



# Instructions for Using This Work Book Supplement for Entomology Project

**Place in the sturdy binder with the e-Record.**

These record materials are designed to be placed in a sturdy binder along with your e-record.

*This was designed for binder use so that:*

- . member's manual and record sheets always remain together;
- . additional materials can be inserted easily;
- . pages turn easily and completely to display material; and
- . advanced units can be added to the same book as you progress in 4-H entomology projects.

## Use of Insect Labels

You will notice that this record contains several cut-out labels for use in your collection. If you run out, make more labels out of heavy paper that are the same size.



1  
2



3  
4  
5



# Unit 1- Let's Learn About Insects

Nine- and 10-year-old members should start with Unit 1; older members may start with Unit 2. Unit 1 will introduce you to entomology and define entomology and insects. You will learn how to make an insect collection by using labels and pins and placing them in boxes. In addition, you will learn how to keep proper records and exhibit your collection.

## Project Outline for Completion of Unit 1

1. Study the life history of one insect found in your area from entomology books and pamphlets. Record the information in the proper place on the record sheets.
2. Learn differences between insects and other arthropods.
3. Make an insect collection of at least 10 but not more than 35 insects. Pin and display insects according to directions given in this manual. Collect insects from at least three different scientific orders and display them within their correct groups. Regular insect pins are preferred but not required (they will be required in later units.)
4. Exhibit your collection and entomology record at a local or county fair.

## Suggested Additional Activities

1. Make items useful for collection and display of your insect collection, such as an insect net, pinning block, killing jar, or spreading board.
2. Attend a meeting related to a subject on insects. Your county Colorado State Cooperative Extension office is a good place to learn of such activities. Museums, local colleges, biology teachers and libraries provide insect-related programs.
3. Read bulletins, pamphlets and books on entomology. Check your county Colorado State Cooperative Extension office and local libraries. Include these in your unit record.
4. Keep records of when and where you caught the insects that are in your collection.
5. Start working with keys that can separate the different scientific orders of adult insects.
6. Keep a record of things you learn through Unit 1 that you think would be most useful for future 4-H Unit 1 members to know.

## Unit 1: Let's Learn About Insects - page 4

### Objective 1

From entomology books and pamphlets, make a study of the life history of one insect found in your area. Record the information at the proper place on the record sheets.

Common name of the insect: \_\_\_\_\_

Scientific order in which the insect is included: \_\_\_\_\_

Give a brief description of the insect you chose for special study:

How big is it? \_\_\_\_\_

How would you describe its coloration or markings? \_\_\_\_\_  
\_\_\_\_\_

What kind of mouthparts does it have? \_\_\_\_\_

What kind of wings does it have? \_\_\_\_\_

Any other interesting features of this insect? \_\_\_\_\_  
\_\_\_\_\_

Why did you chose this insect for your Unit 1 feature? \_\_\_\_\_  
\_\_\_\_\_

How does this insect develop (check one)?

*Simple metamorphosis* Egg - Nymph - Adult

*Complete metamorphosis* Egg - Larva - Pupa - Adult

### Objective 2

Learn the differences between insects and other arthropods.

Insects are a kind of animal known as arthropods. But there are several other arthropods that are not insects, such as millipedes, centipedes, pillbugs, and spiders (arachnids). Find two differences between an insect and some other arthropod you have observed.

Pick an arthropod that is not an insect. What is it? \_\_\_\_\_

How does it differ from an insect? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Objective 3

Record any insect-related books and materials (such as television programs, CDS, movies) you have looked at as part of your Unit 1 project. \_\_\_\_\_

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### Objective 4

For this unit you are asked to make an insect collection of at least 10 but not more than 35 insects. Pin and display insects according to directions given in the manual. Have insects that represent at least three different orders and arrange them in your display within their correct groups. Boxes used to display the insects should be of sturdy design and not overly large. Boxes for the Unit 1 displays should be approximately 12 inches by 16 inches by 3 inches.

Use of regular insect pins is preferred but not required in Unit 1. (They will be required in later units.) It is also useful to record when and where you found the insects that are included in your collection. You may wish to include this on a sheet attached to this record book or on labels pinned with insect.

Exhibit your collection at a local or county fair.

Number of insects in your display: \_\_\_\_\_

Number of insect orders: \_\_\_\_\_

# Unit 2- - Learn More About Insects

Four-H club members 11 years of age or older may elect to start with this unit rather than Unit 1. In Unit 2, you will learn how to expand an insect collection using labels and pins, and how to keep proper records and exhibit your collection. In addition, you will learn some things about how insects are classified. You will work out an insect control program for one destructive insect, using information from books, pamphlets or insect control guides. Appreciating beneficial insects is also part of this unit.

## Project Outline for completion of Unit 2

1. Make an insect collection of at least 25 but not more than 75 insects. Pin and display insects according to directions in the manual. Use labels to describe when and where you found new insects collected during this unit. Include in your collection representatives from at least six different scientific insect orders. Construct or purchase display boxes that are approximately standard size (12 inches wide, 16 inches long and 3 inches deep). Use standard insect pins.
2. Select an insect which is a useful or beneficial species that is found in your area. Learn about its habits and describe what benefits this insect produces. Use this information to complete the section found in the record sheets.
3. Select an insect which is a pest in your area on plants or animals. Learn about its habits and describe why it is considered to be a pest. Investigate control measures, including biological controls and insecticides if appropriate. Use this information to complete the section found in the record sheets.
4. Fill in the outline about five insects that live in your area. Give their common name, identify their scientific order, and describe what they eat and how they live. Record this information in the table found on the record sheets.
5. Record in your record sheets any materials that you have bought or made used to create your insect collection.

## Suggested Additional Activities

1. Read additional books and pamphlets on insects. Add these to your record.
2. Attend meetings on insects held in your area that are sponsored by local Colorado State Cooperative Extension offices, libraries and schools. Report on these in your record book.
3. Find a nest of ants or bees. Watch them for at least one-half hour. Observe their activities and record these in your record book. If you do any experiments with them, discuss what you did and your results.
4. Practice using the identification key in the manual until you can correctly identify the scientific order to which all the specimens in your collection belong.
5. Keep a record of things you learned in this unit. Particularly important are things you think would be most useful for other 4-H Unit 2 members to know. Share your experiences with others involved in earlier units of entomology and record it in your record.

## Objective 1

Study the life history of *one* beneficial insect and *one* pest insect found in your area.

Record the information in the proper place in the record sheets.

### ***A Beneficial Insect***

Common name of the insect: \_\_\_\_\_

Scientific order in which the insect is included: \_\_\_\_\_

Give a brief description of the insect you chose for special study:

How big is it? \_\_\_\_\_

How would you describe its coloration? \_\_\_\_\_

What kind of mouthparts does it have? \_\_\_\_\_

What kind of wings does it have? \_\_\_\_\_

Any other interesting features of this insect? \_\_\_\_\_

What are the beneficial habits of this insect? \_\_\_\_\_

What can be done to conserve and encourage this insect? \_\_\_\_\_

How does this insect develop (check one)?

- Simple metamorphosis*      Egg - Nymph - Adult  
 *Complete metamorphosis*      Egg - Larva - Pupa - Adult

## ***A Pest Insect***

Common name of the insect: \_\_\_\_\_

Scientific order in which the insect is included: \_\_\_\_\_

Give a brief description of the insect you chose for special study:

How big is it? \_\_\_\_\_

How would you describe its coloration or markings? \_\_\_\_\_

\_\_\_\_\_

What kind of mouthparts does it have? What kind of wings does it have? \_\_\_\_\_

\_\_\_\_\_

Any other interesting features of this insect? \_\_\_\_\_

\_\_\_\_\_

What are this insect's damaging habits that make it a pest? \_\_\_\_\_

\_\_\_\_\_

How does this insect develop (check one)?

*Simple metamorphosis*      Egg - Nymph - Adult

*Complete metamorphosis*      Egg - Larva - Pupa - Adult

How can this insect be controlled and managed? You may wish to include information on biological controls, cultural controls and chemical controls.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What sources of information did you use to find out about this insect? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## Objective 2

Fill in the outline about five insects that live in your area. Give their common name, identify the scientific order they are in and describe what they eat and how they live. Record this information on the table below.

Insect	Scientific Order	Where Collected
<i>Example:</i> Alfalfa Weevil	<i>Example:</i> Coleoptera	<i>Example:</i> On Alfalfa

## Objective 3

For this unit you are asked to make an insect collection of at least 25 but not more than 75 insects. At least six different orders of insects should be represented.

Pin and display insects according to directions given in the manual. Try to label the pinned insects describing when and where you found newly collected insects for this unit. Build or purchase display boxes that are approximately standard size (12 inches wide, 16 inches long and 3 inches deep). Use standard insect pins.

Exhibit your collection at a local or county fair.

Number of insects in your display: \_\_\_\_\_

Number of scientific orders: \_\_\_\_\_

## Objective 4

Record in your record sheets any materials that you used to create your insect collection.

\_\_\_\_\_ Insect Net

\_\_\_\_\_ Killing Jar

\_\_\_\_\_ Pinning Block

\_\_\_\_\_ Display Case

\_\_\_\_\_ Spreading Board

\_\_\_\_\_ Other

\_\_\_\_\_

# Unit 3 - Focus on Insect Habits

In this unit you will learn how to identify insect groups, including those found around lakes and rivers. One focus of the unit will be to concentrate on collecting or categorizing insects in ecological associations. Also, you will be asked to learn detail of the habits of at least one insect that you will specifically study.

## Project Outline for completion of Unit 3

1. Make an insect collection of at least 75 and not more than 150 insects. Include specimens from at least nine different orders, including one that develops in water (Trichoptera/ caddisflies, Plecoptera/ stoneflies, Odonata/ dragonflies, or Ephemeroptera/ mayflies). Pin and display insects as directed in the manual. Use purchased or homemade display boxes that are approximately the standard size indicated in the manual. Standard insect pins are required. All new insects collected as part of Unit 3 must have a label detailing when and where the insect was found.
2. Do a special collection of some type of insect. Include at least eight different kinds of insects in your special collection. Place these in a separate area of your display box or in a separate box. The insects in the special collection count toward the total number of insects needed for this unit. Special collections are mentioned in the entomology manual. They can be of almost any type of insect but must follow some theme. For example, they could be insects collected at porch lights, insects found in an alfalfa field, beneficial insects, pest insects, aquatic insects, grasshoppers, red insects - almost anything. The purpose of the theme is to start identifying ecological associations or patterns of insect groups.
3. Pick 10 insects. Record the insects, scientific order and family in the appropriate place in the following record sheets.
4. Study one insect. Give a report on this insect at a club meeting or at school. Complete the information required on the record sheet.

## Suggested Additional Activities

1. From entomology books and pamphlets, make an intensive study of the life history of an insect in your area. Watch their natural behavior several times, spending at least a few minutes in each observation. Record your observations and summarize the information in your record sheets. If you conduct any experiments, include your findings in the record.
2. Attend meetings on insects that are held in your area that are sponsored by local Colorado State Cooperative Extension offices, libraries and schools. Report on these in your record book. If possible, visit museums and other displays of insects outside your county.
3. Learn more about the methods used to control pest insects. Find out something about Integrated Pest Management (IPM) and how it is applied to manage a problem with a local pest insect. Report what you have learned.
4. Participate in an individual entomology team demonstration. Report these activities in your record.
5. Try to rear an insect through at least one life stage. Describe what you have observed.
6. Keep a record of things you have learned in this unit. Particularly important are things you think would be most useful for other 4-H members to know. Share your experiences with others who are involved in earlier units of entomology and include these in your record.



### **Objective 3**

Study one insect. Report on this insect at a club meeting or at school.

What insect did you study? \_\_\_\_\_

Where did you give your report? \_\_\_\_\_

How many people heard your report? \_\_\_\_\_

### **Objective 4**

Make an insect collection of at least 75 and not more than 150 insects. Include specimens from at least nine different scientific orders, including one that develops in water (Trichoptera/caddisflies, Plecoptera/stoneflies, Odonata/dragonflies, or Ephemeroptera/mayflies). Insects displayed in your special collection count towards the total needed for this unit.

Pin and display insects in accordance with directions given in the manual. Use purchased or homemade display boxes approximately the standard size indicated in the manual. Standard insect pins are required. All new insects collected as part of Unit 3 must have a label detailing when and where the insects was found.

Exhibit your collection at a local or county fair.

Number of insects in your display. \_\_\_\_\_

Number of scientific orders \_\_\_\_\_

# Unit 4 — Community Projects and Insects Sampling

In this unit you will take insect identification to the family level. You will also be asked to map and observe where certain insects are found within your neighborhood and to gain experience with trapping insects for study. This unit also asks for you to reflect on what have been areas that you have found particularly valuable or interesting while studying insects.

## Project Outline for Completion of Unit 4

1. Make an insect collection of at least 100 but not more than 250 insects. At least ten scientific orders should be represented. Pin and display insects in accordance with manual directions. Use purchased or homemade display boxes approximately the standard size indicated in the manual. Standard insect pins are required. All new insects collected as part of Unit 4 must have a label detailing when and where it was found.
2. Select four insect orders and list the names of four families that occur within each order. Give a common name of an insect which is an example of each family listed. Record this information on the record sheets.
3. Make a survey of your neighborhood to see if you can locate any areas where flies or mosquitoes may breed. Make a map of the area and describe the situation in your record.
4. Set up some type of insect trap and record daily what you catch over the course of several days. You may use any type of trap -light trap, pitfall trap, sticky trap, pheromone trap, etc. Discuss how weather affected the number of insects you caught.
6. Write in your record four things you learned during the entire entomology project that you feel have been particularly valuable.

## Suggested Additional Activities

1. Participate in a team or individual demonstration on entomology to your 4-H group or a local school.
2. Make a mini-insect zoo of insects you found. Observe the insects and use them to show others things that insects do. Report your activities.
3. Make a collection of samples that show injury by insects to plants or other materials. Try to find out what insect caused the injury.
4. Collect some immature insects. Try to identify the insect's scientific order.
5. Make a special report on one insect after studying it in several references.
6. Attend meetings on insects held in your area that are sponsored by local Colorado State Cooperative Extension offices, libraries, and schools. Report on these in your record book. If possible, visit museums and other displays of insects outside your county.

### Objective 1

Select four scientific insect orders and list the names of four families that occur within each scientific order. Give a common name of an insect which is an example of each family listed.

Family Name	Common Name of One Insect

Family Name	Common Name of One Insect

Family Name	Common Name of One Insect

Family Name	Common Name of One Insect

**Objective 2**

Survey your neighborhood to locate any areas where flies or mosquitoes may breed. Make a map of the area in the space below and describe the situation in the record sheets.

### Objective 3

Set up some type of insect trap and record daily what you catch over the course of several days. You may use any type of trap: light trap, pitfall trap, sticky trap, pheromone trap, etc. Record your catches and discuss how weather affected the number of insects caught.

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### Objective 4

Make an insect collection of at least 100 but not more than 250 insects. At least 10 scientific orders should be represented. Pin and display insects in accordance with directions given in the manual. Use purchased or homemade display boxes approximately the standard size. Standard insect pins are required. All new insects collected as part of Unit 4 must have a label detailing when and where the insect was found.

### Objective 5

Record four things you learned during the entomology project, since Unit 1, that you feel have been most valuable and interesting.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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3. \_\_\_\_\_

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4. \_\_\_\_\_  
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\_\_\_\_\_
5. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## **Unit 5 – Immature Insects and Insect Management**

Further specialization of your insect studies is important to this unit. Also, considerable effort should be made to learn to identify the immature stages of insects. Based on your understanding of integrated pest management, you will be asked to develop some sort of insect management program.

### **Project Outline for Completion of Unit 5**

1. Make a collection of at least 10 larvae or immature insects and display it with your regular insect collection. These should be kept in vials with rubbing alcohol or a similar preservative. Identify their scientific order.
2. Make a special collection that is different from one you made in Unit 3. Include at least ten insects in this collection.
3. Try to rear an insect through at least two life stages. Record observations on the record sheets.
4. Learn the scientific family name of at least 25 insects in your collection. Give the scientific name of at least five insects.
5. Assume the responsibility for insect control in your home, garden or farm. Report in detail how you set up the program. Complete the record sheet information.

### **Suggested Additional Activities**

1. Participate in a team or individual demonstration on some phase of entomology.
2. Prepare a poster display on the life cycle of an interesting or important insect, showing all stages.
3. Make a special display on the beneficial or pest insects found in your area.
4. Keep a record of newspaper and magazine articles, and television reports that include insects.

**Objective 1**

Learn the scientific family name of at least 25 insects in your collection. Give the scientific name of at least 5 insects.

Family Name	Scientific Name

**Objective 2**

What kind of special collection did you make? \_\_\_\_\_

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What did you learn from it? \_\_\_\_\_

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**Objective 3**

Try to rear an insect through at least two life stages. Record observations.

What insect did you try to rear? \_\_\_\_\_

What did you have a chance to observe while rearing this insect? \_\_\_\_\_

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**Objective 4**

Make an insect collection of at least 150, but not more than 250 insects. Ten orders should be represented. Pin and display insects in accordance with directions given in the manual. Use purchased or homemade display boxes approximately the standard size indicated in the manual. Standard insect pins are required. All new insects collected as part of Unit 5 must have a label detailing when and where the insect was found.

**Objective 5**

Assume the responsibility for insect control in your home, garden or farm.

What insect did you attempt to control? \_\_\_\_\_

How did you go about the control program? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

How successful do you think it was and why? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Objective 6**

Make a collection of at least 10 larvae or immature insects and display it with your regular insect collection.

What 10 immature insects did you include in your collection?

Common Name	Scientific Order

# Unit 6 ----Special Activities

## Project outline for Completion of Unit 6

1. Write about three special activities. The three activities may be selected from the list of suggestions below. Unit leaders may agree to other advanced entomology activities to fulfill this requirement. Describe and document the activities you have selected.
  - a. Junior Leadership: Assist in obtaining and helping younger members with entomology.
  - b. Prepare a larval or immature display of at least 20 different specimens. Label the insect's scientific order and family if known.
  - c. Prepare a live insect display for school, a club or shop-window viewing.
  - d. Operate a light trap and keep records for your county or area Colorado State Cooperative Extension agent.
  - e. Conduct individual or team demonstrations.
  - f. Prepare a written report on some pest or beneficial insect. Use and list several references.
  - g. Prepare photographs of insects or some phase of entomology. Include these with record sheets.
  - h. Visit a local beekeeper and learn the essentials of beekeeping.
  - i. Survey local insecticide dealer stores and study the different types of insecticides. Record the number of trade names there are for the same insecticide.
  - j. Prepare and conduct an insect identification contest for your 4-H club.
2. Collect, pin, label and display one box of a special collection of beetles, flies, grasshoppers, butterflies or some other scientific order. Display at least 50 insects all from the same order with no more than three of the same kind in each display.

# Unit 7 — Advanced Entomology

## **'Project Outline for Completion of Unit 1**

There are no specified requirements for this unit. You will make your own experiments and study, reporting these on the record sheets. You may get ideas by looking at other reference books listed.

No insect displays are required for advanced entomology. However, you should prepare a small display illustrating your project work, such as a poster, chart or a display of special equipment used or developed. Research projects are also encouraged. You may enroll in advanced entomology for several years to advance your skills and leadership.

Cut-Out Labels of Insect Orders for Your Collection