



# Creating an Entomology Project



## What kind of project can you do with insects?

You can do all kinds of projects with insects, ranging from beginner to advanced. Your project will help you learn more about the science of entomology. Making an insect collection is an important part of your project, but also consider learning more about insect biology, behavior, or economic importance. Start by making a goal for yourself. Examples include:

*I want to learn more about insects in corn.*

*I want to understand the importance of pollinators in Iowa.*

## Insects are cool, interesting animals and make great 4-H projects!

Use additional resources to help get you started thinking about your goals and the fun things that you can learn about insects!

Find Entomology Project Activity Guides at [www.extension.iastate.edu/store/](http://www.extension.iastate.edu/store/)



*Bug Watchers* (4H 423A)

*What's Bugging You?* (4H 423B)

*Dragons, Houses and Other Flies* (4H 423C)

*The Group Helpers Guide* (4H 423LDR)

If the store is out of stock, here is another order resource: [www.4-hmall.org/Category/4-hcurriculum-entomology.aspx](http://www.4-hmall.org/Category/4-hcurriculum-entomology.aspx)

## Your exhibit will be judged in several categories. Try to address all these questions in your display:

- What was the goal of your project and exhibit?
- What were the most important things you learned as you worked toward this goal?
- What skills did you learn while doing this exhibit?
- What were decisions and challenges that you faced and how did you handle them?
- What worked, what didn't?
- List the resources that you used.
- What did you learn about insects?
- How did this exhibit help you better understand the relationship between nature and people?
- What would you like to do on this project area next year?

## Remember neatness counts!

- Was the project completed and does it have a finished appearance?
- Was the workmanship constant and neat?
- Did you consider the appearance from a distance?
- Did you follow guidelines for making a proper insect collection?

**Fair note:**  
**You cannot bring live insects for an entomology exhibit!**



## Listed below are some exhibit ideas

### **Clover Kids: grades K-3**

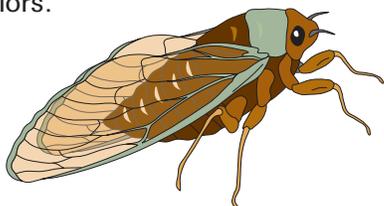
1. Draw your favorite insects and label their body parts.
2. Display useful products made by insects.
3. Make original artwork using insects as the main theme.
4. Create a diary of insects you see in your backyard or at a park. Take notes over several weeks and include drawings of the insects in their habitat.

### **Junior 4-H members: grades 4-6**

1. Collect and display different insect nests and the insects that built them.
2. Make and display a traditional insect collection.
3. Make a working exhibit to demonstrate the various ways insects communicate with each other.
4. Make a diorama of insect relatives (e.g., spiders, ticks, mites) showing their habitats.

### **Intermediate 4-H members: grades 7-8**

1. Make a working exhibit on the construction of an insect net, viewing jar, or other collection devices.
2. Study the role of insects in movies, television, or music and summarize your opinions in a video. Or critique an insect-related movie and describe the accuracy (or inaccuracy!).
3. Make a mural of an Iowa landscape that features the importance of insects.
4. Make an expanded insect collection. Examples include grouping insects according to whether they are destructive, beneficial, or of no economic importance. Or show insects at various life stages and make a display comparing these differences.
5. Study the various methods insects use to defend themselves, and make a comic book that includes drawings and descriptions of these behaviors.



### **Senior 4-H members: grades 9-12**

1. Make a display of several insects that vector animal or plant diseases. Communicate the significance of those diseases, and how they may be controlled.
2. Study and observe the effects of pollution on insects by examining the differences of aquatic insects above and below a pollution or waste runoff site. Give a presentation about the effects of pollution on insects and what the consequences might be if these insects became extinct.
3. Design and grow a butterfly garden. Keep a written and photographic journal of dates, times, numbers, and types of butterflies that frequent the garden.
4. Visit a local agricultural supply store and make an inventory of the different insecticides they offer. Describe their uses and display how to use and dispose of these products safely. You might instead tour a local greenhouse to find out their insect issues and provide a summary of their management program.
5. Study various career opportunities available in entomology and interview an expert about career preparation and his/her likes and dislikes about the job. Write a children's story telling the pros and cons of working with insects.

## **Insect Pinning**

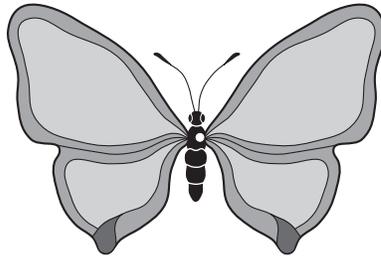
**Pinning:** Pinning your insects will be the most difficult and frustrating part of your project. Making a complete and neat collection takes time and a lot of patience! Always collect more specimens than you think you need so that you can practice your technique. Use entomology pins for your collection – sewing pins are not recommended because they rust and can destroy your specimens.

Pins can be purchased at the Iowa State University Book Store in Ames, [www.ubs.iastate.edu](http://www.ubs.iastate.edu). You can also order pins and other entomology supplies online at [www.bioquip.com](http://www.bioquip.com). There are several sizes available, but #2 is the most common pin size.

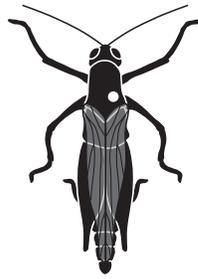
## Where to put the pin



**Hymenoptera**



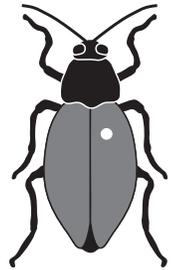
**Lepidoptera**



**Orthoptera**

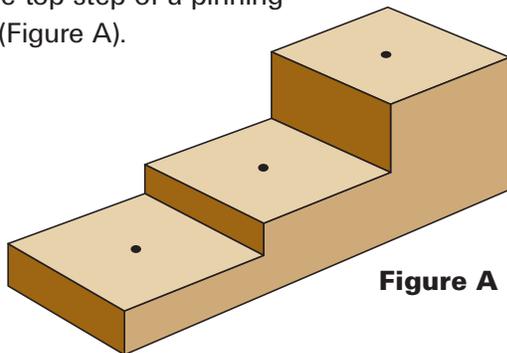


**Hemiptera**



**Coleoptera**

- All pins should be placed in the thorax, slightly off to the right of the midline. Pins should be vertical to the insect. About  $\frac{1}{3}$  to  $\frac{1}{4}$  of the pin should remain above the insect, so you can handle it properly. To ensure neatness and uniformity in your collection, use the top step of a pinning block (Figure A).



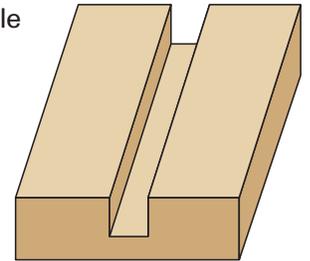
**Figure A**

- Pins should go directly into the thorax of most insects, including Diptera, Hymenoptera, and Lepidoptera. Pins should go through the pronotum of Orthoptera and true bugs within Hemiptera. Place the pin through the forewing of Coleoptera and Dermaptera.

- Carefully press the pinned insect into a foam insulation sheet until the body touches. Carefully maneuver the legs and antennae away from the body with an extra pin, so that they dry in a relatively "normal" position. Use additional pins to hold the body parts until they fully dry, about one week.

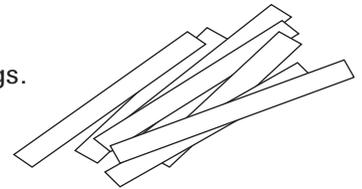
**Special pinning:** In some cases, you may wish to spread the wings of particularly beautiful insects for display. The most common examples are butterflies, moths, and dragonflies. Spreading insect wings takes special care because they are very delicate. The wings should be open and flat so that you can see the wing patterns. A foam insulation board can be used to make a platform for spreading and drying wings.

Cut a groove down the middle of the board about  $\frac{1}{2}$ " wide and  $\frac{1}{2}$ " deep (Figure B).

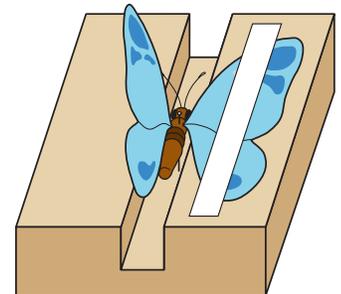


**Figure B**

Set the pinned insect inside the groove so the wings can lie flat on the board to dry. Use additional pins to secure the body from twisting while spreading the wings. Cut several small strips of paper to hold the wings flat while drying.

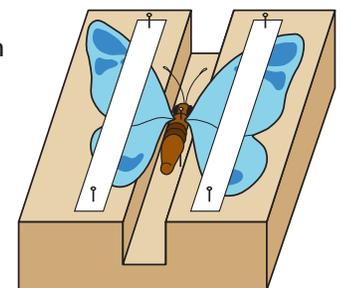


Place a strip over the forewing and gently push down until it is flat against the board (Figure C). Pin the slip of paper onto the board, but do not put a pin through the wing (Figure D).



**Figure C**

Drag the wing up or down as necessary for display. Typically the bottom of the forewing should be at a 90-degree angle to the body. Repeat with the hindwing, using multiple pieces of paper and pins if needed. The hindwing usually is displayed with the top part just under the forewing. Repeat with the other side. Let them dry for at least a week and then (carefully!) transfer them to permanent storage.



**Figure D**

## Putting it all together.

Is your exhibit a proper insect collection? Here are some things you need to prepare a successful exhibit.

**References:** Find books at the library or bookstore that include common insects.

*A Golden Guide of Insects*, ISBN 9781582381299 (\$7)

*National Audubon Society Insect Field Guides*, ISBN 9780394507637 (\$13)

Also, use the Internet to help identify your specimens.

<http://bugguide.net>

<http://www.insects.org/entophiles>

## How many do you need?

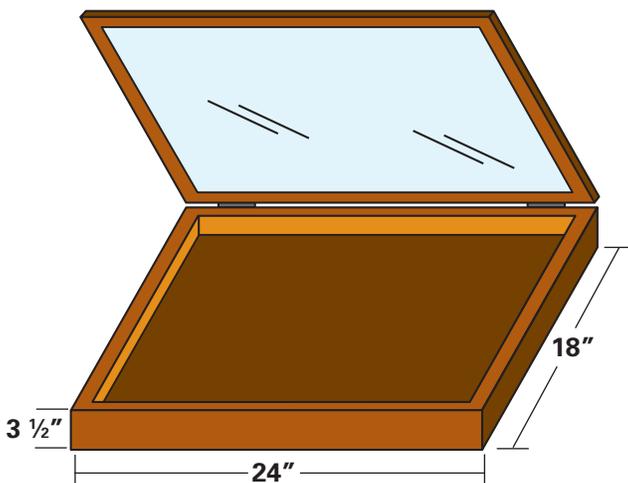
A beginner collection should display at least 5 orders and 25 species. An advanced general collection should have at least 15 orders and 110 species. When displaying insect life cycles, include 5 different insect species in at least 2 orders. For insects that undergo complete metamorphosis, all stages except the egg should be displayed. For insects that undergo simple metamorphosis, display at least three stages of development.

## Storage and display

To store and display your project for a short time, use a cigar box or shoe box. Be sure to place a piece of cork in the bottom to secure the pinned specimens. For long-term storage, use a tight-fitting box to avoid having other insects destroy your collection.

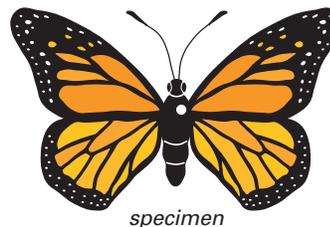
## Make your own display box

A standard entomology display box is 24" x 18" x 3 1/2" deep, and has a glass lid. Include a bottom liner of soft cork or balsa wood. Mothballs or crystals can be put in the corner to stop other insects from destroying your collection.



## Labeling

Two labels are needed for each specimen after they have dried completely. Use stiff paper (e.g., index cards or cardstock) so they don't bend or droop. Write in ink or use a computer printer (4-point font). Labels should be placed below the pinned insect. The top label should contain 1) collection location, 2) date collected, and 3) collector's name. The bottom label could contain 1) identification (Order: Family), including common name; 2) collection habitat, and 3) collection method. Use a pinning block to make sure all the labels are at the same height; this will improve the appearance of a collection.

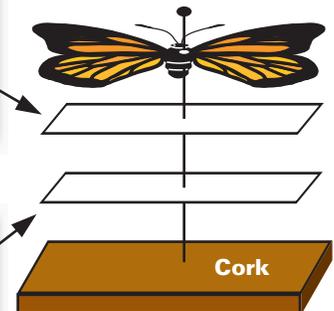


Story County, Iowa USA  
McFarland Park, Ames  
42°05'N 93°34'W  
8 Sept 2010  
E. W. Hodgson

top label

Monarch butterfly  
Coleoptera: Coccinellidae  
Plant: flower bed  
Coll: sweep net

bottom label



Revised by Erin Hodgson, ISU extension entomologist. Originally prepared by Marsha Morgan, 4-H youth specialist; Judy Levings, 4-H youth development specialist; and Ken Holscher, associate professor of entomology.

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# Entomology (Insects)



## Are You Into It?

Entomology is the study of insects and all six-legged creatures. Getting to know insects can be a fun way to get outside and see what is there. There are insects everywhere on Earth, even in the coldest Arctic!

Here's what you can do all year!

### Starting Out Basic/ Level 1

- Learn about different insect body parts
- Find out how Insects communicate with one another
- Research what types of bugs are considered pests
- Demonstrate how to make an insect net and how to use it

### Learning More Intermediate/ Level 2

- Research how insects use color to blend in with their environment
- Learn the life cycle and life stages of insects
- Find out where insects live
- Interview an exterminator about what insects are considered pests

### Expanding Horizons Advanced/ Level 3

- Create a butterfly garden to attract butterflies to your home
- Find out how different types of insects eat
- Start your own insect collection
- Learn how to classify insects in different groups
- Investigate the importance of wings and flying in insects

### Interesting Insects

#### Fireflies

1. **Watch the Light Show.** Look for males flashing as they fly and females twinkling in one place. See if you can figure out their flash patterns. Are they all one species or several different ones?
2. **Talk Back.** Using a small flashlight, try imitating the patterns you see. If you flash the male's pattern, a female may flash back. Try the female's response; you may lure a male right to your fingertips!

3. **Catch and Release.** For a close-up look, catch a few fireflies in a jar. Check them out and then let them go, of course.
4. **Be Firefly-Friendly.** Make your neighborhood a good habitat for fireflies. Turn off bright outdoor lights, which "drown out" fireflies' messages. Avoid lawn chemicals. Plant trees, shrubs, and grasses to provide places for the beetles to rest and hide.



## Step It Up

### Leadership

- Plan a field trip for a youth group to visit an insectary.
- Hold a workshop to show younger 4-Hers how to make their own bug collection.

### Citizenship

- Complete a [Service Learning project](#)
- Plant a butterfly garden for an elementary school, daycare, or nursing home.
- Create a caterpillar or butterfly display for a classroom so students can see the real life change from caterpillar to chrysalis to butterfly!

### Communications

- Conduct a workshop to help people understand household pests and how to control them.
- Visit the local nursing home and give a presentation about insects. Bring your insect collection or jars of insects to share for show and tell!

## Exhibit Ideas

Take a look at ["Making an Entomology Exhibit"](#) to get some great ideas on where to start with your project!

Create a poster showing different crop pests and their natural predators.

Make an insect display with scientific and common names.

Create a butterfly garden in your backyard and record the species that visit it. These websites will help you get started! [University of Kentucky](#), [University of Minnesota](#)

Interview a bee producer and learn why bees are important to plants and the environment.

Make a poster showing the different [invasive species](#) in your area, how they affect the ecosystem, and how they are spread.

Create a list of beneficial insects and find out what makes them beneficial

Some butterflies and insects migrate. Find out which ones do and where they go for the winter.

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## 4-H Resources

### 4-H Entomology Project Manuals

- [Making an Entomology Exhibit](#) (4H 422)
  - [Pollinators in Your Garden](#)
  - [Insect Investigator](#)
  - [Gardening for Butterflies](#)
  - [Bug Watcher -- Entomology Project Guide](#)
  - Teaming with Insects -- [Curriculum](#)
  - [Level 1](#) (4H08440)
  - [Level 2](#) (4H08441)
  - [Level 3](#) (4H8442)
  - [Facilitators Guide](#)(4H08443)
  - Project Butterfly WINGS
  - [Youth Guide](#) (4H8392)
  - [Facilitator Guide](#)(4H8393)
- These and other publications available through [ISU Extension Online Store](#) or at your [County Extension Office](#).

### Online 4-H Resources

- [Project Butterfly WINGS](#)
- [Butterfly Identification Cards- Reiman Gardens](#)
- [Recordkeeping Forms](#)

## Other Resources

[Bug Guide](#)- Iowa State University guide to identifying insects and finding more information.

[Iowa Insects, Spiders, and Other Invertebrates](#)- The Iowa Association of Naturalists presents a booklet all about insects, spiders, and invertebrates.

[Insect Almanac](#)- Insect information for use in urban, crop, livestock, and other areas all in one place, provided by the University of Nebraska.

[Who let the Bugs Out?](#)- Purdue University identifies the difference between beneficial insects and pests. Learn how to identify them too!

[Kentucky Critter Files](#)- Learn about insects, spiders and other arthropods through the University of Kentucky Entomology Department.

[Fireflies](#)-University of Illinois species spotlight

[Indiana 4-H Beekeeping](#)-Purdue Extension

[Monarch Lab](#)- The University of Minnesota teaches about butterflies from their life cycle to migration as well as how to care for your own.

#### Category:

Agriculture & Natural Resources

#### Tags:

bugs, insects, science, 4-h project

## • Overwintering spots

We don't see butterflies when the temperatures drop, but some do spend their winters in tree crevices, under bark, in log piles, or in building nooks. Hibernation boxes also are available. A log pile can serve as an over-wintering hotel for butterflies. The logs are criss-crossed to provide as many open spaces within the pile as possible. The ideal pile uses logs 3 to 6 feet long, stacked 3 to 5 feet high, and protected at the top by canvas or another covering. It should be placed in a sheltered location near nectar flowers or shrubs and host plants.

## Favorite Nectar Plants

(Perennials)

Aster (*Aster* spp.)  
Bee balm (*Monarda didyma*)  
Black-eyed Susan or gloriosa daisy (*Rudbeckia* spp.)  
Blazing star or gay-feather (*Liatris scariosa*)  
Butterfly bush (*Buddleia* spp.)  
Butterfly weed (*Asclepias tuberosa*)  
Catmint (*Nepeta* × *jaassenii*)  
Chives (*Allium schoenoprasum*)  
Coreopsis, lanceleaf (*Coreopsis lanceolata*)  
Coreopsis, thread-leaf (*Coreopsis verticillata*)  
Daylily (*Hemerocallis* spp.)  
False indigo (*Baptisia australis*)  
Fernleaf yarrow (*Achillea filipendulina*)  
Gas plant (*Dictamnus albus* or *D. fraxinella*)  
Globe thistle (*Echinops ritro*)  
Goldenrod (*Solidago* hybrids)  
Hollyhock (*Alcea rosea*), single varieties  
Hyssop (*Hyssopus officinalis*)  
Joe-pye weed (*Eupatorium purpureum*)  
Lavender (*Lavandula angustifolia* 'Hidcote Strain')  
Lilac, common or French hybrid (*Syringa vulgaris*)  
Pearly everlasting (*Anaphalis margaritacea*)  
Phlox (*Phlox paniculata*, *Phlox maculata*)  
Purple coneflower (*Echinacea purpurea*)  
Showy stonecrop sedum  
(*Sedum spectabile* 'Autumn Joy')  
Snakeroot (*Cimicifuga racemosa*)  
Sunflower heliopsis (*Heliopsis helianthoides*)  
White clover (*Trifolium repens*) also called  
Dutch clover

(Annuals)

Borage (*Borago officinalis*)  
Cosmos 'Sensation' (*Cosmos bipinnatus*)  
Dill (*Anethum graveolens*)  
Globe amaranth (*Gomphrena globosa*)  
Heliotrope (*Heliotropium arborescens*)  
Lantana (*Lantana camara*)  
Marigold (*Tagetes* spp.)  
Mexican sunflower (*Tithonia rotundifolia*)  
Nasturtium (*Tropaeolum majus*), especially  
yellow varieties  
Parsley (*Petroselinum crispum*) any variety  
Pentas (*Pentas lanceolata*)  
Stock (*Matthiola incana* 'Annua' hybrids)  
Sweet alyssum (*Lobularia maritima*), especially  
purple  
Zinnia (*Zinnia elegans*)

## Favorite Host Plants

Alyssum	Nasturtium
Aster	Parsley
Borage	Ragweed
Carrot	Stinging nettle
Cherry	Thistle
Crabgrass	Violets
Hollyhock	White clover
Marigold	Wisteria

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Nelson, extension communication specialist. Illustrations  
by Mark Müller.

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RG 601 Reviewed and Reprinted March 2006

REIMAN  
GARDENS  
IOWA STATE UNIVERSITY

# Gardening for Butterflies



IOWA STATE UNIVERSITY  
University Extension

A butterfly garden can be as simple as a massed planting of butterfly-favorite plants in a sunny corner of your yard or as large as a specially planted area of a state park.

## Butterfly Garden Characteristics

### • Sunny location

Butterflies depend on the sun to warm their body temperature to the 85°-100°F range needed for flying. Scientists have even observed that butterflies position themselves during the night so that the early morning sun touches their wings to warm them.

### • Moisture

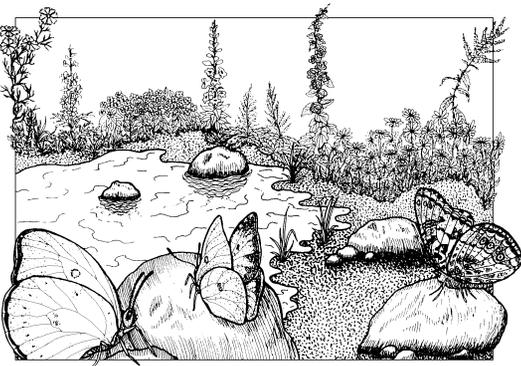
If you've ever wondered why butterflies congregate at the edge of a mudpuddle, it's because they can't drink directly from open water. You can recreate a similar setting by sinking a container of wet sand in the ground. Add rocks or sticks for the perches.

### • Rocks

On cloudy or cool days large rocks provide a basking spot to help warm butterflies for flight.

### • Nectar plants and host plants

Although the Roman naturalist Pliny the Elder thought caterpillars came from the morning dew that formed on tree leaves, we know that



specific butterflies come from specific caterpillars. Both the butterflies and the caterpillars need specific plants or flowers to satisfy their energy needs. Of course, the more varieties you can plant, the greater your chances for attracting more butterflies. Remember too, that planting in clumps—not rows—increases the likelihood of butterflies finding and choosing your garden for a feeding stop. The proper host plant for caterpillar feeding must be included to ultimately have the desired butterfly species. (See chart below.)

### • Shelter

Trees, shrubs, fences, and buildings can provide protection from prevailing winds. A leafy cover offers a hiding place from hungry birds.

### • Untidiness

If you want to attract butterflies, it helps to be tolerant because butterflies prefer a “natural” look rather than a “tidy” garden. That means allowing some “weed” species, such as stinging nettle and thistle, to grow in the landscape. It also means avoiding pesticides. Insecticides are the most dangerous, but herbicides also can destroy needed nectar or host plants.

Butterfly	Host plant (caterpillar needs)	Nectar plant (butterfly needs)
American Painted Lady	burdock, ironweed, everlastings, pussy toes	thistle, knapweed, aster, yarrow, marigold, zinnia
Great Spangled Fritillary	violets	thistle, coneflowers, bee balm, milkweed, ironweed
Monarch	milkweed	milkweed, goldenrod, thistle, liatris, cosmos
Mourning Cloak	willow, elm, poplar, birch, hackberry	milkweed, rotting fruit, sap, shasta daisy
Pearl Crescent	aster	aster, thistle, black-eyed susan, milkweed
Question Mark	nettles, hackberry, elm	rotting fruit, sap, aster, milkweed
Red Admiral	nettles	rotting fruit, sap, aster, thistle, dandelion, clover
Common Sulfur	white clover, vetch, alfalfa	clover, goldenrod, aster, milkweed, phlox
Eastern Black Swallowtail	carrot, dill, parsley	milkweed, thistle, phlox, clover, alfalfa
Giant Swallowtail	prickly ash	milkweed, lilac, goldenrod, dame's rocket
Tiger Swallowtail	cherry, ash, birch, cottonwood, willow, lilac	thistle, milkweed, phlox, bee balm, clover, sunflower

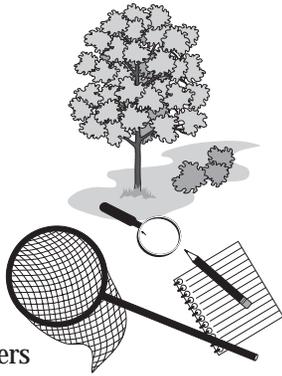
The world has more than 1 million different types of insects. Become an insect investigator and see how many you can find!

Here's what you'll need:

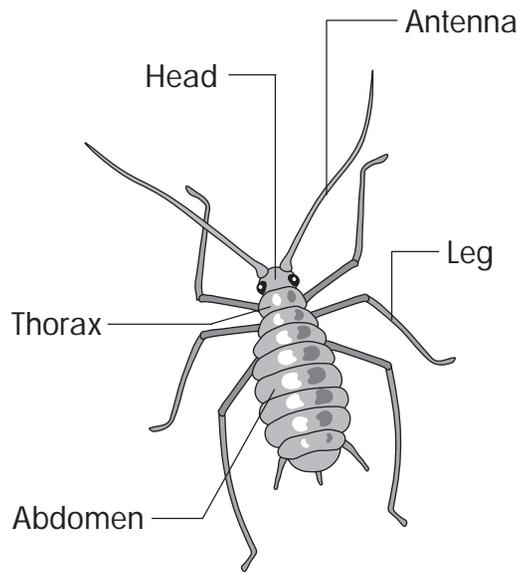
- Outdoor area
- Interest in insects

(If available):

- Magnifying glass
- Notebook
- Pencils and/or markers
- Net



What is an insect?



Insects have a head, thorax, abdomen, and six legs. Look closely for these parts to make sure it is really an insect.

For more information about gardening, youth activities related to horticulture, and insects, visit these Web sites:

ISU Extension publications  
<http://www.extension.iastate.edu/pubs/>

ISU Horticulture  
<http://www.hort.iastate.edu/>

ISU Youth and 4-H programs  
<http://www.extension.iastate.edu/4H/>

ISU Entomology  
<http://www.ent.iastate.edu/>

Prepared by Cindy Haynes, extension horticulturist, Betsy Eness, horticulture student, and Diane Nelson, communication specialist. Illustrated by Jane Lenahan, graphic designer, Instructional Technology Center.

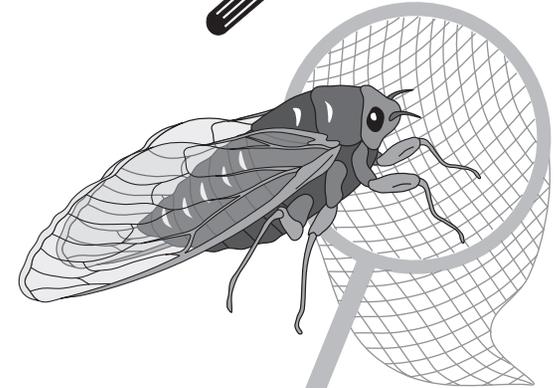
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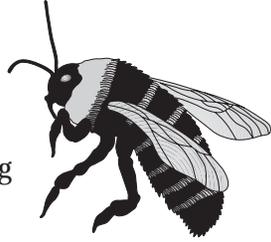
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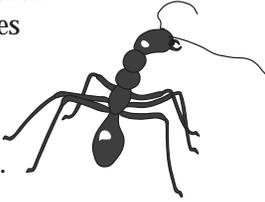
# Insect Investigator

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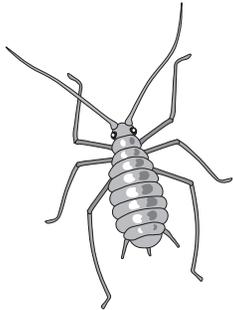
Did you know that honey bees have chores just like you? When they are old enough to work, their first job is cleaning the hive. The next week they get to feed the younger bees. Repairing the hive keeps them busy the third week. During the fourth week they guard the hive and then finally, in the fifth week, they leave home to collect nectar and pollen. Do you think bees get an allowance?



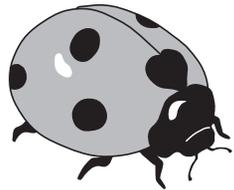
As many as 654,900 ants can live in a nest at one time. Talk about needing your own room!



Aphids are tiny green insects that suck juices out of plants. They can do a lot of damage while snacking in your garden.



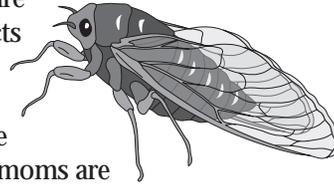
Most people think of ladybugs as friendly, but aphids don't think so! Ladybugs are *predators*. Predators eat other insects. Ladybugs can eat 5,000 aphids (their favorite snack) in their lifetime! No wonder gardeners love ladybugs.



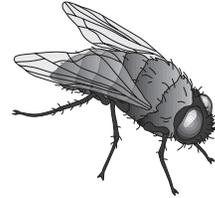
Spittlebugs are tiny insects that cover themselves with foam to hide. The foam makes the plant look like someone spit on it. This makes them easy to find in the garden.



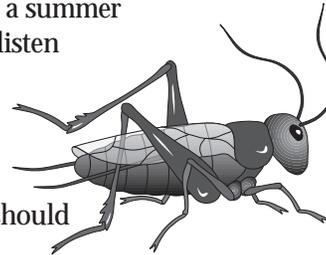
Male cicadas are the loudest insects in the world. They can be heard  $\frac{1}{4}$  of a mile away. I bet their moms are glad they live outside!



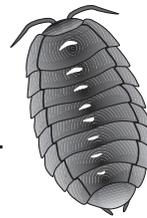
Flies hum in the key of F and beat their wings more than 20,000 times a minute. Now that's an exhausting music lesson!



Some crickets can tell temperature. On a summer evening, sit and listen to how many chirps you hear in 15 seconds. Add 40 to that number, which should be close to the actual temperature!



Pick up a rock or look under a board and you are likely to find a sowbug. Sowbugs are related to crabs. That is why they like dark, wet places to live.



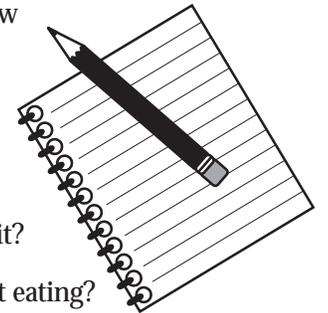
Now see how many of these insects you can find!

- Honey bee
- Ant
- Aphid
- Ladybug
- Spittlebug
- Cicada
- Fly
- Cricket
- Sowbug



Keep an Insect Investigator Journal. Entomologists are scientists that study insects. They write down descriptions of what they see to help them learn new things. You can too! Here are some ideas for what to include:

- Draw a picture.
- Where did you see it?
- What was the insect eating?
- Was it flying, hopping, crawling, or just standing still?
- Was it day or night when you saw the insect?
- What was the weather like?





## Attracting pollinators to your garden

Pollinators are essential for high yield and high quality of many vegetables and fruits in the garden. For example, strawberries, squash, melons, sweet cherries, and apples must have pollinators to ensure a high yield of good produce.

Gardeners can do several things to preserve, protect, and attract pollinators.

- Diversify garden plantings to offer a variety of flower colors, fragrances, and shapes throughout the growing season.
- Consider leaving flowering weeds such as clover, wild parsnip, and dandelions to serve as alternate nectar sources for pollinators.
- Limit pesticide use.
- When insecticides are necessary use those that are least disruptive and apply when pollinators are least active (very early morning, late evening, or after dark).
- Do not apply insecticides to plants that are blooming or when it is windy.

## For more information

Check these Web sites:

ISU Entomology—  
[www.ent.iastate.edu](http://www.ent.iastate.edu)

ISU Extension Distribution Center—  
[www.extension.iastate.edu/store](http://www.extension.iastate.edu/store)

ISU Horticulture—  
[www.yardandgarden.extension.iastate.edu](http://www.yardandgarden.extension.iastate.edu)

Iowa Master Gardeners—  
[www.mastergardener.iastate.edu](http://www.mastergardener.iastate.edu)

Reiman Gardens—  
[www.reimangardens.iastate.edu](http://www.reimangardens.iastate.edu)

Prepared by Betsy Matos, former entomology research assistant and Diane Nelson, extension communication specialist. Illustrations by Jane Lenahan, Creative Services, Instructional Technology Center.

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4/07

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# Pollinators in the Garden



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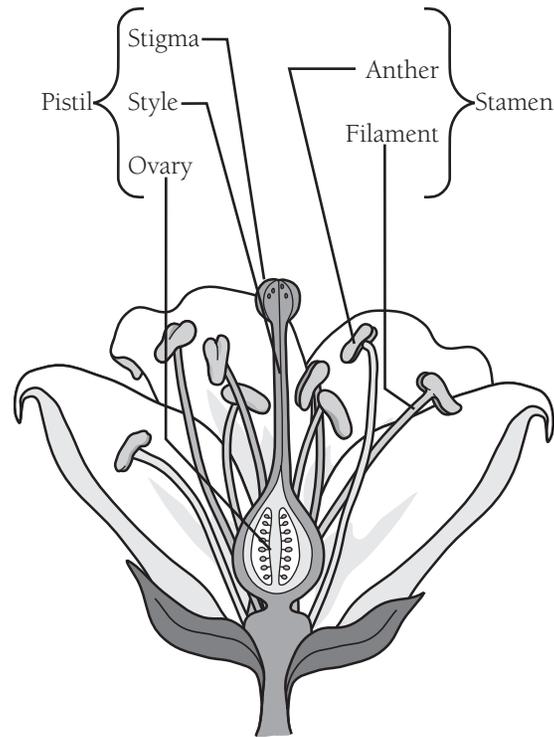
**F**lowers offer more than meets the eye and nose as we enjoy their colorful, fragrant beauty. Beyond our pleasure is their role in sexual reproduction that ensures continuance of the plant species. Flowering followed by pollination must happen for plants to produce seeds. Without pollination most fruits and vegetables will not set fruit, the fruit will be incomplete or misshapen, or the yield will be low.

## What is pollination?

Pollination is the transfer of pollen from the anther (male organ of the flower) to the stigma (female organ of the flower). The culmination of pollination is fertilization, the union of the male sperm nucleus contained in the pollen with a female egg located inside the ovary. To achieve fertilization the pollen grain that lands on the stigma must grow downward through a structure called the style and arrive in the ovary where the eggs are located. If pollination and fertilization are successful the result is a fertilized egg that may grow into a seed.

Plants vary in the way they accomplish pollination. Some plants—such as corn, grape, soybean, tomato, eggplant, and pepper—have female and male organs close together in the same or adjacent flowers. Wind releases the pollen so that it falls onto the stigma without difficulty; no aid or assistance is needed. For other plants the pollen will not fall easily to the stigma so another means of transporting pollen is necessary. These plants depend on pollinators, usually insects, to carry pollen from one flower to another—more specifically, from the male flower parts to the female flower parts.

Although we appreciate flowers for their beauty, the colors, shapes and even fragrances first evolved for only one purpose: to attract pollinators. Flowers with bright colors (especially blue,



yellow, red, and violet) attract pollinators during the daytime. At night, fragrance overrules color in importance.

Coevolution of flowers and pollinators has resulted in spectacular differences among flowers. Some flowers have variations in colors or lines that point the pollinator toward the nectar. Other flowers use traps, twists, or other devices to force pollinators into contact with the pollen.

Everything about the flower (shape, size, structural arrangement, and fragrance) is important for attracting pollinators and maximizing pollination efficiency. Consequently, different flowers attract different pollinators.

## Common pollinators in Iowa

Insects that commonly serve as pollinators in Iowa include honey bees, bumble bees, solitary bees such as mining bees and leafcutter bees, flower beetles, hover flies, and butterflies. These insects are not selflessly doing a favor to the flowers. They are enticed to do the job with a reward of food—nectar (sugar and water) and pollen (protein). In a honey bee hive, for example, all the members of the colony are nourished by the pollen and nectar brought in by the worker bees. Hummingbirds, certain bats, and a few other animals also are pollinators.

Insects have many highly modified structures to accomplish the dual tasks of obtaining food and carrying pollen. For example, the mouthparts of some pollinators are adapted for reaching past the anthers and stigmas. Butterflies and moths have a long tubular proboscis for reaching to the bottom of the flower. Similarly, certain bees have “tongues” for drawing up nectar as the insects walk on the exposed anthers. Beetles and ants have short mouthparts and are unable to reach nectaries located deep in the flower without crawling completely inside.

Once the pollinator flies or crawls to the flower, the mouth, body, antennae, or legs may collect pollen that is dispersed to the next flowers visited by the pollinator.

