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Insectigator: Bug or insect – do you know the difference?

Kerry Elsen

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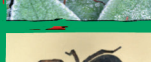
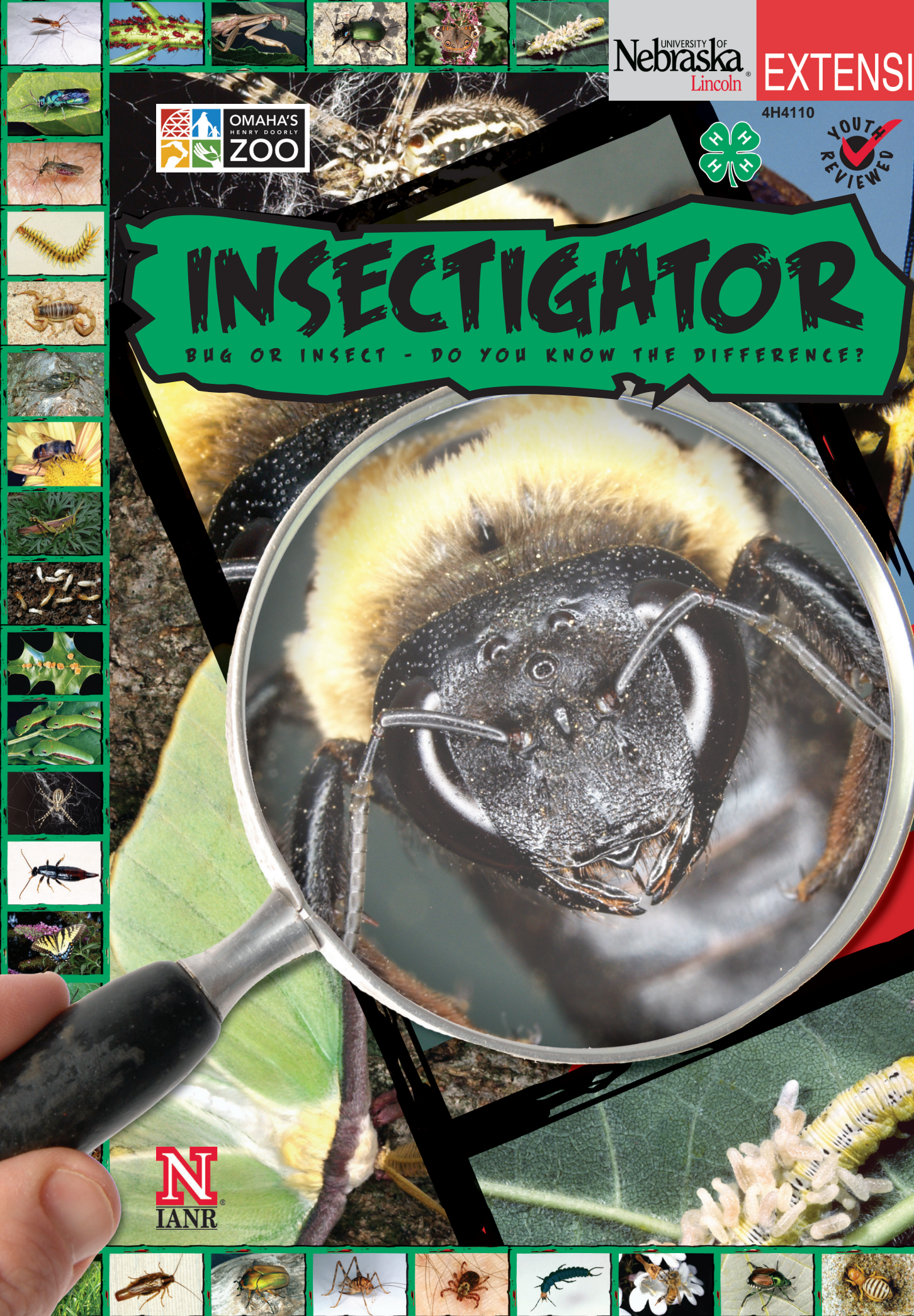
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INSECTIGATOR

BUG OR INSECT - DO YOU KNOW THE DIFFERENCE?



INSECTIGATOR: BUG OR INSECT - DO YOU KNOW THE DIFFERENCE?

You can take this mini-challenge before you begin the *Insectigator* project to measure your “insectigation” skills, or you may want to wait until you complete the project to see how much you learn ... or BOTH!

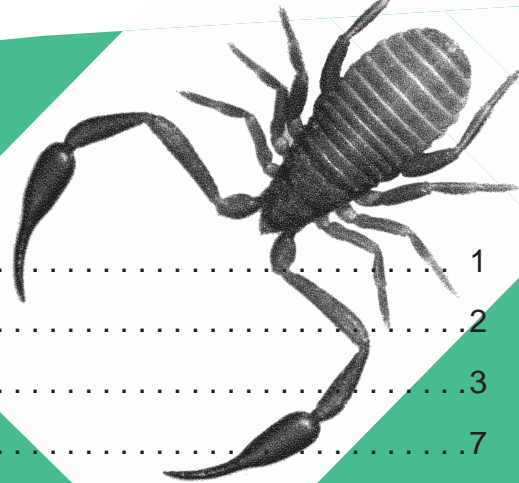
In this project, your challenge is to learn the difference between insects and all the other “creepy crawlies” you find indoors and outdoors. Insects are truly the focus of this manual, and you will learn all about their special characteristics.

Look carefully at the images on the front cover. You may even want to use a magnifying glass to get a closer look. Using the smaller copy of the cover below, circle all of the creatures you think are insects. When you are done, see the inside back cover for the answers. One has been circled to help get you started!



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INSECTIGATOR NOTEBOOK	Center of Manual



The Nebraska Statewide Youth Curriculum Committee was formed in 2007 to provide youth perspective to all aspects of the curriculum development and promotion process. When you see the "Youth Reviewed" logo on the cover of a Nebraska 4-H curriculum, you are reading a publication that has included youth input from this specially selected team of 4-H members.



HENRY DOORLY ZOO OMAHA'S

3701 So. 10th St. / Omaha, NE 68107-2200 / 402-733-8401 / FAX:402-733-7868

Dear 4-H Member and Insectigator,

Omaha's Henry Doorly Zoo fully supports and endorses the Insectigator curriculum developed by the University of Nebraska–Lincoln. The mission of the Zoo's education department is to inspire wonder, appreciation, and awareness of the natural world through personal and unique experiences.

The Insectigator curriculum meets all of the Zoo's standards and is in line with the mission and philosophy of the Henry Doorly Zoo education department. The education staff at the Zoo will be able to utilize the curriculum in all formal and informal programs at the Wildlife Safari Park and Henry Doorly Zoo.

The Zoo fully supports the publication of the 4-H Insectigator curriculum. The Insectigator is a great example of curriculum that encourages families to go outside and investigate wildlife around them.

We encourage Nebraska 4-H to continue to develop curriculum that encourages kids to explore the natural world. Through programs like 4-H, we hope to develop the next generation of scientists.

Sincerely,

Elizabeth Mulkerrin
Education Curator
Omaha's Henry Doorly Zoo



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PROJECT AND LIFE SKILLS

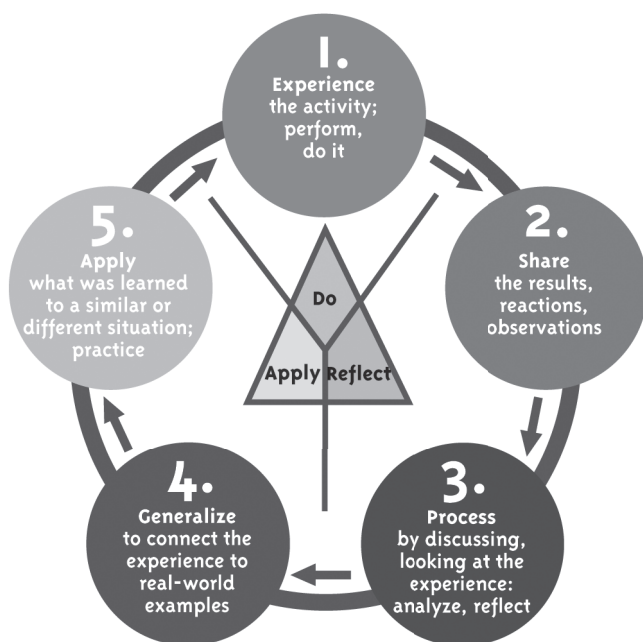
Each activity emphasizes a life skill that builds workforce and personal competencies and a project skill related to the subject matter. Life skills such as critical thinking, problem-solving, keeping records, planning/organizing and self-responsibility are part of this curriculum, but the life skill most emphasized is decision making.

Thus, each activity highlights a decision-making skill:

- Define the problem
- Consider alternatives
- Gather information
- Evaluate alternatives
- Make decision
- Evaluate decision.

THE EXPERIENTIAL MODEL

This model helps leaders formulate activities to reflect the DO, REFLECT, APPLY in five steps.



Pfeiffer, J.W., and Jones, J.E. (1985). *The Reference Guide to Handbooks and Annuals, Vol. 1-10, 1972-1985*. San Diego, CA: University Associates Publishers and Consultants.

YOUTH LEARNING CHARACTERISTICS

FOR YOUTH AGES 8 AND OLDER

This manual is recommended for youth 8 years of age and older but could be used by younger children with adult help.

Active is the key word for this group. Physical activity is the key to involvement.

This age group:

- Likes hands-on activities — promote seeing and doing.
- Has need of opportunities to share thoughts and reactions with others. Ideas are either right or wrong, great or disgusting, fun or boring. There is little middle ground.
- Looks to adults for approval, following rules out of respect.
- Likes to be joiners.
- Prefers group competition to a single winner, where only one can be best.
- Comparison with others is difficult as it erodes self-confidence.
- Build success with these youth by comparing past performance with their newest progress.
- Strong need to feel accepted and worthwhile.
- Encouragement from an adult can have very strong, positive results.
- Immediate self-reward is still the emphasis.
- Provide guides for improvement for the next time for success.

Adapted from North Central Regional Extension publication 292, *Ages and Stages of Child and Youth Development: A Guide for 4-H Leaders*, 1992.

TARGETING LIFE SKILLS MODEL



Graphic provided by Iowa State University Extension

The "Targeting Life Skills Model" helps identify developmental life skills in 4-H and Youth Development Educational programs. They are grouped by:

- Head** Thinking, managing
- Heart** Relating, caring
- Hands** Working, giving
- Health** Being, living

HOW TO BE A SUCCESSFUL INSECTIGATOR

This manual was created for beginning entomologists, especially those between 8 and 11 years old. Anyone who has an interest in learning the basics about insects is encouraged to use this manual, regardless of age.

This manual can be used several ways. Educators working in a classroom will find the school standards that this curriculum meets listed with each activity. These activities will give students a great introduction to entomology and the insect's role within our environment. This manual also will give them an opportunity to experience scientific investigation firsthand.

4-H clubs can use this manual and its contents for club activities or project demonstrations. Youth are encouraged to do their investigation in groups and share their findings with other club members.

Youth who are not 4-H members or involved with a class are encouraged to work through the manual as individuals or with family members and friends.

As you begin your journey as an Insectigator, please remember all the things that you find fascinating and share them with others!



INTRODUCTION TO INSECTIGATOR

Dear Insectigator,

Insects are truly fascinating creatures! They are colorful and mysterious, and are capable of many things that are impossible for humans. These are only a few of the reasons that I wanted to share my curiosity about insects with others.

This manual was developed as part of my Master's Degree in Entomology. As I began to work through my courses, I was constantly gaining knowledge that encouraged further exploration. As you begin to read through this manual, you will learn the basics of entomology, the study of insects.

Numerous activities in this manual give both youth and adults the opportunity to spend time together exploring what is living in their back yard. I encourage you to work through these activities with friends and family members. Challenge each other to discover the most unique insect. Scientists always enjoy sharing their findings with others!

4-H members are encouraged to use the activities that are included as fair projects in addition to or in place of insect collections. I found it much easier to successfully complete an insect collection after I had a more comprehensive understanding of the creatures I was working with.

I hope that you enjoy the fun and fascinating facts about insects. Insects play a large role in the environment as well as provide many products for humans. Before you scream and step on the next insect you see, take a few moments and think about how insects can help you.

Congratulations on becoming an Insectigator! I hope you find insects fascinating and enjoy exploring in your back yard.

Let the exploring begin!

Kerry John
Extension Assistant
University of Nebraska–Lincoln Extension



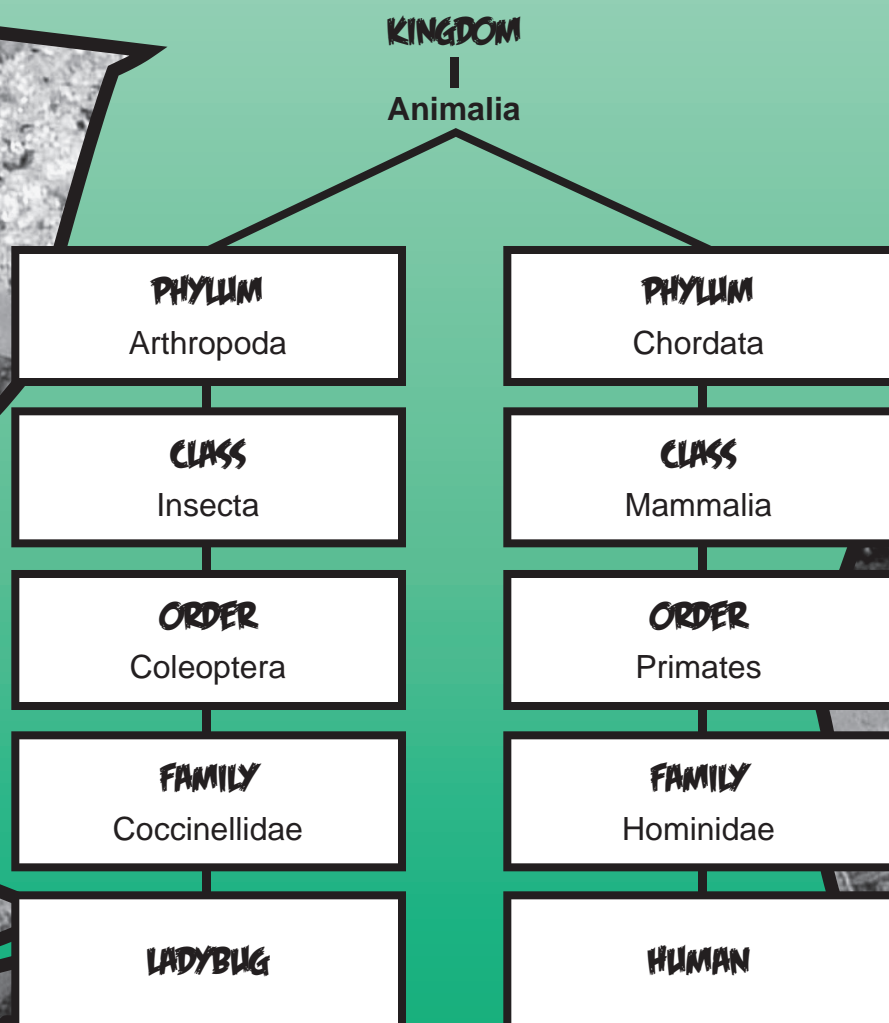
READ THIS BEFORE YOU START – IMPORTANT THINGS TO KNOW!

WHAT'S BUGGIN' YOU?

Is it really bugs that make people scream? Creepy, crawly critters often get a bad rap and are all lumped into one big “insect” category. But not all crawly critters are insects. The simplest way to decide if you have an insect or not is to count its legs. Insects have only six legs.

A few of our favorite critters that are often mistaken as insects are roly-polies, centipedes, millipedes, and those that are always guaranteed to get a scream — spiders! Remember, one key to knowing that these critters are not insects is that they all have more than six legs.

For years scientists have used scientific classifications to name living things. The following classification chart shows the relationship between insects and humans. We all know what humans look like, and we all know that lady bugs are beetles with hard red shells covered with black dots. Let's compare them. On the right side of the chart is how humans are classified by scientists. On the left side is an example of how a lady beetle is classified.



While all six-legged creatures are related to each other and belong to the Class Insecta, these six-legged insects belong to specific orders and families. For example, a Monarch butterfly is in the Order Lepidoptera and a member of the Family Nymphalidae. In comparison, a honey bee, part of the Order Hymenoptera, is part of the Family Apidae.

Meanwhile, centipedes, millipedes, and roly-polies are all members of the Phylum Arthropoda, but they are not insects at all! Each of these little critters is in a class of its own, and each one of them has more legs than the six-legged insects.

Centipedes are in the Class Chilopoda. Millipedes belong to the Class Diplopoda. Roly-polies are members of the Class Crustacea. Each of these arthropods has its very own class and order name.

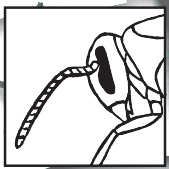
Now that you have a basic understanding of how to determine if you have an insect or another creature, let's take a look at some insects that we are all familiar with and the class and order to which they belong. The chart lists common names of insect groups as well as their class and order name. The definition shows you how the order name describes the insect. A more complete list of insect orders and descriptions starts on Page 22.

COMMON INSECT ORDERS

COMMON NAME	CLASS	ORDER	DEFINITION
Ants, Bees, and Wasps	Insecta	Hymenoptera	Hymen (membrane) and ptera (wing) (with 2 pairs of wings)
Dragonflies and Damselflies	Insecta	Odonata	Odontos (tooth)
Grasshoppers	Insecta	Orthoptera	Orthos (straight) and ptera (wing) (with 2 pairs of wings)
Beetles	Insecta	Coleoptera	Koleos (sheath) and ptera (wing) (with 2 pairs of wings)
Flies	Insecta	Diptera	Di (two) and ptera (wing) (with 2 pairs of wings)
Butterflies and Moths	Insecta	Lepidoptera	Lepido (scale) and ptera (wing) (with 2 pairs of wings)
True Bugs and Cicadas	Insecta	Hemiptera	Hemi (half) and ptera (wing) (with 2 pairs of wings)

HOW AN INSECT'S BODY WORKS

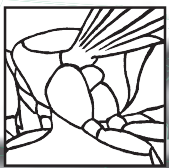
Humans have complex bodies. We have many bones, muscles, and organs that allow us to live. The bodies of insects seem simple, but they are just as complicated. To start with, they have three main parts: head, thorax, and abdomen. Each of these parts is responsible for a specific job. There is one big difference between human and insect bodies. Insects have an exoskeleton, and humans have an endoskeleton. An insect's skeleton is on the outside, while a human's skeleton is inside the body.



HEAD

The head's main function is to sense what is around it and detect food. An insect has a pair of compound eyes (more than one lens). Human eyes have one lens. On the top of their head most insects also have a pair of ocelli (or simple eyes) and two antennae (feelers).

Just like you and I, insects have a mouth. But while humans have mouths that function alike, insects have different types of mouthparts (teeth). Insects eat many different things and require mouthparts that enable them to consume their food. These mouthparts can be very complicated. As you start to understand entomology and insects, think of their mouthparts in the same way that you would your teeth.



THORAX

The thorax is the middle of an insect's body. This is the body part that allows an insect to move. An insect also has legs and wings that help it move, and they attach to the thorax. Insects move in many different ways and have more than one type of leg, which will be described on Pages 12 and 13. We will not go into detail about insect wings in this manual because they are complex.

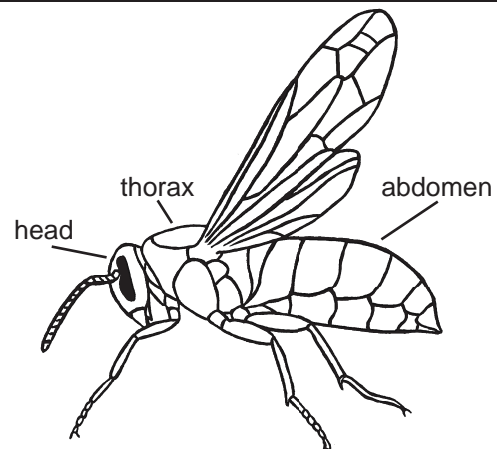


ABDOMEN

The abdomen is an important part of the insect's body. It allows an insect to breathe, remove waste, and reproduce. An insect does not have a nose to breathe through, but rather breathes through tiny holes called spiracles in the side of its abdomen.

Insects digest their food in much the same way that humans do. Food goes in their mouth, is broken down as it goes through their digestive system, and exits their body at the end of the abdomen.

Insects usually reproduce by laying eggs. All female insects have ovipositors, and they lay eggs in a variety of places. These organs also are found on the end of the insect's abdomen.



EDUCATIONAL STANDARDS FOR THIS SECTION:

National Standards: NS.E.U.1, NS.E.U.2, NS.E.U.5, NS.E.C.1, NL-ENG.K-12.3, NL-ENG.K-12.6

State Standards: S 4.1.1, S 4.1.2, S 4.4.1, R/W 4.1.1, R/W 4.1.3, R/W 4.1.7, R/W 4.2.5

UNIT 1: I'VE GOT LEGS!

SUCCESS INDICATOR

You will be able to decide what type of legs an insect has, and this will help you identify it.

LIFE SKILLS PRACTICED

Learning to Learn

PROJECT SKILLS PRACTICED

Identify the purpose of insect legs; identify different kinds of insects by looking at legs.

INTRODUCTION

Now that we know all adult insects have six legs, we can talk about the types of legs they have. Humans have only one type of leg. We usually move by walking or running.

Insects travel in many different ways and live in habitats that are very different. For example, insects that live in water have legs that are very different from insects that live on land. Having legs that are different allows insects to move in the best way possible, much in the same way that ducks have webbed feet and humans do not.

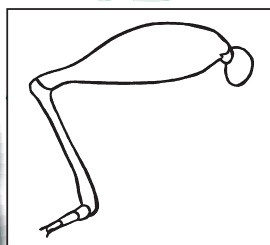
Insects have the following types of legs: running/walking, jumping, digging, grasping or swimming. Being able to decide what type of legs an insect has can help you identify it. It also will help you find out where the insect lives.

TYPE OF LEG

WHAT IT LOOKS LIKE

WHO HAS THEM

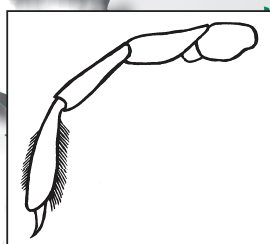
JUMPING



The femur is long and the tibia is large and rounded.

Grasshoppers
Crickets
Katydid

SWIMMING



Long, thin femur and a large, flat, webbed tibia.

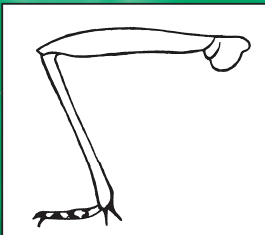
Water boatman
Backswimmers
Giant water bug

TYPE OF LEG

WHAT IT LOOKS LIKE

WHO HAS THEM

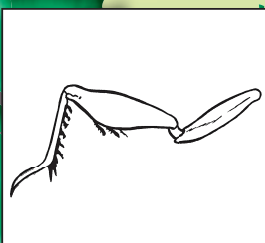
RUNNING/WALKING



Legs are long and thin

Ground beetles
Tiger beetles
Cockroaches

GRASPING



Front legs have spines.
The femur and tibia are large.

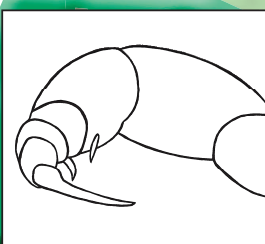
Praying Mantis

DIGGING



Legs are large and appear to have claws. Mole crickets

DIGGING

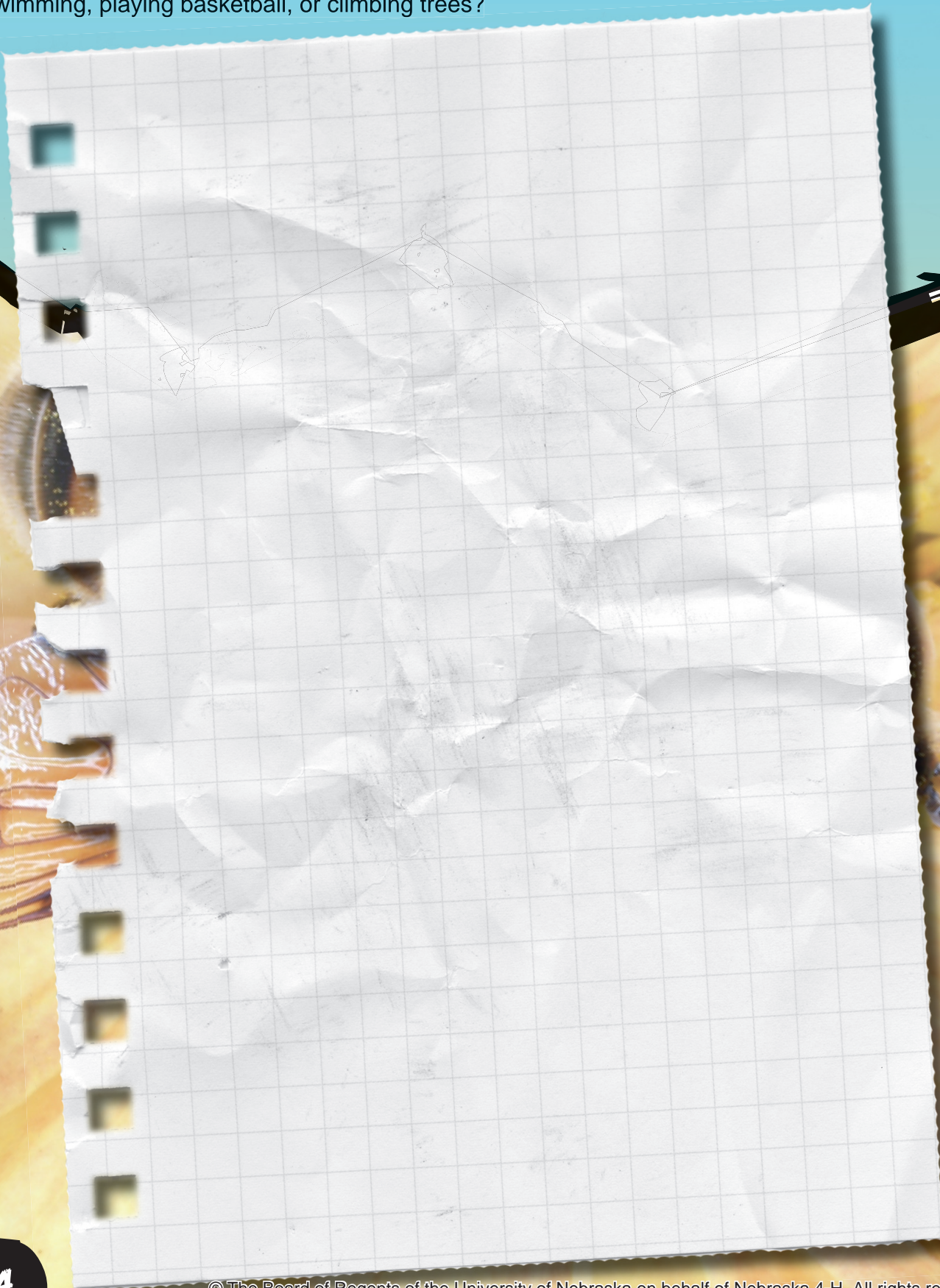


Legs appear to have hook-like claws. Lice



ACTIVITY 1: INSPECT YOUR FEET

Now that you have a basic understanding of what an insect is, think about your favorite pastime and draw an insect that would have the type of legs required for this activity. Do you enjoy swimming, playing basketball, or climbing trees?



ACTIVITY 2: AM I AN INSECT?

We have talked about some of the basic things required to be an insect. It is your turn to see if you can identify an insect. Begin by thinking of places that you might look to find a few of your favorite insects and also where you might look to find a roly-poly. It's OK to ask your parents for help.

After you have decided where to look, head outside and see what you can find. As you find a few specimens, decide if they are insects or if you caught something else. Remember to count their legs! While you are looking at their legs, figure out what type of legs your insect has from the list on Pages 12-13.

SUPPLIES

You will need a notebook, pencil, and magnifying glass. Scientists often use field notebooks to remember all of the things they discover and observe while they are doing research. In some cases, the insects that you find may be quite small. A magnifying glass can make it easier to decide what type of legs the insects have.

DISCUSSION

- How many legs does your creepy crawly have?
- Did you think you caught an insect?
- What type of legs does your insect have?
- Where did you find your insect?
- Do you think this is where your insect lives? Why? What evidence do you have?

COMMUNICATION

After you have completed your research, share what you have found with other club members or your parents.

DEBRIEFING TIME

Share What You Did

1. What did you do?
2. Where did you go to find your creatures?
3. What did you learn while looking at the insects you collected?

Process What's Important

1. Why is taking a close look at living things an important or useful thing to do?
2. What suggestions would you have for someone else looking for insects?

Generalize to Your Life

1. What are some key points you learned?
2. What are some ways you like to learn?

Apply What You Learned

1. What can you do to help yourself keep learning about insects?
2. How can you use research skills in different situations?

EDUCATIONAL STANDARDS FOR UNIT 1

National Standards: NS.E.U.1, NS.E.U.2, NS.E.U.5, NS.E.A.1, NS.E.A.2, NS.E.C.1, NS.E.C.3, NL-ENG.K-12.3, NL-ENG.K-12.4, NL-ENG.K-12.5, NL-ENG.K-12.6, NL-ENG.K-12.7, NL-ENG.K-12.12, NA-VA.K-4.1, NA-VA.K-4.6

State Standards: S 4.1.1, S 4.1.2, S 4.2.1, S 4.4.1, S 4.4.3, R/W 4.1.1, R/W 4.1.3, R/W 4.1.7, R/W 4.2.5, R/W 4.3.1, R/W 4.3.2, R/W 4.4.1, VPAK 12.2.1, VPAK 12.6.1, VPAK 12.8.0

UNIT 2: CAN INSECTS SMELL?

SUCCESS INDICATOR

You will understand why antennae are important for insects.

LIFE SKILLS PRACTICED

Learning to Learn

PROJECT SKILLS PRACTICED

Use antennae as another way to determine differences among insects.

INTRODUCTION

We have talked about a few things that will help you to decide if you have caught an insect and what kind it is. In Unit 4, you will learn about insect antennae, how they are different, and how an insect uses them. Insects do not have noses like you and I, but they can still smell!

Insects use their feelers or antennae to smell. Antennae also are used to determine humidity levels, and some insects use them to hear. The structure of an insect's antennae can help you identify the insect you are looking at. Use the chart below to help identify different types of antennae.

INSECT

ANTENNAE TYPE

WHAT THEY LOOK LIKE

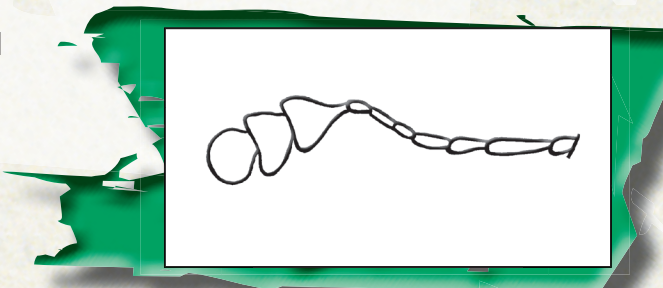
House Flies

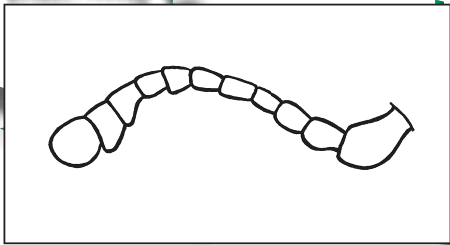
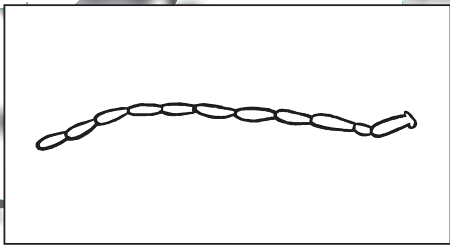
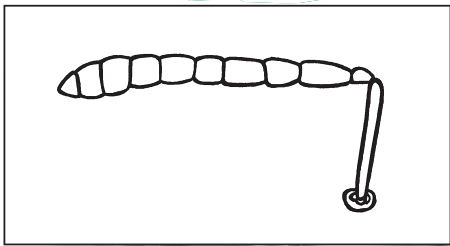
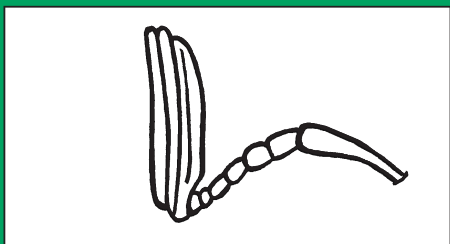
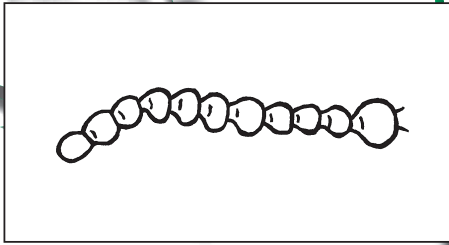
Aristate — Bristlelike



Butterflies

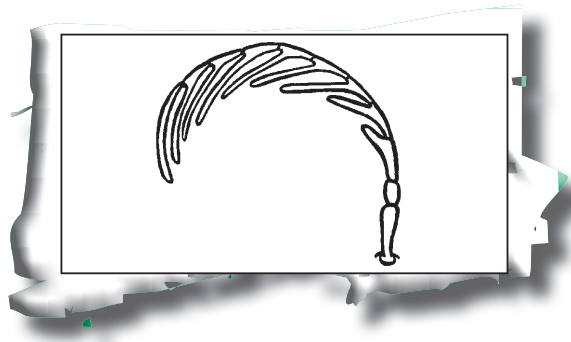
Capitate — Clubbed on the end



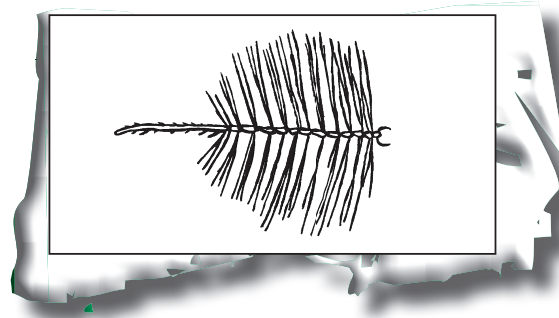
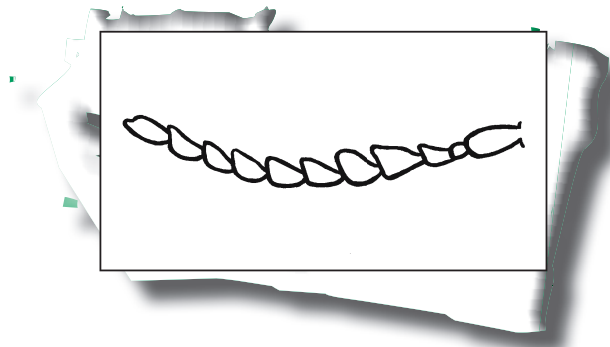
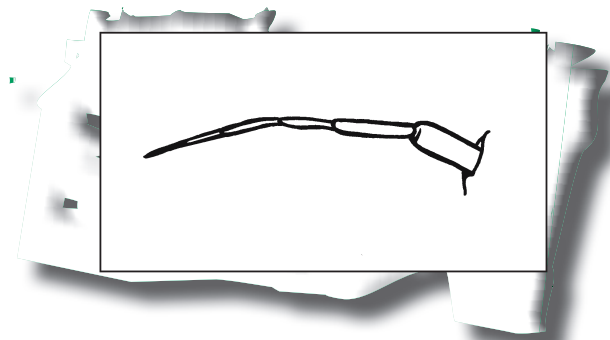
INSECT	ANTENNAE TYPE	WHAT THEY LOOK LIKE
Carrion Beetles	Clavate — Gradually lubbed	
Ground Beetles Cockroaches	Filiform — Threadlike	
Weevils Ants	Geniculate — Bent, like an elbow	
Scarab Beetles	Lamellate — Finger-like segments at the tip	
Termites	Moniliform — Bead-like	

INSECT**ANTENNAE TYPE****WHAT THEY LOOK LIKE**

Fire-Colored Beetles

Pectinate — Comb-like

Male Mosquitoes

Plumose — FeatheryClick Beetles
Leaf Beetles**Serrate** — Saw-toothedDragonflies
Damselflies**Setaceous** — Bristle-like

ACTIVITY 3: KNOW YOUR INSECT PUZZLE*

As an insectigator, you have learned the basic parts of an insect. Can you find those parts in the puzzle below? The word bank after the puzzle will help you remember the spelling of the parts you have learned. Can you find all of the parts listed?

C	M	N	E	P	L	U	M	O	S	E	E	E	H	M	Z
L	S	O	Q	L	C	L	A	M	E	L	L	A	T	E	D
A	L	W	C	A	P	I	T	A	T	E	S	M	G	P	T
V	A	R	U	N	N	I	N	G	A	A	W	A	R	A	T
A	B	T	R	L	D	S	P	E	C	T	I	N	A	T	E
T	F	H	S	A	B	D	O	M	E	N	M	T	S	C	F
E	X	O	S	K	E	L	E	T	O	N	M	E	P	E	Y
S	V	R	F	F	D	F	A	F	U	A	I	N	I	U	E
T	D	A	W	A	P	T	E	G	S	V	N	N	N	W	D
T	S	X	E	J	S	D	N	D	E	H	G	A	G	A	Z
N	O	H	F	I	L	I	F	O	R	M	H	E	E	L	C
L	F	A	R	M	P	G	E	J	R	U	V	C	U	K	V
R	O	A	H	M	E	G	A	A	A	Y	C	E	A	I	J
W	N	U	U	M	K	I	E	E	T	D	P	F	E	N	E
N	D	J	G	E	I	N	E	Y	E	Z	O	B	O	G	I
I	E	S	I	A	Q	G	P	T	T	E	E	K	E	N	P

WORD BANK

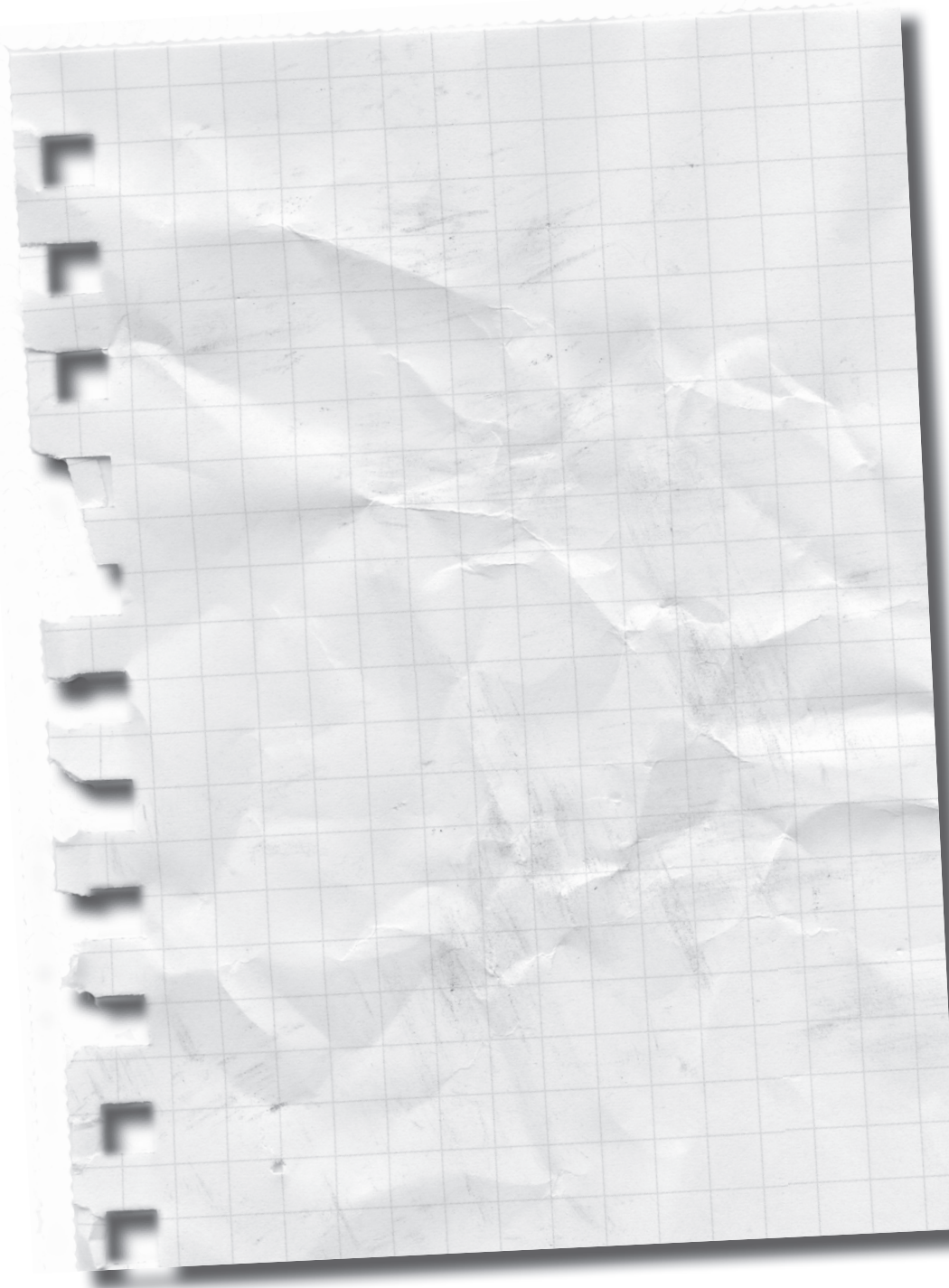
Head	Thorax	Abdomen	Antennae	Exoskeleton	Jumping	Filiform
Swimming	Running	Grasping	Digging	Walking	Serrate	Lamellate
Setaceous	Pectinate	Clavate	Capitate	Plumose	Aristate	

*Answers are on Page 21

ACTIVITY 4: INVENT AN INSECT

This is your opportunity to take the things that you have learned so far and invent an insect. Insects have six legs, three regions to their body, and one pair of antennae.

In the space below, draw an insect. At the bottom of the page, explain why it has the type of legs and antennae that you have given it. Where do you think it might live?



DEBRIEFING TIME

Share What You Did

1. What did you do?
2. What did you learn while doing this project?
3. What surprised you?

Process What's Important

1. What would you do if you were having trouble identifying an insect?
2. What did you learn from these activities that you didn't know before?

Generalize to Your Life

1. What key points have you learned?
2. When else have you had fun and learned at the same time?

Apply What You Learned

1. What can you do to help yourself keep learning?
2. What are some ways you can learn new things about insects or other things that interest you?

Answers to puzzle on Page 19:

C	M	N	E	P	L	U	M	O	S	E	E	E	H	M	Z
L	S	O	Q	L	C	L	A	M	E	L	L	A	T	E	D
A	L	W	C	A	P	I	T	A	T	E	S	M	G	P	T
V	A	R	U	N	N	I	N	G	A	A	W	A	R	A	T
A	B	T	R	L	D	S	P	E	C	T	I	N	A	T	E
T	F	H	S	A	B	D	O	M	E	N	M	T	S	C	F
E	X	O	S	K	E	L	E	T	O	N	M	E	P	E	Y
S	V	R	F	F	D	F	A	F	U	A	I	N	I	U	E
T	D	A	W	A	P	T	E	G	S	V	N	N	N	W	D
T	S	X	E	J	S	D	N	D	E	H	G	A	G	A	Z
N	O	H	F	I	L	I	F	O	R	M	H	E	E	L	C
L	F	A	R	M	P	G	E	J	R	U	V	C	U	K	V
R	O	A	H	M	E	G	A	A	A	Y	C	E	A	I	J
W	N	U	U	M	K	I	E	E	T	D	P	F	E	N	E
N	D	J	G	E	I	N	E	Y	E	Z	O	B	O	G	I
I	E	S	I	A	Q	G	P	T	T	E	E	K	E	N	P

EDUCATIONAL STANDARDS FOR UNIT 2

National Standards: NS.E.U.1, NS.E.U.2, NS.E.U.5, NS.E.C.1, NS.E.C.3, NL-ENG.K-12.3, NL-ENG.K-12.4, NL-ENG.K-12.5, NL-ENG.K-12.6, NA-VA.K-4.1, NA-VA.K-4.6

State Standards: S 4.1.1, S 4.1.2, S 4.4.1, S 4.4.3, R/W 4.1.1, R/W 4.1.3, R/W 4.1.7, R/W 4.2.5, VPAK 12.2.1, VPAK 12.6.1, VPAK 12.8.0

UNIT 3: I AM AN INSECT, BUT WHAT KIND?

SUCCESS INDICATOR

You can place insects into the correct Order.

LIFE SKILLS PRACTICED

Learning to Learn

PROJECT SKILLS PRACTICED

Learning scientific and common insect names; classifying insects according to names.

INTRODUCTION

To understand insects, we need to know what kind of insects we are studying. While all insects seem similar, they can be very

different.

Insects have scientific Order names that help us identify them by including a hidden description in their name. These names come from Greek or Latin words, making them difficult to spell and to pronounce. In this manual, we have given most of the insects "common Order names," making it easier to say and remember their names.

In the following list, each insect Order is listed with its scientific name, followed by the common name. The scientific name can be broken down into parts.

Many insect Orders have two parts to their name. For example, the scientific name for termites is Isoptera, which can be broken down into Iso ("equal") and ptera ("wing"). Taking the scientific name and breaking it into parts makes it easier to pronounce and to understand how it got its name. Insects are usually called by their common order name.



THYSANURA - SILVERFISH

Thysano (fringe), and oura (tail). These insects are wingless. They have bodies that are flat and covered by scales. Three long, thread-like appendages come from the tip of a silverfish's abdomen. Silverfish sometimes can be found in ant or termite nests. They often eat plant material.

MICROCORYPHIA - JUMPING BRISTLETAILS

Micro (small), and koryphe (head). These small insects are wingless. They are covered with scales and usually live in the soil. They eat algae, moss, lichens, and decaying plants. These insects are able to jump when they sense that they are in danger.





EPHEMEROPTERA - MAYFLIES

Ephemeros (for a day), and ptera (wing). Mayflies usually have two pairs of wings. They have a long abdomen that tapers toward the end, from which a pair of long thread-like filaments extend. These insects live near streams and feed on plants or other insects.

ODONATA - DRAGONFLIES AND DAMSELFLIES

Odontos (tooth). They both have long, slender bodies, large compound eyes, and two pairs of wings. Their wings do not fold over their back when they are resting. Dragonflies hold their wings out flat. Damselflies keep their wings over their backs or slightly apart. Dragonflies and damselflies can usually be found near bodies of water. They eat smaller insects.



BLATTODEA - COCKROACHES

Blatta (cockroach). Cockroaches have flattened, oval bodies. They are generally reddish-brown to dark brown in color and prefer nocturnal (dark) habitats. Cockroaches like to eat plant material or they are scavengers. When exposed by light, they run fast and can slip into small spaces and even cracks in a wall.



ISOPTERA - TERMITES

Isos (equal), and ptera (wing). Termites have soft bodies. They are pale in color, sometimes almost appearing to be white. Termites can be winged or wingless. These insects have chewing mouthparts that allow them to eat wood and other plant materials. Generally, they can be found under the bark of a dead tree, in fallen logs, or in damp wood in homes.





MANTODEA - PRAYING MANTIDS

Mantis (soothsayer). Mantids can easily be identified by their triangular heads, long, slender bodies, and compound eyes. They are generally bright green or brown in color. Mantids have raptorial (grasping) forelegs to catch their prey. They usually are found in colorful habitats with large amounts of vegetation. They occasionally can be found in trees. Mantids eat anything they can catch and are often cannibalistic.

GRYLLOBLATTODEA - ROCKCRAWLERS

Gryllus (cricket), and blatta (cockroach). Rockcrawlers are wingless, slender, and have a flattened body. They can be difficult to find because they hide under rocks or in crevices. Rockcrawlers eat smaller invertebrates (insects and spiders).



DERMAPTERA - EARWIGS

Derma (skin), and ptera (wing). The forceps-like pinchers on the tip of their abdomen make earwigs easy to identify. Earwigs have bodies that are somewhat flattened and have chewing mouthparts. The adults have wings. They live in gardens, or under rocks or bark. They feed on living and dead plants or smaller insects.

ORTHOPTERA - GRASSHOPPERS, CRICKETS, AND KATYDIDS

Orthos (straight), and ptera (wing). These insects have wings, jumping legs, and chewing mouthparts. They live in many different habitats and eat plants or other insects. These insects fly but generally only short distances.





PLECOPTERA - STONEFLIES

Plektos (plaited or twisted), and ptera (wing). Stoneflies are flattened insects with chewing mouthparts and two pairs of wings. They have a pair of bristles at the tip of their abdomen. Stoneflies eat plant material and are usually found near streams and lakes, or on rocks or plants.

PHASMIDA - WALKINGSTICKS

Phasma (apparition or specter). These insects greatly resemble a stick. They have slender, stick-like bodies and long legs. Walkingsticks are found in wooded areas where they can find leaves for feeding.



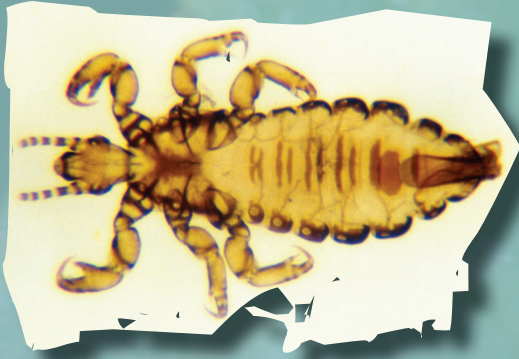
EMBIOPTERA - WEBSPINNERS

Embios (lively), and ptera (wing). Webspinners are small, slender insects that often have wings in the adult stage and threadlike antennae. These insects frequently are found between rocks or logs, or under tree bark. Webspinners usually feed on plant material.

ZORAPTERA - ANGEL INSECTS

Zoros (pure), and aptera (wingless). Zorapterans are often confused with small termites. These insects can be winged or wingless. If they have wings, they are usually brown. In the wingless form, they are pale in color and are blind. Most Angel Insects are wingless. They generally live under the bark of rotting logs. They have chewing mouthparts and feed on fungus and dead arthropods.



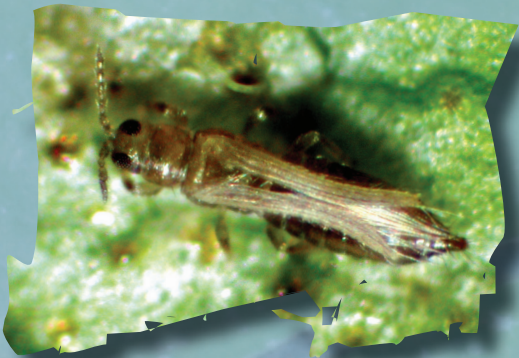


PHTHIRAPTERA - LICE

Phtheiros (louse), aptera (wingless). Lice can have either chewing or sucking mouthparts. They are small and wingless, and have flat bodies. Lice are ectoparasites (on the outside of bird and other mammals). Lice with sucking mouthparts suck blood from humans and livestock. Lice with chewing mouthparts prefer birds and eat skin, hair, or feathers.

HEMIPTERA - TRUE BUGS, CICADAS, AND LEAFHOPPERS

Hemi (half), and ptera (wings). These insects can differ greatly. They have piercing-sucking mouthparts, allowing them to suck plant sap. A few Hemipterans feed on other insects or are blood-sucking ectoparasites. True bugs are usually terrestrial (live on land), but a few are aquatic (live in the water).



THYSANOPTERA - THRIPS

Thysanos (bristle or fringe), and ptera (wing). Thrips are small, flat insects that sometimes have two pairs of feathery wings. These insects have rasping-sucking mouthparts that they use to suck the sap out of plants. Thrips can be found anywhere and eat numerous plants, but some prey on tiny insects and mites.

MEGALOPTERA - DOBSONFLIES

Megalo (large), and ptera (wing). Dobsonflies have two pairs of wings and are soft-bodied. The wings fold flat or roof-like over their body. They have chewing mouthparts and usually can be found on plants near water. These insects eat small invertebrates, including insect larvae, worms, and clams.



RAPHIDOPTERA - SNAKEFLIES

Rhaphidos (needle), and ptera (wing). Snakeflies have a long, narrow body and a slender prothorax (neck). They have two pairs of wings that fold roof-like over their body and have chewing mouthparts. Snakeflies feed on other insects in many habitats.



NEUROPTERA - ANTLIONS AND LACEWINGS

Neuron (sinew or nerve), and ptera (wing). Antlions and lacewings are slender, soft-bodied insects that have two pairs of lacey wings that fold roof-like over their bodies. They have chewing mouthparts and feed on other insects. They live in many different areas.

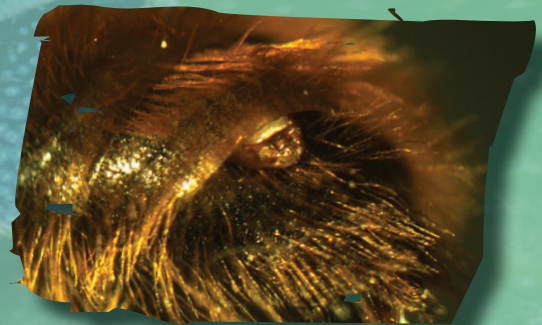


COLEOPTERA - BEETLES

Koleos (sheath), and ptera (wing). Beetles are the most well-known of all insects. They have chewing mouthparts, feed on a variety of things, and live in many habitats. They usually have hardened forewings that cover the body. Their membranous hindwings, folded beneath, extend for flying.

STREPSIPTERA - TWISTED-WINGED PARASITES

Streptos (twisted), and ptera (wing). Twisted-winged parasites live on other larger insects beneath the plates that form the abdomen. Adult males have clubbed forewings, large hindwings, and antler-like antennae.



MECOPTERA - SCORPIONFLIES

Mekos (length), and ptera (wing). These are long, slender insects that have two pairs of wings held flat or roof-like over their bodies. They have beak-like chewing mouthparts and feed on other insects. Scorpionflies are usually found in grassy or wooded habitats.

SIPHONAPTERA - FLEAS

Siphon (pipe or bent tube), and aptera (wingless). Fleas are flat-sided and wingless. They have piercing-sucking mouthparts and feed by sucking blood from birds and animals. Their large hindlegs make them powerful jumpers.





DIPTERA - FLIES, MOSQUITOES, AND GNATS

Di (two), and ptera (wing). Flies have one pair of wings with a small set of knobs where their second pair of wings would be. These knobs are called halteres. Halteres provide flies with balance. Flies live in many different habitats, including our homes. The different habitats also require them to have differing mouthparts because they feed on what is available in the area where they are living.

TRICHOPTERA - CADDISFLIES

Trichos (hair), and ptera (wing). Caddisflies are somewhat moth-like in appearance. Their antennae are long and filiform. They have four hairy wings that fold roof-like over their body. They tend to gather near bodies of water as their larvae are aquatic. Caddisflies have piercing-sucking mouthparts. Caddisflies do not always eat, but when they do, their food is usually nectar, sap, or algae. They are strongly attracted to lights at night.



LEPIDOPTERA - BUTTERFLIES AND MOTHS

Lepidos (scale), and ptera (wing). Butterflies and moths both have two pairs of wings that are covered with small scales. When resting, their wings are usually flat or folded roof-like over their bodies. They have coiled, sucking mouthparts that they use to suck plant nectar.

HYMENOPTERA - ANTS, BEES, AND WASPS

Hymen (membrane), and ptera (wing). Members of this group can be either winged or wingless. Winged forms have two pairs of membranous wings. All Hymenoptera have chewing or chewing-lapping mouthparts. They live in many different habitats and feed on animal and plant tissues.



ACTIVITY 6: SAY CHEESE

Now that you have a basic understanding of which insects belong to each Order, let's try to identify a few insects. Begin by thinking of the insects that you might be able to find close to where you live. Spend some time looking for insects that you think look cool. Maybe they are the most colorful or the strangest looking. Take their picture. To complete the activity, you need to have at least five different Orders represented. You will need to take several pictures of each insect to make sure you have at least one good photo of each.

DISCUSSION

- Does your insect have wings?
- If your insect has wings, does it have one or two pairs of wings?
- What type of antennae does it have?
- What type of legs does your insect have?
- Where did you find your insect?

SUPPLIES

- A camera, either 35mm or digital, and a method for developing your photos
- Posterboard that is no larger than 14 inches by 18 inches and is either white or black. If you choose black, you also will need white paper.
- Tape, glue, rubber cement, or another type of adhesive
- A pen or marker
- A magnifying glass also may be useful.

COMMUNICATION

Once you have developed your photos, you will need to determine what Order your insect belongs to. After each insect has been identified, attach the photo to the posterboard and label it. The label needs to include the Order to which your insect belongs and where you found it.

DEBRIEFING TIME

Share What You Did

1. What did you do?
2. Where did you go to find your insects?
3. What did you like best about classifying insects?

Process What's Important

1. What would you do if you couldn't find five different kinds of insects?
2. What made this a good activity?

Generalize to Your Life

1. What key points have you learned?
2. What similar experiences have you had throughout this project/activity?

Apply What You Learned

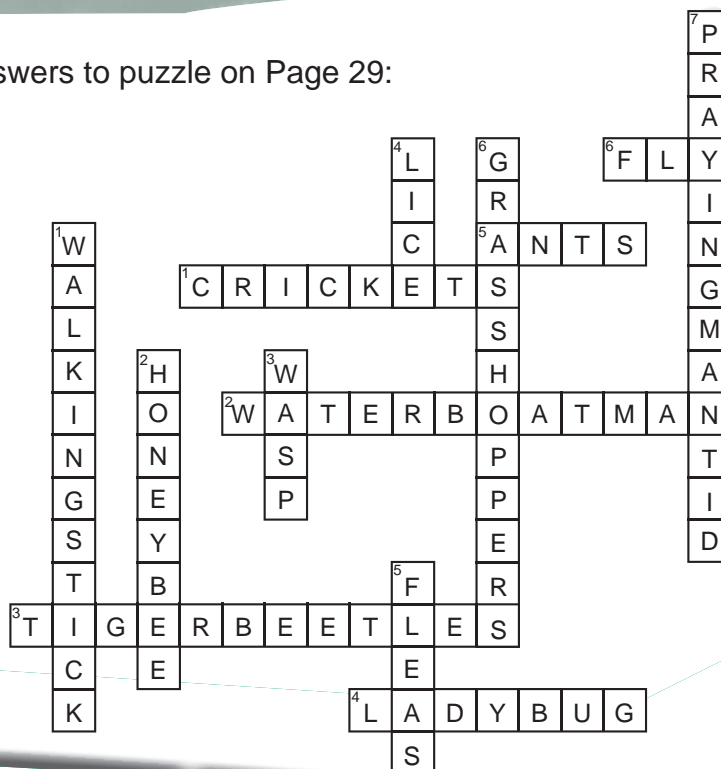
1. How can you use classification skills in different situations?
2. What can you do to help yourself keep learning?

EDUCATIONAL STANDARDS FOR UNIT 3

National Standards: NS.E.U.1, NS.E.U.2, NS.E.U.5, NS.E.A.1, NS.E.A.2, NS.E.C.1, NS.E.C.3, NL-ENG.K-12.3, NL-ENG.K-12.4, NL-ENG.K-12.5, NL-ENG.K-12.6, NL-ENG.K-12.7, NL-ENG.K-12.12

State Standards: S 4.1.1, S 4.1.2, S 4.2.1, S 4.4.1, S 4.4.3, R/W 4.1.1, R/W 4.1.3, R/W 4.1.7, R/W 4.2.5, R/W 4.3.1, R/W 4.3.2

Answers to puzzle on Page 29:



UNIT 4: WHO KNEW?

SUCCESS INDICATOR

You will know some additional characteristics of insects.

LIFE SKILLS PRACTICED

Learning to Learn, Decision Making

PROJECT SKILLS PRACTICED

Consider why insects have such unique abilities and characteristics.

INTRODUCTION

Insects are fascinating creatures! In this unit you will learn some of the talents they have and some of the differences between insects and humans. Think about what it would be like if you could do some of these things!

- Some grasshoppers can jump nearly 10 times their height and 20 times their length. Can you jump over a telephone pole?
- Dragonflies have more than 10,000 lenses per eye.
- A honey bee flaps its wings 250 times per second. That's 15,000 times per minute. How many times per minute can you flap your arms?
- A butterfly needs to have a body temperature above 86 degrees to be able to fly.
- Insects have their skeleton on the outside of their body.

- Some beetles can drag 120 times their weight.
- A flea can jump up to 13 inches in distance.
- Some butterflies and flies have taste buds on their feet.
- Grasshoppers are one of the world's worst insect pests.
- All insects that sting are female.
- Some sphinx moths (hummingbird moths) are the fastest insect fliers, reaching a top speed of over 33 miles per hour.
- Oftentimes, insects smell through their antennae.
- It takes 2,000 to 3,000 honey bees working an entire day to collect enough nectar to make a pound of honey.
- A cockroach can live up to nine days without its head.
- The largest bug in the world is a Goliath Beetle. It can weigh up to 3.5 ounces and be 4.5 inches long.
- Honey bees have hair on their eyes.
- Butterflies and moths are found on all land masses except Antarctica.
- A house fly's feet are 10 million times more sensitive than a human's tongue.
- Ants do not sleep.

"Who Knew?" taken from Turpin, Tom F., *Insect Appreciation*, third edition.

ACTIVITY 7: CREATE AN INSECT

Now that you know what it takes to be an insect and some insect characteristics, it is time to create your own insect!

Begin by spending some time outside, searching for insects. Try to create an insect that would resemble something that you might find outside near your house or maybe your favorite insect. You also could try to invent your very own new insect.

SUPPLIES

You may use any materials you would like to create your insect. Here are a few suggestions:

- clay
- egg cartons
- paper of varying weights
- paper clips
- clothes pins

- packing peanuts
- tape and glue
- markers or paint
- ribbon
- beads
- eyes
- chenille wire
- feathers
- yarn
- clear plastic film (wings)

Don't forget to give your insect antennae!



DISCUSSION

- Try to figure out why your insect is living in the area where you found it.
- What does your insect eat?
- What eats your insect?
- What type of legs does your insect have?
- Does your insect fly?
- What would your invented insect eat? Where would it live? What type of legs would it have?

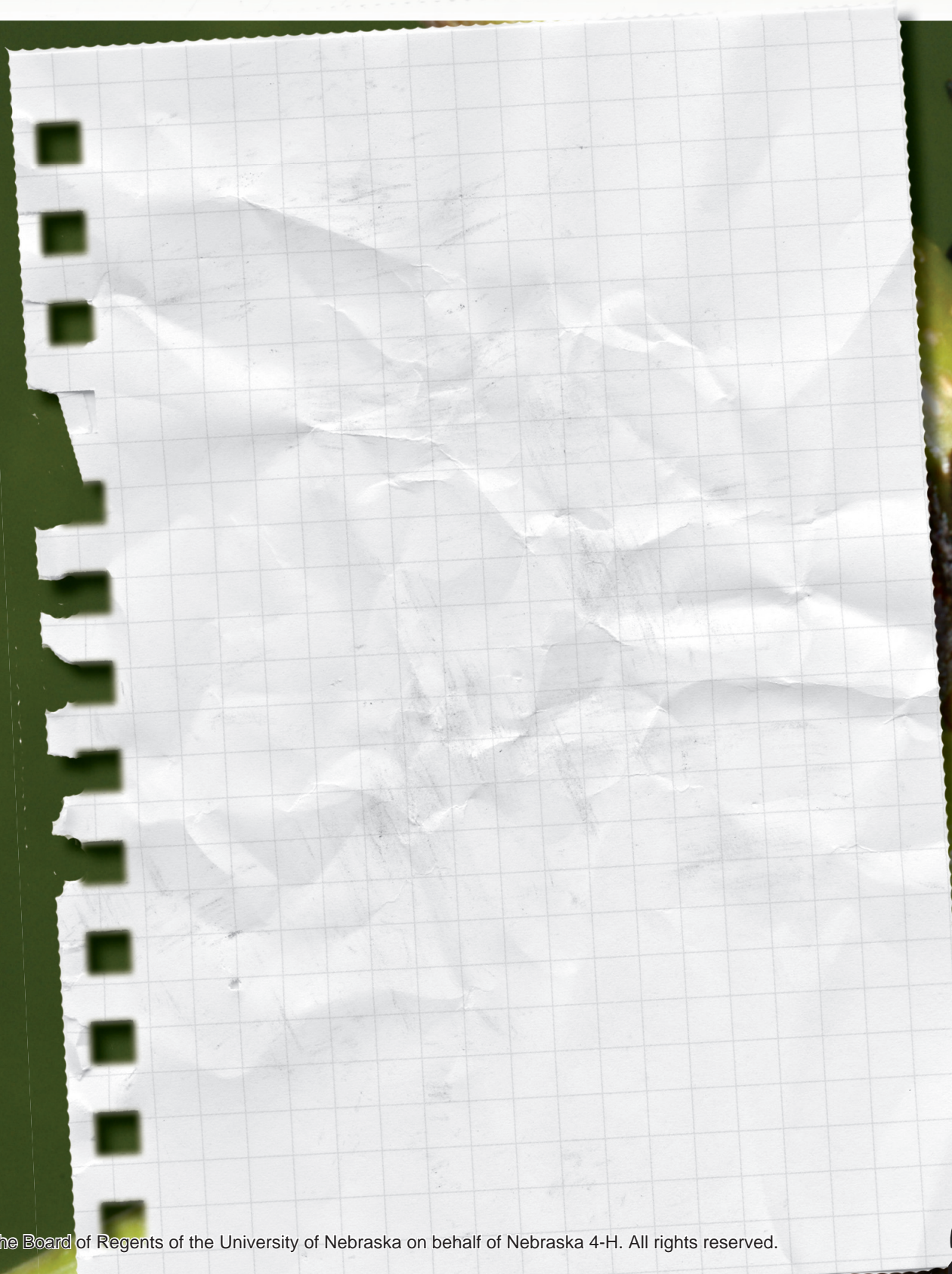
COMMUNICATION

After you have finished creating your insect — whether you invented an insect or built your favorite one — explain to your club where your insect lives, why it is the color you chose, what it eats, and how it moves. Share the model you created with your club. You might want to tell about your insect on a poster, just like scientists do!



ACTIVITY 8: SELF-PORTRAIT

We are approaching the end of this investigation book. It is time for you to think about what you have learned so far and compare the characteristics of an insect to your own. Can you jump really high? Do you like to swim? Do you like to fly? Think about the things that you like to do and which insect would have the same characteristics. If you were an insect, what would you look like? Don't forget to color your portrait!





DEBRIEFING TIME

Share What You Did

1. What did you do?
2. How did you feel about being creative?
3. How did you share your project with others?

Process What's Important

1. How did you make your decisions about designing your insect? What steps did you take?
2. What did you learn through sharing your insect with others?

Generalize to Your Life

1. Why is it important to have plenty of information before making decisions?
2. What similar experiences have you had throughout this project/activity?

Apply What You Learned

1. How can you use communication skills in different situations?
2. What can you do to help yourself keep learning?

EDUCATIONAL STANDARDS FOR UNIT 4

National Standards: NS.E.U.2, NS.E.U.5, NS.E.C.1, NS.E.C.3, NL-ENG.K-12.3, NL-ENG.K-12.4, NL-ENG.K-12.5, NL-ENG.K-12.6, NL-ENG.K-12.7, NL-ENG.K-12.12, NA-VA.K-4.1, NA-VA.K-4.6

State Standards: S 4.1.2, S 4.4.1, S 4.4.3, R/W 4.1.1, R/W 4.1.3, R/W 4.1.7, R/W 4.2.5, R/W 4.3.1, R/W 4.3.2, R/W 4.4.1, VPAK 12.2.1, VPAK 12.6.1, VPAK 12.8.0

UNIT 5: WHAT DOES AN ENTOMOLOGIST DO?

SUCCESS INDICATOR

You will know what an entomologist does for a career. You will be able to create a good living environment for an insect.

LIFE SKILLS PRACTICED

Communication, Marketable Skills

PROJECT SKILLS PRACTICED

Explain what an entrepreneur is; interviewing. Build an insect home.

INTRODUCTION

As you go through this manual, you are becoming an entomologist, someone who studies insects. An entomologist can do many different activities.

Think about some of the activities that you have done by using this manual. You have watched insects in their natural habitats, designed your own insect, and studied antennae, different types of legs, and how insects compare with humans.

Now we are going to discuss a few careers you could have if you wanted to work with insects. These are only a few of the many careers in entomology.

RESEARCH

If you like to be outside observing insects or you like to use a microscope, a career in entomology might be for you! Insects are complicated and can do many things that humans cannot.

Researchers are able to determine how insects are affected by things like climate changes and pesticide use, and how they affect humans, trees, and plants. Many scientists are trying to find a way for insects, plants, animals, and humans to live together without harming each other. Researchers also study insects to learn why we get sick after an insect bites us.

EDUCATION

Do you like to share what you have learned with others? Teachers are important to all of us. They share the information the researchers have discovered with the people they teach. You could be a high school science teacher, a college professor, or an extension educator who shares your fascination of insects with others.

FORENSIC ENTOMOLOGIST

Have you ever watched a criminal investigation show on TV? If you have a good understanding of insects and like to solve mysteries, this could be an excellent career for you!

Insects have a relationship with almost every event. Studying insects to understand the order of events may make it possible to solve crimes. This career can seem gross at times, but it can be as fascinating as insects!

APICULTURALIST

An apiculturist is a type of entomologist who spends much time working with honey bees. You could be a beekeeper, processing honey from beehives into what we eat. Apiculturists also understand the relationship between honey bees and the plants they pollinate and how honey is developed from nectar. You can't be afraid of getting stung if you want to study honey bees!

ACTIVITY 9: MEET AN ENTOMOLOGIST

As we have made our way through this manual, we also have developed an understanding of what entomologists do. It is your turn to do some research.

Think about some of the people in your area who might be entomologists (crop consultants, pesticide applicators, extension educators, science teachers, or college professors). You are not limited to this list. Feel free to find other entomologists.

Pick one entomologist and interview this person about his or her job, favorite insect, and what this person thinks is most interesting about insects. Create a poster of your findings. Explain what the entomologist you interviewed does. You might include whether this is a job that interests you. Be sure to include photos or drawings on your poster.



ACTIVITY 10: BUILD YOUR BUG A HOME

We have been talking about how bodies work, how they move, and where they live. In Activity 7, we created an insect. Now we need to build our bug a home! Again, we will start by spending some time outside doing research.

Try to see what your favorite insects live in or on, what they eat, and where they hide from predators. You can use the same insect you made in Activity 7, or you may create a new one. After you have created your habitat, place your insect in its home.

SUPPLIES

If you are not using your insect from Activity 5, you need to build one. Once you create an insect, you can start building its habitat. You can use many different materials. Here are some suggestions:

- foam board or posterboard for the base
- natural materials (leaves, sticks, grasses or flowers)
- glue
- tape
- markers

DISCUSSION

- What types of things does your insect live in or on?
- What makes this a good habitat for your insect?
- Can you think of anything that would make this habitat better for your insect?
- Do you think that your insect has more than one habitat?
- Is this a safe habitat for your insect?
- What other insects live in or near your insect's habitat?

COMMUNICATION

You have just completed researching where your favorite insect lives. Share the habitat you have built with members of your club, or enter it at the county fair. You could create a poster describing what you discovered by researching your insect's habitat. Ask your club's other members if they can find the insect in its home.

DEBRIEFING TIME

Share What You Did

1. What did you do?
2. What was your goal for this project when you began?
3. What did you learn while doing this project?

Process What's Important

1. Why was interviewing an entomologist an important or useful thing to do?
2. What suggestions would you have for someone else who wanted to do a similar project?

Generalize to Your Life

1. How is communication important to you?
2. What advice would you give to someone who wants to explore careers?

Apply What You Learned

1. Why was this project important to your life?
2. How will you act differently in the future as a result of taking this project?

EDUCATIONAL STANDARDS FOR UNIT 5

National Standards: NS.E.C.1, NS.E.C.3, NS.E.G.1, NL-ENG.K-12.3, NL-ENG.K-12.4, NL-ENG.K-12.5, NL-ENG.K-12.6, NL-ENG.K-12.7, NL-ENG.K-12.12

State Standards: S 4.4.1, S 4.4.3, S.4.8.1, R/W 4.1.1, R/W 4.1.3, R/W 4.1.7, R/W 4.2.5, R/W 4.3.1, R/W 4.3.2, R/W 4.4.1

GLOSSARY

- CANNIBALISTIC:** An insect that eats other insects in the same family.
- COMPOUND EYE:** An insect eye that has more than one lens.
- ECTOPARASITES:** Insects that must have a host to survive. They live completely on another organism, or they may leave and seek another host.
- ENDOSKELETON:** The type of skeleton a human has, providing support on the inside of the body.
- EXOSKELETON:** An insect's hard outer covering, which provides external support and protection.
- HABITAT:** Where an insect lives, eats, and reproduces.
- HALTERES:** Tiny hindwings of a fly that are used for balance. These are so small they cannot be seen without a magnifying glass.
- INVERTEBRATES:** An animal that does not have a backbone.
- LICHENS:** An organism consisting of fungi and algae that grows on rock and trees.
- NOCTURNAL:** When something is active at night.
- OCELLI:** Eye spots that insects have to detect light. These are single lens eyes.
- PARASITIDS:** Organisms that live entirely on other organisms and kill them.
- PREDATORS:** Organisms that attack insects and feed on other insects, mites, or spiders.
- SPIRACLES:** A set of breathing holes found on the sides of an insect's thorax and abdomen.
- VEGETATION:** Plants or plant material that is eaten by organisms.

REFERENCES

Evans, Arthur. Field Guide to Insects and Spiders of North America. 2007.

Triplehorn, Charles A. and Johnson, Norman F. Borror and Delong's Introduction to the Study of Insects, 7th Edition. 2005.

Turpin, F. Tom, The Entomological Foundation. Insect Appreciation, 3rd Edition. 2002.

BRINGING 4-H TO THE CLASSROOM - AN INTRODUCTION TO SCHOOL STANDARDS

Content standards establish specific expectations for the assessment of cumulative learning by the end of first grade, fourth grade, eighth grade, and twelfth grade. The standards listed for this curriculum serve as a base guide and are not absolute. You may find that you add or subtract specific standards as you seek to meet the needs of your unique educational setting. In addition, as the curriculum is adapted, standards for grade levels not listed here may be met. Visit the Nebraska Department of Education Web site to access current standard lists in each content area.

As this is a University of Nebraska–Lincoln Extension publication, the Nebraska State Educational Standards have been aligned to the materials in this curriculum. Alignment of the Nebraska standards is in compliance with national educational standards. If you are using this curriculum in another state, please refer to your local education department to reference your own individual state standards and see how they relate to the standards listed here.

Insectigator Activities: Aligned with Nebraska State Education Content Standards and National Education Standards

The content area “home base” for this curriculum is Science, Engineering, and Technology.

NEBRASKA SCIENCE STANDARDS

- 4.1.1 – Students will develop an understanding of systems, order, and organization.
- 4.1.2 – Students will develop an understanding of evidence, models, and explanation.
- 4.2.1 – Students will develop the abilities needed to do scientific inquiry.
- 4.4.1 – Students will develop an understanding of the characteristics of living things.
- 4.4.3 – Students will develop an understanding of living things and environments.
- 4.8.1 – Students will develop an understanding of science as a human endeavor.

NATIONAL SCIENCE STANDARDS

NS.E.U – Unifying Concepts and Processes

Unifying concepts and processes help students think about and integrate a range of basic ideas, which builds an understanding of the natural world

1. Systems, order, and organization
2. Evidence, models, and explanations
5. Form and function

NS.E.A – Science as Inquiry

Science as inquiry requires students to combine processes and scientific knowledge with scientific reasoning and critical thinking to develop their understanding of science.

1. Abilities necessary to do scientific inquiry
2. Understandings about scientific inquiry

NS.E.C – Life Science

Life science focuses on science facts, concepts, principles, theories, and models that are important for all students to know, understand, and use.

1. Characteristics of organisms
3. Organisms and the environment

NS.E.G – History and Nature of Science

The history and nature of science illustrates different aspects of scientific inquiry, the human aspects of science, and the role that science has played in the development of various cultures.

1. Science as a human endeavor

NEBRASKA READING AND WRITING STANDARDS

4.1.1 – Students will draw on a variety of strategies to read and understand unfamiliar words and phrases.

4.1.3 – Students will identify the basic facts and essential ideas in what they have read or viewed.

4.1.7 – Students will identify and apply knowledge of the structure, elements, and meaning of nonfiction or informational material and provide evidence from the text to support their understanding.

4.2.5 – Students will use self-generated questions, note-taking, summarizing, and outlining to enhance learning.

4.3.1 – Students will pose questions and contribute their own information or ideas in group discussions in order to acquire new knowledge.

4.3.2 – Students will make oral presentations that demonstrate appropriate consideration of audience, purpose, and information to be conveyed.

4.4.1 – Students will gain information or complete tasks by listening.

NATIONAL LANGUAGE ARTS STANDARDS

NL-ENG.K-12.3 – Evaluation strategies

Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).

NL-ENG.K-12.4 – Communication skills

Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

NL-ENG.K-12.5 – Communication strategies

Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

NL-ENG.K-12.6 – Applying knowledge

Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.

NL-ENG.K-12.7 – Evaluating data

Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

NL-ENG.K-12.12 – Applying language skills

Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

NEBRASKA VISUAL AND PERFORMING ARTS STANDARDS

VPAK12.2.1 – Students recognize the value of the arts in their own learning and creative process.

VPAK12.6.1 – Students understand connections between the arts and other fields of study.

VPAK12.8.0 – Students use the visual and performing arts to solve problems.

NATIONAL VISUAL AND PERFORMING ARTS STANDARDS

NA-VA.K-4.1 - Understanding and applying media, techniques, and processes

Students use different media, techniques, and processes to communicate ideas, experiences, and stories.

NA-VA.K-4.6 - Making connections between visual arts and other disciplines

Students identify connections between the visual arts and other disciplines in the curriculum.

	NATIONAL SCIENCE STANDARDS	NEBRASKA SCIENCE STANDARDS	NATIONAL LANGUAGE ARTS STANDARDS	NEBRASKA LANGUAGE ARTS STANDARDS	NATIONAL VISUAL & PERFORMING ARTS STANDARDS	NEBRASKA VISUAL & PERFORMING ARTS STANDARDS
INTRO	NS.E.U.1 NS.E.U.2 NS.E.U.5 NS.E.C.1	S 4.1.1 S 4.1.2 S 4.4.1	NL-ENG.K-12.3 NL-ENG.K-12.6	R/W 4.1.1 R/W 4.1.3 R/W 4.1.7 R/W 4.2.5		
UNIT I	NS.E.U.1 NS.E.U.2 NS.E.U.5 NS.E.A.1 NS.E.A.2 NS.E.C.1 NS.E.C.3	S 4.1.1 S 4.1.2 S 4.2.1 S 4.4.1 S 4.4.3	NL-ENG.K-12.3 NL-ENG.K-12.4 NL-ENG.K-12.5 NL-ENG.K-12.6 NL-ENG.K-12.7 NL-ENG.K-12.12	R/W 4.1.1 R/W 4.1.3 R/W 4.1.7 R/W 4.2.5 R/W 4.3.1 R/W 4.3.2 R/W 4.4.1	NA-VA.K-4.1 NA-VA.K-4.6	VPAK12.2.1 VPAK12.6.1 VPAK12.8.0
UNIT II	NS.E.U.1 NS.E.U.2 NS.E.U.5 NS.E.C.1 NS.E.C.3	S 4.1.1 S 4.1.2 S 4.4.1 S 4.4.3	NL-ENG.K-12.3 NL-ENG.K-12.4 NL-ENG.K-12.5 NL-ENG.K-12.6	R/W 4.1.1 R/W 4.1.3 R/W 4.1.7 R/W 4.2.5	NA-VA.K-4.1 NA-VA.K-4.6	VPAK12.2.1 VPAK12.6.1 VPAK12.8.0
UNIT III	NS.E.U.1 NS.E.U.2 NS.E.U.5 NS.E.A.1 NS.E.A.2 NS.E.C.1 NS.E.C.3	S 4.1.1 S 4.1.2 S 4.2.1 S 4.4.1 S 4.4.3	NL-ENG.K-12.3 NL-ENG.K-12.4 NL-ENG.K-12.5 NL-ENG.K-12.6 NL-ENG.K-12.7 NL-ENG.K-12.12	R/W 4.1.1 R/W 4.1.3 R/W 4.1.7 R/W 4.2.5 R/W 4.3.1 R/W 4.3.2		
UNIT IV	NS.E.U.2 NS.E.U.5 NS.E.C.1 NS.E.C.3	S 4.1.2 S 4.4.1 S 4.4.3	NL-ENG.K-12.3 NL-ENG.K-12.4 NL-ENG.K-12.5 NL-ENG.K-12.6 NL-ENG.K-12.7 NL-ENG.K-12.12	R/W 4.1.1 R/W 4.1.3 R/W 4.1.7 R/W 4.2.5 R/W 4.3.1 R/W 4.3.2 R/W 4.4.1	NA-VA.K-4.1 NA-VA.K-4.6	VPAK12.2.1 VPAK12.6.1 VPAK12.8.0
UNIT V	NS.E.C.1 NS.E.C.3 NS.E.G.1	S 4.4.1 S 4.4.3 S.4.8.1	NL-ENG.K-12.3 NL-ENG.K-12.4 NL-ENG.K-12.5 NL-ENG.K-12.6 NL-ENG.K-12.7 NL-ENG.K-12.12	R/W 4.1.1 R/W 4.1.3 R/W 4.1.7 R/W 4.2.5 R/W 4.3.1 R/W 4.3.2 R/W 4.4.1		

The Wild Bird Habitat Stores

Connecting families with nature since 1993



Alamo Plaza / 56th & Hwy 2 / Lincoln, NE 68516
(402) 420-2553 / (800) 606-2553
wildbirdhabitatstore.com

To All Formal and Non-formal Educators of Children and Future Wildlife Conservationists,

The Wild Bird Habitat Stores of Nebraska have been connecting families with nature for the past 17 years. Although we provide backyard wildlife products to consumers, we are more than simply a retail outlet. Our mission is to generate an awareness of the natural community around us for adults and children, whether in one's own backyard, a trip to a nature center, or a walk through the woodlands and prairies.

The future for the conservation of our wildlife and their habitats will one day rest with today's children. As a teacher/naturalist at the Pioneers Park Nature Center leading children on investigative hikes through the woodlands, wetlands, and prairies, I see firsthand their excitement in the discoveries that abound. From turning over a log to explore these micro-habitats loaded with insects, arachnids, and crustaceans, to dipping a net in the wetlands and creeks excited to see what aquatic life they will retrieve, kids become instinctively reconnected with nature when given this opportunity.

The *Insectigator* is one of a number of curriculums published by University of Nebraska–Lincoln Extension 4-H that will be a valuable tool for teachers and parents to assist children in the exploration and investigation of the natural world we live in. The curriculum can be easily adapted for use in any ecological region or area across the country.

Birds and bugs are the most visible of all wildlife and occur not only in our rural landscapes, but in our backyards, neighborhoods, and city parks. Just stepping out the backdoor can begin a world of wildlife discoveries for a child. The Wild Bird Habitat Stores will make these publications available for educators and families in our place of business. And as a teacher/naturalist, the curriculum in these publications will be a useful resource when I lead kids on hikes to explore nature.

Sincerely,

Dave Titterington
Founder/Owner
Wild Bird Habitat Stores

Teacher/Naturalist
Pioneers Park Nature Center

[illegible]

NOTES

[illegible]

ANSWER KEY



How many insects on the front cover did you correctly identify? _____



INSECTIGATOR NOTEBOOK

Congratulations, you have become an insectigator! Your Insectigator notebook has cards with insects or clues to help you answer the questions about the insects you find. See how many you can find and if you can answer all of the questions. You may add additional pages to your notebook as you continue your quest as an insectigator.

GRASSHOPPER

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

LADY BUG

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

CRICKET

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

WALKINGSTICK

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

PRAYING MANTID

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

FLY

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

BUTTERFLY

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

DRAGONFLY

What type of legs does it have?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?



What type of leg is this?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

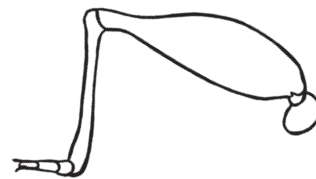
What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

What insect have you found?



What type of leg is this?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

What type of antennae does it have?

What do you think it eats?

Can your insect fly?

What might eat your insect?

What insect have you found?



What type of leg is this?

What color is it?

Where did you find it?

Do you think this is where your insect lives?

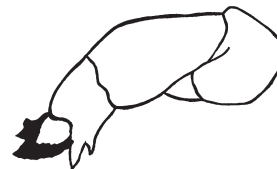
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What do you think it eats?

Can your insect fly?

What might eat your insect?

What insect have you found?



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Do you think this is where your insect lives?

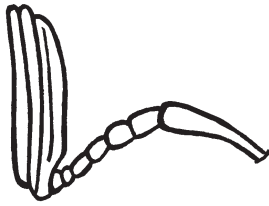
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