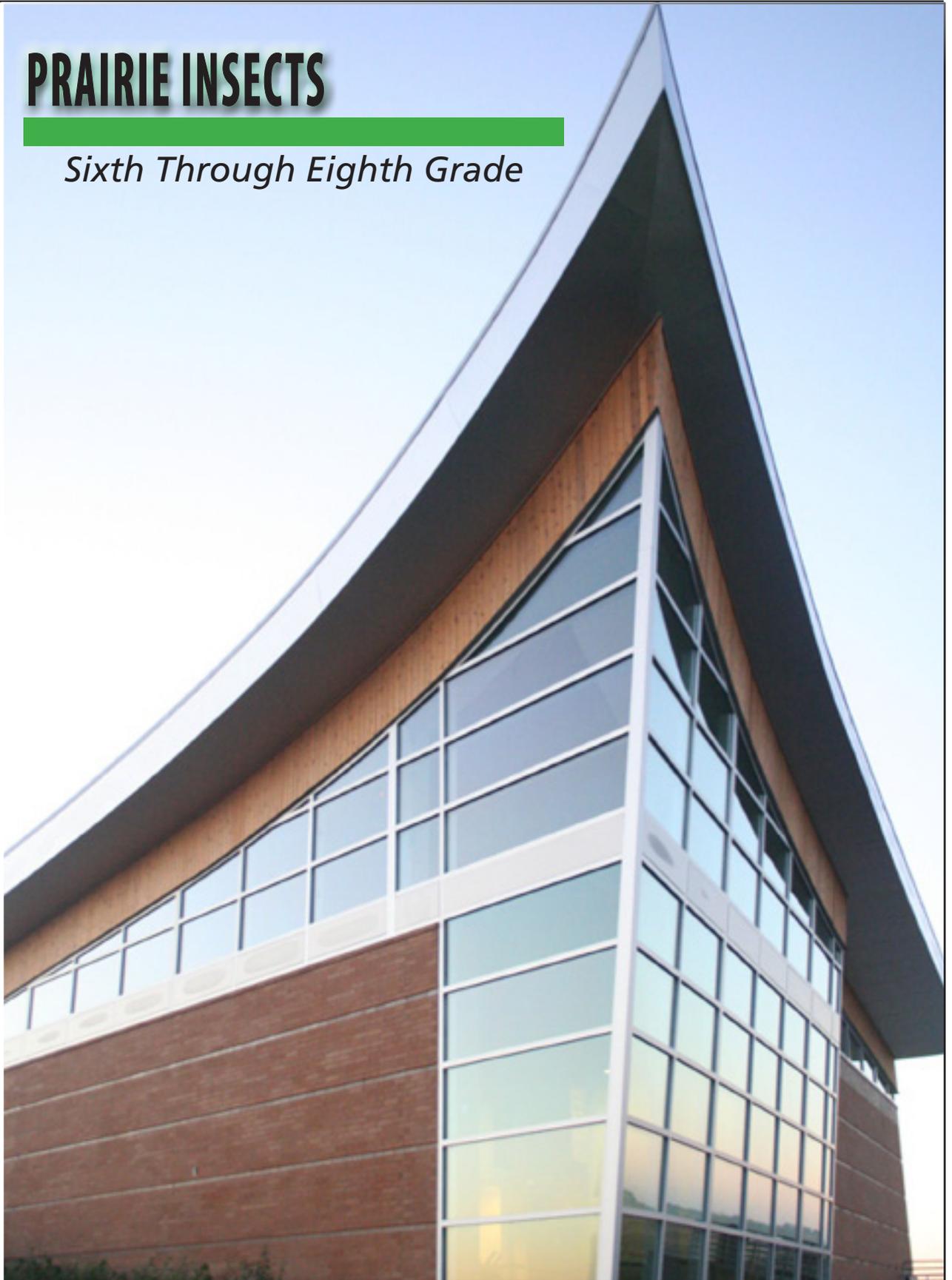


Free Land was the Cry!

PRAIRIE INSECTS

Sixth Through Eighth Grade



Homestead

National Park Service
U.S. Department of the Interior

Homestead National Monument
of America, Nebraska



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TABLE OF CONTENTS

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Some of the ideas in this lesson may have been adapted from earlier, unacknowledged sources without our knowledge. If the reader believes this to be the case, please let us know, and appropriate corrections will be made. Thank you.

PROGRAM DESCRIPTION



'The Monument's natural resources are managed in such a way as to maintain a heterogeneous landscape composed of a mosaic of high quality remnant and restored tallgrass prairie, lowland bur oak forest and associated ecotones, as well as prairie streams and their hydrologic processes; that reflect the value of the site as a homestead, represents as accurately as possible the environment encountered by early settlers, and preserves native biodiversity.'

*Desired Future Condition of the Natural Resources of
Homestead National Monument of America*

Homestead National Monument of America's tallgrass prairie is managed so that visitors can experience an environment similar to the one experienced by homesteaders. An important element in the biodiversity of the tallgrass prairie is insects.

The homesteaders encountered insects often in their everyday life. Ants and grain beetles could infest their grain and staple food supplies. Wasps could sting vicious-

ly and if one was allergic to their sting, death would follow as they had no antidotes to the venom. Fleas carried deadly diseases such as plagues. Bed bugs, lice, chiggers and mosquitos also made life uncomfortable.

Homesteaders often had to treat animals for the New World Screwworm, a type of blow fly that would infest wounds of living animals, including humans. Clothes moths would eat holes in wool and cotton clothing. Butterflies, although not problematic, were prevalent in the prairies as well. Even though insects were a challenge for the homesteaders they are important to maintaining a healthy prairie.

Insects perform a vast number of important functions. They aerate the soil, pollinate blossoms, and control insect and plant pests; they also decompose dead materials, thereby reintroducing nutrients into the soil. Burrowing bugs such as ants and beetles dig tunnels that provide channels for water, benefiting plants. Bees play a major role in pollinating fruit trees and flower blossoms. Gardeners love the big-eyed bug and praying mantis because they control the size of certain insect populations, such as aphids and caterpillars, which feed on new plant growth. Finally, all insects fertilize the soil with the nutrients from their droppings.

CURRICULUM OBJECTIVES

- Students will learn how insects are classified using the seven level classification system graphic organizer.
- Students will characterize and explore different types of insects that homesteaders experienced.
- Students will research the Monarch butterfly.
- Students will define a complete beetle metamorphosis.
- Students will describe each stage in the life cycle of a darkling beetle.

NATIONAL STANDARDS

NS.5-8.1 SCIENCE AS INQUIRY

As a result of activities in grades 5-8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry.

NS.5-8.3 LIFE SCIENCE

As a result of their activities in grades 5-8, all students should develop an understanding

- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms.

SPECIAL ICONS		<i>Enrichment Activities</i>		<i>Science</i>	<i>Cool Internet Sites:</i>	
	Indicates a reproducible handout is included		Indicates an additional math lesson		Indicates websites with valuable information	Indicates an additional language arts lesson
		Indicates advanced lessons		Indicates an additional science activity		

Pre-Visit Activity #1 (suggested)

THE CLASSIFICATION SCHEME

All organisms are classified into groups called Kingdoms. This classification is based on their cell and body structure. A kingdom is the largest, broadest category. Each kingdom is divided into phyla, according to more specific characteristics. Phyla are then divided into classes that are subdivided into orders. Each time the organisms are divided, the characteristics are more and more specific. Orders are divided into families and families into genera. The final division is into species. Each species is different and unique. Species may be similar, but no two species are exactly alike.

Using the Classification Scheme page, have students learn the order of the classification system.



The Classification Scheme
All organisms are classified into groups called Kingdoms. This classification is based on their cell and body structure. A kingdom is the largest, broadest category. Each kingdom is divided into phyla, according to more specific characteristics. Phyla are then divided into classes that are subdivided into orders. Each time the organisms are divided, the characteristics are more and more specific. Orders are divided into families and families into genera. The final division is into species. Each species is different and unique. Species may be similar, but no two species are exactly alike.

Kingdom

Phylum

Class

Order

Family

Genus

Species

*Try learning one of these sentences to help you remember the order of the classification system. The first letter of each word represents a group in the classification system.
King Phillip came over from Germany sick or King Phillip came over for good soup.*



For a list of websites
with more information about insects
please see the
Website List
at the back of this unit.

CLASSIFICATION GRAPHIC ORGANIZER

Pre-Visit Activity #2 (suggested)

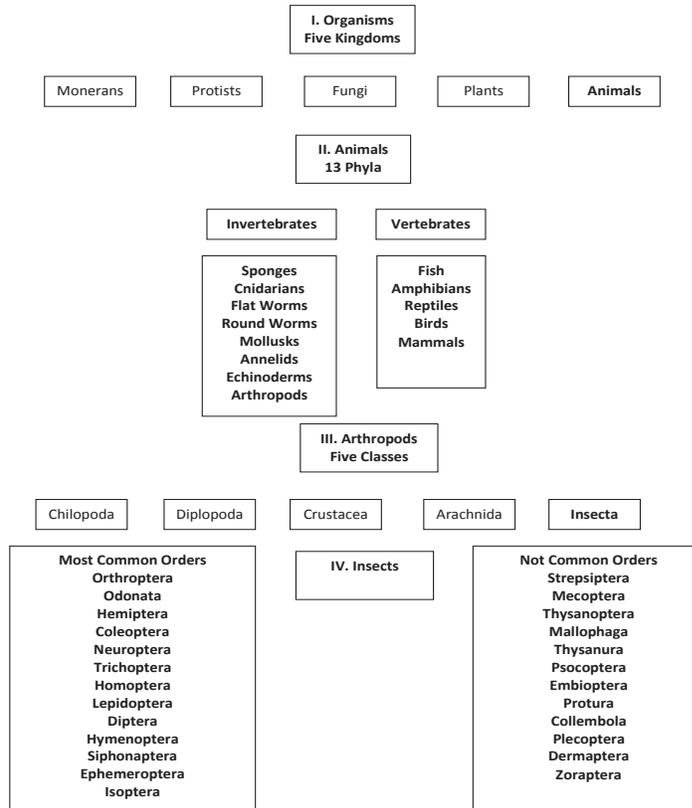
Science



Using the Classification: A Graphic Organizer handout, have students find pictures in magazines or on the internet to identify the different groups of organisms.



Classification: A Graphic Organizer



Pre-Visit Activity #3 (suggested)

CHARACTERISTICS OF INSECTS

Using the Characteristics of Insects page, have students research the characteristics of insects.

1. Spiders have eight legs. Are they insects? Why or why not?
2. What are the three body parts of an insect?
3. The word insect comes from a Latin word meaning what?
4. Lice do not have wings. Can they be insects? Why or why not?
5. Butterflies have two pairs of wings. Why must they be classified as insects?
6. What are an insect's antennae used for?
7. What are three characteristics of insects shared by other arthropods?
8. Suppose there are 800,000 kinds of insects in the world and 89,000 kinds of them in the United States. What percentage of kinds of insects can be found in the United States?

Next, assign an insect family to each student in the class. Instruct the students to use reference materials to develop a research paper. Each paper should include the following information:

- a. Identifying characteristics of members of the family (include an illustration)
- b. Habitats where the family is usually found
- c. Food sources for the family
- d. Distribution of the family in the United States (include a range map.)



CHARACTERISTICS OF INSECTS

Pre-Visit
Activity #3
(suggested)



RANGER-LED EXPERIENCE

Insect Scavenger Hunt

Main idea: More insects are found on earth than any other type of animal. Students will have the opportunity to explore and collect insects from various habitats.

Objective:

1. To learn about the habitats of insects and other arthropods
2. To recognize insect roles in the environment
3. To explore insect diversity



Materials: insect nets, plastic bags or bottles for specimens

Procedure: See how many examples for each of the listed items you can find.

Item	Habitat	Possible Points	Points Received
An insect home		5	
A predatory insect		2	
An insect that uses camouflage		5	
An arachnid		2	
A crustacean		2	
A millipede		2	
A centipede		2	
An insect that lives in a society		2	
A decomposer insect		3	
An insect without wings		3	
An insect with 2 wings		2	
An insect with 4 wings		2	
3 different beetles		5	
An insect pollinator		3	
An insect belonging to the order Orthoptera		2	
An insect belonging to the order Hemiptera		2	
An insect belonging to the order Lepidoptera		2	
An insect belonging to the order Diptera		2	
An insect belonging to the order Hymenoptera		2	
An immature insect		3	
An insect egg		5	

Total: 58 _____

RANGER-LED EXPERIENCE



Homestead National Monument of America is proud to be a pioneer in distance learning technology.

Contact the Education Coordinator at (402) 223-3514 to schedule your virtual field trip on Prairie Insects.

Post-Visit Activity #1 (suggested)

THERE'S A BEETLE IN MY FLOUR!

Have you ever opened a bag of flour or dog food and noticed black or brown beetles crawling around? Those beetles were probably darkling beetles. There are many different kinds of darkling beetles. Some, called flour beetles, feed on flour, corn meal, dog food, cereal, dried fruit, and all kinds of stored grain. These beetles often infested the staple supplies of the homesteaders. Many recipes called for twice-sifted flour and the reason was to eliminate bugs in the flour. They still are serious pests in homes, grocery stores, and warehouses today. Homesteaders could not afford to throw the infested flour away, so they ate it, beetles and all!

The larvae of some darkling beetles are called mealworms. The mealworm larvae will change into stiff, white pupae. Then in a short while the pupae will change into beetles. Feed the beetles small bits of raw vegetables (such as carrots and turnips), cornmeal and dog food. The adults will lay eggs that are very tiny, clear white, and sticky. The eggs hatch within 5 to 12 days, starting a new generation of mealworms.

Mealworms are often sold in pet stores as food for lizards, snakes, turtles, and other pets. You can purchase a small container of mealworms and raise your own beetle colony to watch firsthand how beetles change from eggs to adults.

In this activity students will discover the changes that take place in a mealworm colony.

Materials

Mealworms (available at most pet stores)
Oatmeal or bran
Rubber band
Food for adult darkling beetles

Large jar
Small piece of screening
Apple or potato
Dissecting microscope (optional)

Method

1. Fill a large jar with oatmeal or bran. Add a wedge of apple or potato to provide moisture for the mealworms. This will provide all the water they will need.
2. Place mealworms in jar and cover top with a small piece of screening. Fasten with a rubber band.
3. Check jar every few days to make sure it is moist, but not too wet. Mealworms remain as larvae for up to four months. Since you won't know their age when you purchased them, check them daily.

Extensions

1. Think of ways to find out how mealworms react to temperature changes.
How are the eggs affected by temperature changes?
2. What is the average length of a mealworm?
3. Grow two or three separate colonies and feed each one something different (oatmeal, bran, dog food). Is there a difference in size? Color? Behavior? Rate of development?
4. Construct a "beetle" book illustrating each stage in the beetle's life cycle.
5. Make a flip video of the beetle life cycle.
6. Under a dissecting microscope look at the beetle's antennae, compound eyes, legs, and hard outer wings. Sketch each body part.
7. Have students write a story about a day in the life of a mealworm or a flour beetle.
8. Take a walk and search for beetle grubs, pupae, and adults. Search inside rotting logs and stumps or in the soil. Look on flower heads, garden plants, trees, and shrubs.

THERE'S A BEETLE IN MY FLOUR!

Post-Visit
Activity #1
(suggested)



MIGRATION OF THE MONARCHS

Web Quest

Time required

Web Quest: 1-2 45-minute blocks.

Activities

Teacher Component:

- Prepare copies of the Migration of the Monarchs WebQuest on page 21.
- Order eggs and/or larvae if you wish to grow some Monarchs.

Student Component:

- Locate the recommended websites and answer questions.
- Turn in the assignment at the end of the period.
- Decide and develop project.

Objectives

1. Students will research the biology, life cycle and nomenclature of the Monarch butterfly.
2. Students will discover factors that affect the life of the Monarch butterfly.
3. Students will develop and conduct original research involving the Monarch butterfly.

Recommended Websites

<http://www.earthsky.org/faq/bugs-Monarch-migration>

<http://Monarchlab.org/>

<http://www.Monarchwatch.org/index.html>



MIGRATION OF THE MONARCHS

Post-Visit Activity #2 (suggested)

DIRECTIONS:

Before starting the questions, navigate to the recommended web sites and browse through the information.

Take note of the information given and take a few minutes to explore the sites. This will give you an understanding of how the web sites are organized and what type of information is found at each one.

Using the information found on the websites, answer the following questions.

1. List some of the places Monarch butterflies can be found.
2. Where do Monarch butterflies of eastern North America begin their lives?
3. What destination is the eastern North American Monarch trying to reach when they migrate in the fall?
4. Describe the basic life cycle of the Monarch.
5. How many eggs can a single female Monarch lay in her lifetime?
6. What plant does the Monarch larva feed on?
7. How long does it take the Monarch egg to hatch after it is laid?
8. How do chemicals in milkweeds benefit Monarchs?
9. What is happening inside the chrysalis of a Monarch?
10. How soon is the newly-emerged female Monarch butterfly able to reproduce?
11. What is the life span of an adult Monarch butterfly?
12. How far does the eastern North American Monarch travel during migration?
13. How many generations of Monarchs grow and reproduce in one year?
14. How fast can a Monarch go during migration?
15. Why is it necessary for a Monarch to eat on its way south?
16. Where, specifically, in Mexico do the Monarchs rest over the winter?
17. Why is this location a good one for the Monarchs?
18. List some ways that you could help the Monarchs.
19. What is the greatest threat to the Monarch? What other factors can affect the Monarch population?
20. Classify the Monarch butterfly beginning with Kingdom and progress down to the smallest classification.
21. What is an entomologist and what does he do? Why should we study entomology? (a helpful site for this information is: <http://entsoc.org/teachers>)
22. Access the Reading Room article found at: <http://www.Monarchwatch.org/read/articles/snow.htm>
Write a short summary of the articles. Include answers to these questions in your summary:
 - 1). Based on your knowledge of insects, were these articles factual or designed to panic the reader?
 - 2). What could have been an underlying reason the author wrote the articles this way?



Full-size versions of this worksheet, along with answers, is available at the end of this unit.

CHARACTER EDUCATION

CARING

Caring students help, give, love, and are kind. You can tell a person is caring by what she or he does. They are caretakers of people, pets, plants, possessions and our planet, Earth.

5 Minute Focus

- Why care about insects?
- Give examples of good insects.
- Give examples of bad insects.
- What benefits do people get from insects?
- What are some ways to care about insects?

WEBSITE LIST

A good introduction to insects is found here:

http://www.bbc.co.uk/nature/animals/wildbritain/look_around/insects/

Browse a beetle photo gallery: <http://www.goliathus.com/en/gallery.php>

Can you guess which bugs are insects here:

http://www.brooklynexpedition.org/structures/bugs/bug_index_1.html

Create a super bug here: <http://www.mylearning.org/interactive.asp?journeyid=77&resourceid=311>

Great insect identification site:

<http://www.nhm.ac.uk/nature-online/life/insects-spiders/bug-forum/?q=image/tid/25>

Insect pest identification pages: <http://www.idlab.ento.vt.edu/IDLab/Fact/Fact3.html>

Meet Cicadas that grow underground:

<http://www.bananasinpyjamas.com/science/scribblygum/February2001/default.htm>

Meet more underground bugs:

http://www.fieldmuseum.org/undergroundadventure/critters/critter_info.shtml

Online word search about bugs:

<http://magma.nationalgeographic.com/ngexplorer/0501/wordwise/index.html>

See a praying mantis eat its prey: <http://museumvictoria.com.au/bugs/life/sense.aspx>

Shrink to 1 cm tall and go on an underground bug adventure:

<http://school.discoveryeducation.com/schooladventures/soil/>

Watch a short video of an antlion digging a pit: <http://www.antlionpit.com/digging.html>

Watch a video of stag beetles fighting:

<http://www.arkive.org/stag-beetle/lucanus-cervus/video-09a.html?movietype=rpMed>

Watch flesh-eating beetles on a web cam here:

<http://www.nhm.ac.uk/kids-only/naturecams/beetlecam/index.html>

Watch tree ants capture a grasshopper: <http://museumvictoria.com.au/bugs/foodchains/predation.aspx>

ADDITIONAL RESOURCES

The Classification Scheme

All organisms are classified into groups called Kingdoms. This classification is based on their cell and body structure. A kingdom is the largest, broadest category. Each kingdom is divided into phyla, according to more specific characteristics.

Phyla are then divided into classes that are subdivided into orders. Each time the organisms are divided, the characteristics are more and more specific. Orders are divided into families and families into genres. The final division is into species. Each species is different and unique. Species may be similar, but no two species are exactly alike.

Kingdom

Phylum

Class

Order

Family

Genus

Species

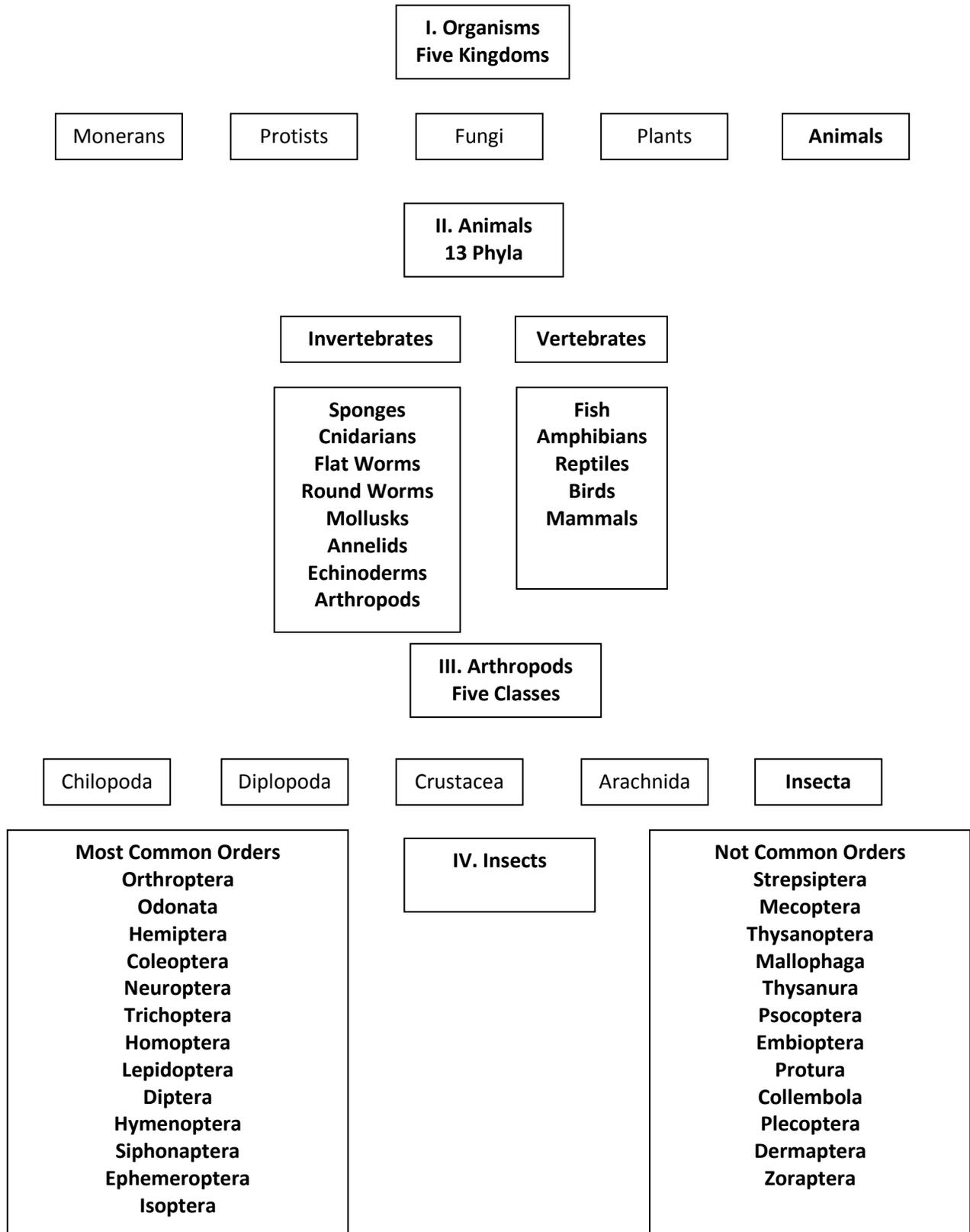
Try learning one of these sentences to help you remember the order of the classification system. The first letter of each word represents a group in the classification system.

King Phillip came over from Germany sick.

or

King Phillip came over for good soup.

Classification: A Graphic Organizer



Characteristics of Insects

1. Spiders have eight legs. Are they insects? Why or why not?
2. What are the three body parts of an insect?
3. The word insect comes from a Latin word meaning what?
4. Lice do not have wings. Can they be insects? Why or why not?
5. Butterflies have two pairs of wings. Why must they be classified as insects?
6. What are an insect's antennae used for?
7. What are three characteristics of insects shared by other arthropods?
8. Suppose there are 800,000 kinds of insects in the world and 89,000 kinds of them in the United States. What percentage of all kind of insects could be found in the United States?

Next, assign an insect family to each student in the class. Instruct the students to use reference materials to develop a research paper. Each paper should include the following information:

- a. Identifying characteristics of members of the family (include an illustration)
- b. Habitats where the family is usually found
- c. Food sources for the family
- d. Distribution of the family in the United States (include a range map.)

Characteristics of Insects

Key

1. Spiders have eight legs. Are they insects? Why or why not?

No, insects only have six legs.

2. What are the three body parts of an insect?

Head, thorax, abdomen

3. The word insect comes from a Latin word meaning what?

Incised or cut

4. Lice do not have wings. Can they be insects? Why or why not?

Yes, not all insects have wings.

5. Butterflies have two pairs of wings. Why must they be classified as insects?

Insects are the only arthropods that have wings.

6. What are an insect's antennae used for?

Sense receptors

7. What are three characteristics of insects shared by other arthropods?

Jointed legs, segmented bodies, exoskeletons

8. Suppose there are 800,000 kinds of insects in the world and 89,000 kinds of them in the United States. What percentage of all kinds of insects could be found in the United States?

11 percent ($89,000/800,000 = .11125 * 100 = 11\%$)

MIGRATION OF THE MONARCHS

Name _____

DIRECTIONS:

Before starting the questions, navigate to the recommended web sites and browse through the information. Take note of the information given and take a few minutes to explore the sites. This will give you an understanding of how the web sites are organized and what type of information is found at each one. Using the information found on the websites, answer the following questions.

1. List some of the places Monarch butterflies can be found.
2. Where do Monarch butterflies of eastern North America begin their lives?
3. What destination is the eastern North American Monarch trying to reach when they migrate in the fall?
4. Describe the basic life cycle of the Monarch.
5. How many eggs can a single female Monarch lay in her lifetime?
6. What plant does the Monarch larva feed on?
7. How long does it take the Monarch egg to hatch after it is laid?
8. How do chemicals in milkweeds benefit Monarchs?
9. What is happening inside the chrysalis of a Monarch?
10. How soon is the newly-emerged female Monarch butterfly able to reproduce?
11. What is the life span of an adult Monarch butterfly?
12. How far does the eastern North American Monarch travel during migration?
13. How many generations of Monarchs grow and reproduce in one year?
14. How fast can a Monarch go during migration?
15. Why is it necessary for a Monarch to eat on its way south?
16. Where, specifically, in Mexico do the Monarchs rest over the winter?
17. Why is this location a good one for the Monarchs?
18. List some ways that you could help the Monarchs.
19. What is the greatest threat to the Monarch? What other factors can affect the Monarch population?
20. Classify the Monarch butterfly beginning with Kingdom and progress down to the smallest classification.
21. What is an entomologist and what does he do? Why should we study entomology? (a helpful site for this information is:
<http://entsoc.org/teachers>
22. Access the Reading Room article found at:
<http://www.Monarchwatch.org/read/articles/snow.htm>
Write a short summary of the articles. Please include answers to the following questions in your summary:
 - 1). Based on your knowledge of insects, were these articles factual or designed to panic the reader?
 - 2). What could have been an underlying reason the author wrote the articles this way?

Migration of the Monarchs

Key

1. List some of the places Monarch butterflies can be found.
USA, southern Canada, Australia, New Zealand, Hawaii and other Pacific Islands, Spain, Azores, and Bermuda
2. Where do Monarch butterflies of eastern North America begin their lives?
In the northern US and southern Canada
3. What destination is the eastern North American Monarch trying to reach when they migrate in the fall?
Mexico
4. Describe the basic life cycle of the Monarch.
Complete metamorphosis, egg, larva, pupa, adult
5. How many eggs can a single female Monarch lay in her lifetime?
100 - 400
6. What plant does the Monarch larva feed on?
Milkweed
7. How long does it take the Monarch egg to hatch after it is laid?
Four days
8. How do chemicals in milkweeds benefit Monarchs?
The leaves contain toxins that are stored in the animal's exoskeleton for the rest of its life, making both caterpillar and butterfly poisonous to most predators
9. What is happening inside the chrysalis of a Monarch?
A transformation that rearranges its internal organs to change into a nectar-sipping butterfly
10. How soon is the newly-emerged female Monarch butterfly able to reproduce?
3-8 days
11. What is the life span of an adult Monarch butterfly?
2-5 weeks
12. How far does the eastern North American Monarch travel during migration?
1,000 to 3,000 miles (1,600 to 4,800 kilometers)
13. How many generations of Monarchs grow and reproduce in one year?
The fourth generation grows but doesn't reproduce until the next year
14. How fast can a Monarch go during migration?
80 mph
15. Why is it necessary for a Monarch to eat on its way south?
Fuels their flight and extra is converted to fat reserves to sustain them during the winter hibernation
16. Where, specifically, in Mexico do the Monarchs rest over the winter?
The Oyamel fir forests, within an area only 300 square miles, high in the Transverse Neovolcanic Belt of central Mexico
17. Why is this location a good one for the Monarchs?
In the cool climate, their metabolic rate is lower which allows the Monarchs to conserve energy reserves for spring migration. The fir trees also protect the butterflies from the weather (wind, snow, hail) and the clouds and fog provide moisture.

18. List some ways that you could help the Monarchs.
Plant a butterfly and milkweed garden, support Monarch conservation programs in Mexico, participate in Monarch monitoring and tagging
19. What is the greatest threat to the Monarch? What other factors can affect the Monarch population?
Humans, loss of habitat, weather, killing of milkweeds with pesticides
20. Classify the Monarch butterfly beginning with Kingdom and progress down to the smallest classification.
Kingdom Animalia, Phylum Arthropoda, Class Insecta, Order Lepidoptera, Family Danaidae, Genus Danus, Species Plexippus
21. What is an entomologist and what does he do? Why should we study entomology?
An entomologist is an individual that studies insects. We need to study insects to: feed the world, preserve the diversity of life, prevent the spread of disease, and to fight crime.
- 22-1. Based on your knowledge of insects, were these articles factual or designed to panic the reader?
It is factual because it did occur.
- 22-2. What could have been an underlying reason the author wrote the articles this way?
It was designed to panic the reader because it does not take into account how fast the Monarch can reproduce. Probably was designed so that more attention would be paid to conservation of habitat which is a problem in Mexico.

Name: _____

Insect Scavenger Hunt

Main idea: More insects are found on earth than any other type of animal. Students will have the opportunity to explore and collect insects from various habitats.

Objective:

1. To learn about the habitats of insects and other arthropods
2. To recognize insect roles in the environment
3. To explore insect diversity

Materials: insect nets, plastic bags or bottles for specimens

Procedure: See how many examples for each of the listed items you can find.

Item	Habitat	Possible Points	Points Received
An insect home		5	
A predatory insect		2	
An insect that uses camouflage		5	
An arachnid		2	
A crustacean		2	
A millipede		2	
A centipede		2	
An insect that lives in a society		2	
A decomposer insect		3	
An insect without wings		3	
An insect with 2 wings		2	
An insect with 4 wings		2	
3 different beetles		5	
An insect pollinator		3	
An insect belonging to the order Orthoptera		2	
An insect belonging to the order Hemiptera		2	
An insect belonging to the order Lepidoptera		2	
An insect belonging to the order Diptera		2	
An insect belonging to the order Hymenoptera		2	
An immature insect		3	
An insect egg		5	

Total: 58 _____