

# Comparing and Contrasting Organisms

Field guides are books used by scientists, students, and amateur naturalists to help them identify different plant or animal species. Field guides usually contain clear descriptions of particular organisms, along with photographs or accurate illustrations. Guides are available for all kinds of organisms, including weeds, edible plants, mushrooms, trees, birds, insects, reptiles, and mammals. Field guides give us a way to understand and interact with the environment and also help us gauge the natural diversity of an area.

Field guides are often based on a system called a dichotomous key, which directs your search to identify the species. Each time you make a choice, the key directs you to a new set of descriptions until you reach the name of the species you want to identify. Usually the field guide provides the scientific and common names of the species and lists other information such as identifying characteristics, range, and habitat. In this activity, you will make a field guide featuring organisms found around your home or school. Then you will use your customized field guide to teach other students about the organisms found in your community.

## OBJECTIVES

**Design** a model for a field guide and **select** a theme.

**Collect** data about each organism species and **classify** organisms for placement in field guide.

**Identify** organisms by name and characteristics.

## MATERIALS

- binder, 3-ring
- bug box
- drawings or photos of plant or animal specimens, clear and detailed
- field guides and other reference books
- forceps or tweezers
- pencils, colored



## Procedure

1. Select a theme for your field guide, and indicate your choice in the space provided. Some examples of topics for your guide include native wildflowers, butterflies and moths, songbirds, mosses and ferns, invertebrates, mammals, social insects, snails and other shelled organisms, or useful plants in your area. Select one of those listed or choose your own topic. The theme for your field guide will be:

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**Comparing and Contrasting Organisms** *continued*

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2. Observe a specimen of each species you wish to feature in your guide. Handle all animals gently and with respect. Invertebrates should be handled with forceps or tweezers. Make detailed field drawings or take photographs of each species. If appropriate, put a specimen in a bug box to contain it while you make your illustration. Write a brief description in your notebook of when, where, and in what type of habitat you found or observed the specimen. Wash your hands after handling any outdoor plants or animals.
3. Decide if you will illustrate your field guide with drawings or photographs. You could also find pictures of them in books or magazines. Just make sure the illustrations you use are clear enough for people to be able to identify the organisms in the field. For plant species, you may use actual specimens. Use the method you have selected to represent each specimen.

**Analysis**

1. **Analyze the Results** List the kinds of information that would be helpful to people using your field guide.

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2. **Analyze the Results** Mount the specimens or pictures in your field guide. Next to each specimen or picture, write or type the following information about the species, as well as the information you identified in step 2:

- a. common and Latin species name
- b. identifying characteristics
- c. characteristics of growth, lifespan, relative abundance, food requirements, and habitat
- d. for plants, include soil, water, climate requirements, and any known uses



Be sure to include the same kinds of information and present it in the same order for each specimen. To give a more professional look to your field guide, scan your pictures into a computer, type in the text, and print out the finished page.

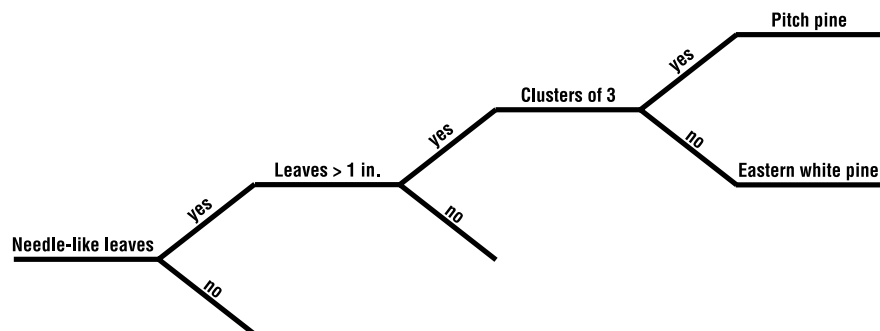
**Comparing and Contrasting Organisms** *continued***Conclusions**

- 3. Communicate the Results** When your species profiles are complete, decide how you will organize them in the guide. What factors will you use to organize your field guide?
- \_\_\_\_\_
- \_\_\_\_\_

- 4. Recognizing Patterns** A detailed key will help the field guide user identify a particular species. Below is part of a simple tree identification key based on leaf comparisons. The concept map (or decision tree) below it will help you trace how it is used to identify the two leaves shown in the drawings. Draw a line between each leaf cluster pictured and write its common name.

**A Dichotomous Key to Common Trees of the Northeastern United States**

1. a. Leaves are thin and needle-like (coniferous) .....	Go to 2	
b. Leaves are broad and fan-like (deciduous) .....	Go to 6	
2. a. Needles are over 1 in. long and are clustered .....	Go to 3	
b. Needles are 1/2 in. long or less .....	Go to 4	
3. a. Needles occur in clusters of 3 .....	Pitch pine ( <i>Pinus rigida</i> )	
b. Needles occur in clusters of 5 .....	Eastern white pine ( <i>Pinus strobus</i> )	

**Concept Map of the Dichotomous Key Pictured Above**

## Comparing and Contrasting Organisms *continued*

**5. Interpreting Information** Use the outline of the key on the previous page to develop a key for your own field guide. Commercial field guides often arrange groups of organisms such as plants, insects, or birds by families—using shared characteristics and relationships. Look for obvious distinguishing characteristics such as wing color and patterns or shape of antennae for butterflies and moths, and flower color and form or leaf shapes and vein patterns for plants. Decide what features you will use in the key to your field guide and record them below. Each section of the key should focus on a different feature.

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**6.** Put the completed pages of your guide in a 3-ring binder. Put the key in the front of the guide. Give your field guide a name and create a title page.

**7. Interpreting Information** What would explain the popularity of field guides with naturalists and other people who care about the environment?

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**8. Communicating the Results** How can field guides promote the understanding and protection of biodiversity?

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# Comparing and Contrasting Organisms

## Teacher Notes

**TIME REQUIRED** Three 45-minute class periods

## SKILLS ACQUIRED

Classifying  
Organizing data  
Identifying and recognizing patterns  
Communicating  
Constructing models



Alecia Hagberg  
Dalton  
High School  
Dalton, Georgia

## RATING

Easy ← 1 2 3 4 → Hard

Teacher Prep–2  
Student Set-Up–2  
Concept Level–2  
Clean Up–2

## THE SCIENTIFIC METHOD

**Make Observations** Procedure, step 2

**Analyze the Results** Analysis, questions 1 and 2

**Communicate the Results** Procedure, step 1; Conclusions, questions 3 and 8

## MATERIALS

If students plan to take photographs of specimens, a digital or instant developing camera is more convenient than a standard film camera.

## SAFETY CAUTIONS

Caution students to handle all animals gently and with respect. Have them put any small animal specimens in a bug box to observe more closely while creating their illustrations. Invertebrates should be handled with forceps or tweezers. Students should wash their hands after handling any outdoor plants or animals.

## DISPOSAL

Have students return any live specimens to the collection site after identifying the organisms. Remind them to disturb the survey sites as little as possible and to restore anything they disturbed after completing the investigation.

## TIPS AND TRICKS

Have each student or small group make a field guide, or students in one class can consolidate their work to produce one larger guide to the wildlife of your local community.

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## Skills Practice Lab

## FIELD ACTIVITY

# Comparing and Contrasting Organisms

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Field guides are often based on a system called a dichotomous key, which directs your search to identify the species. Each time you make a choice, the key directs you to a new set of descriptions until you reach the name of the species you want to identify. Usually the field guide provides the scientific and common names of the species and lists other information such as identifying characteristics, range, and habitat. In this activity, you will make a field guide featuring organisms found around your home or school. Then you will use your customized field guide to teach other students about the organisms found in your community.

## OBJECTIVES

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## MATERIALS

- binder, 3-ring
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- forceps or tweezers
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## Procedure

1. Select a theme for your field guide, and indicate your choice in the space provided. Some examples of topics for your guide include native wildflowers, butterflies and moths, songbirds, mosses and ferns, invertebrates, mammals, social insects, snails and other shelled organisms, or useful plants in your area. Select one of those listed or choose your own topic. The theme for your field guide will be:

**Answers may vary with the student and the local habitat.**

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

**Comparing and Contrasting Organisms** *continued*

2. Observe a specimen of each species you wish to feature in your guide. Handle all animals gently and with respect. Invertebrates should be handled with forceps or tweezers. Make detailed field drawings or take photographs of each species. If appropriate, put a specimen in a bug box to contain it while you make your illustration. Write a brief description in your notebook of when, where, and in what type of habitat you found or observed the specimen. Wash your hands after handling any outdoor plants or animals.
3. Decide if you will illustrate your field guide with drawings or photographs. You could also find pictures of them in books or magazines. Just make sure the illustrations you use are clear enough for people to be able to identify the organisms in the field. For plant species, you may use actual specimens. Use the method you have selected to represent each specimen.

**Analysis**

1. **Analyze the Results** List the kinds of information that would be helpful to people using your field guide.

**The field guide should mention important details such as the range where the flora or fauna is found, whether it is endemic or exotic, and where to find the species, but will vary with the organism selected as the theme. For example, with birds, the call, coloring, size, habits, notable features of eggs and nesting patterns are useful. For plants, the guide could also provide information about when and if it blooms, whether it is common or rare, and if it is hazardous to humans.**

2. **Analyze the Results** Mount the specimens or pictures in your field guide. Next to each specimen or picture, write or type the following information about the species, as well as the information you identified in step 2:
  - a. common and Latin species name
  - b. identifying characteristics
  - c. characteristics of growth, lifespan, relative abundance, food requirements, and habitat
  - d. for plants, include soil, water, climate requirements, and any known uses

Be sure to include the same kinds of information and present it in the same order for each specimen. To give a more professional look to your field guide, scan your pictures into a computer, type in the text, and print out the finished page.

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

**Comparing and Contrasting Organisms** *continued***Conclusions**

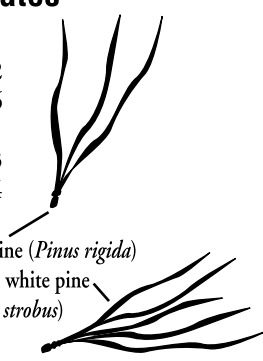
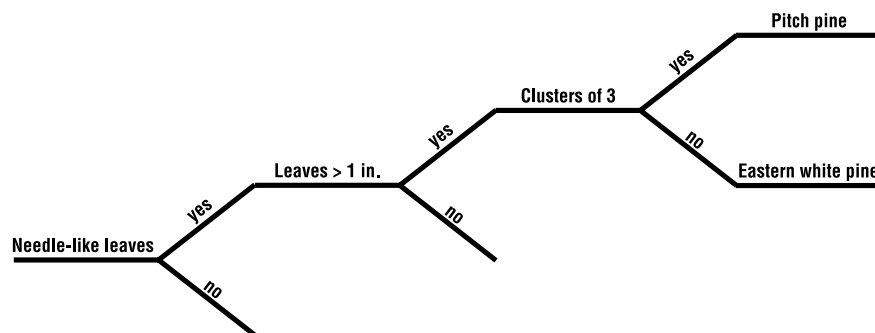
- 3. Communicate the Results** When your species profiles are complete, decide how you will organize them in the guide. What factors will you use to organize your field guide?

**Organisms are most commonly organized according to taxonomic family relationships. They could also be organized by features such as color, size, or use.**

- 4. Recognizing Patterns** A detailed key will help the field guide user identify a particular species. Below is part of a simple tree identification key based on leaf comparisons. The concept map (or decision tree) below it will help you trace how it is used to identify the two leaves shown in the drawings. Draw a line between each leaf cluster pictured and write its common name.

**A Dichotomous Key to Common Trees of the Northeastern United States**

1. a. Leaves are thin and needle-like (coniferous) ..... Go to 2  
    b. Leaves are broad and fan-like (deciduous) ..... Go to 6
2. a. Needles are over 1 in. long and are clustered ..... Go to 3  
    b. Needles are 1/2 in. long or less ..... Go to 4
3. a. Needles occur in clusters of 3 ..... Pitch pine (*Pinus rigida*)  
    b. Needles occur in clusters of 5 ..... Eastern white pine (*Pinus strobus*)


**Concept Map of the Dichotomous Key Pictured Above**

The three-leaf cluster is Pitch pine and the five-leaf cluster is Eastern white pine.



Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

**Comparing and Contrasting Organisms** *continued*

- 5. Interpreting Information** Use the outline of the key on the previous page to develop a key for your own field guide. Commercial field guides often arrange groups of organisms such as plants, insects, or birds by families—using shared characteristics and relationships. Look for obvious distinguishing characteristics such as wing color and patterns or shape of antennae for butterflies and moths, and flower color and form or leaf shapes and vein patterns for plants. Decide what features you will use in the key to your field guide and record them below. Each section of the key should focus on a different feature.

**Answers may vary, but the descriptions for the key should match the type of organism in the collection. For invertebrates, the number of legs, body parts, presence or absence of wings and their number are useful features. With a tree field guide, you might focus on bark and seed characteristics, while a wildflower guide might use leaf and flower characteristics.**

- 6.** Put the completed pages of your guide in a 3-ring binder. Put the key in the front of the guide. Give your field guide a name and create a title page.
- 7. Interpreting Information** What would explain the popularity of field guides with naturalists and other people who care about the environment?

**Answers may vary. Field guides give people an enjoyable way to learn more about wildlife and unfamiliar species while not causing harm to the environment.**

- 8. Communicating the Results** How can field guides promote the understanding and protection of biodiversity?

**Answers may vary. They promote a better understanding and appreciation of nature. We can identify species that are invasive and those that may be threatened or rare, which may help us protect endemic species. Through careful identification and observation, we can learn how species interact.**

# Exploring Local Biodiversity

Biodiversity might mean little more than that there are many different species of living organisms on Earth. But if this were all it meant, why should we try to conserve or protect wild plants and animals? Why should we care if an undiscovered beetle or unknown weed becomes extinct? Biodiversity on many levels is an important environmental resource. Human beings depend on other species for food, clothing, building materials, medicines, and the other necessities and comforts of life.

Living creatures work together to provide valuable services such as purifying our air and water, preventing soil erosion, recycling energy and nutrients, and replenishing the oxygen that we need to breathe. They may even affect local climate and weather conditions. Endangered species of plants and animals may have properties still undiscovered that can combat disease or provide new food sources. In this field activity, you will find and classify a variety of different organisms from your school environment. Then you will consider the importance of the organisms that you identify to the ecosystem and their value to human society. You may work in teams or in small groups of three to four members.

## OBJECTIVES

**Locate** organisms in a local area.

**Organize** data into categories.

**Differentiate** organisms by taxonomic classifications.

**Appraise** the value of different species.

## MATERIALS

- bug boxes
- clipboards
- collecting jars, wide-mouth
- field guides
- forceps or tweezers
- gloves, disposable
- hand lens
- nylon stocking or cheesecloth
- paper or notebook
- pen or pencil
- plastic bags for leaves
- rubber bands
- tote bag
- yardstick or meter stick or tape measure



## Procedure

1. Go outside with your teammates to an area near your school selected by your teacher. Take along a yardstick, meter stick, or tape measure. Use a branch to mark out an observation square in the earth the length of the measuring stick on each side. Groups that study trees should map out an appropriate area.

**Exploring Local Biodiversity** *continued*

2. Your assignment is to find as many different kinds of organisms (plants/animals/fungi or other soil organisms) as you can in 10 minutes. Use the hand lens and the data table below to keep track of your observations. Place larger organisms in a bug box or collecting jar to observe. You could use a tick mark to record each new organism discovered in your observation area.

Location of study _____	
Species type   Number of organisms observed	
Plants	
Animals	
Fungi and other soil organisms	

3. Select a reporter for your team. As a group, make a list of those organisms that team members have spotted. Only list those organisms that all team members saw during the observation period. Organize your findings into more specific categories such as birds, insects, grasses, trees and so on. Record your findings below.

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4. If your team does not know the name of any organism observed, do one of the following:
- Write a simple description of the organism and include its measurements.
  - Make a simple drawing or take a photograph of the organism. Give its approximate dimensions. Use the space provided below to record your group descriptions and any drawings of the organisms observed.

## Exploring Local Biodiversity *continued*

c. If practical, collect the organism itself or bring back a part of it (without causing any harm). Treat all living things gently. To bring a live insect or other small animal specimens back indoors, place it into a collecting jar. Make the collecting jar as much like the organism's natural home as possible (with damp soil, leaves, plants, and a place to hide). Cover the jar with a nylon stocking or cheesecloth to provide air and secure it on the jar with a rubber band. Return any specimens to the site when you have finished with them.

5. After you have completed the field survey, put away your materials and restore the site. If you lifted any stones or branches to examine organisms, be sure to return the object to the same position when you are done observing.
6. Return to the classroom. Sit with your team. Your group reporter should share your findings with the entire class. If possible, enlist the aid of other students in identifying unknown specimens. Make a class list of all the different organisms recorded by all the field survey teams. Write them on the chalkboard or chart paper, use an overhead projector, or find another place where all class members can see the list.

## Analysis

1. **Classifying Data** Spend about 15 minutes placing the entire list of organisms into groups that have the most similarity. Place the organisms into taxonomic groups. If your team does not know taxonomic classification, place them into broad groups that seem to make sense to your team members. You could use field guides to help with this organizational task. Describe the organizational scheme your group selected below.

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## Exploring Local Biodiversity *continued*

- 2. Making Evaluations** Spend about 8–10 minutes deciding which organism from your group's list is the most important and which organism is the least important. After that task is completed, spend another 10 minutes deciding which organisms from the total class list are the most and least important. Record your rankings and your reasoning.

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- 3.** Share your group decisions with the class about which organism from the class list is the most important and which organism from the class list is the least important. Discuss how each team arrived at their rankings.

## Conclusions

- 4. Defending Conclusions** Working on your own, review the rankings of species made by your classmates. Then make a list ranking the five key species in the area around your school, from most important to least important. Identify the values you used for the ranking process. Record your rankings and justify them below.

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- 5. Applying Conclusions** People make similar value judgments every day. How might value judgments influence decisions about environmental issues? Recall how the interdependence of species affects the balance of ecosystems. Record your ideas below.

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# Exploring Local Biodiversity

## Teacher Notes

**TIME REQUIRED** One 45-minute class period

### SKILLS ACQUIRED

Collecting data  
Classifying  
Interpreting  
Communicating



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### RATING

Easy ← 1 2 3 4 → Hard

Teacher Prep–1  
Student Set-Up–2  
Concept Level–3  
Clean Up–2

## THE SCIENTIFIC METHOD

**Make Observations** Procedure, steps 1 and 2

**Analyze the Results** Procedure, steps 3, 4, and 6; Analysis, question 1

**Draw Conclusions** Analysis, questions 2 and 3; Conclusions, questions 4 and 5

## MATERIALS

Small pocket notebooks for recording field survey data and other observations, tote bags to carry supplies, and clipboards for holding papers are useful. Gloves to protect hands from underbrush, field guides to plants and small animals, bug boxes and collecting jars to temporarily hold and observe specimens are optional equipment.

## SAFETY CAUTIONS

Encourage students to handle all insects and animals gently and with respect. Urge them to collect animal specimens carefully, keeping them only long enough for observations. Invertebrates should be handled with forceps or tweezers. Students should wash their hands after handling any outdoor plants or animals. Depending on their previous level of outdoor experience, warn students about potentially harmful animals and plants: insects that sting such as wasps and bees, venomous snakes, and plants that can be harmful to touch, such as poison ivy, poison oak, and stinging nettle.

## DISPOSAL

Have students return any live specimens to the collection site after identifying the organisms. Remind them to disturb the survey sites as little as possible and to restore anything they disturbed after completing the investigation.