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Congratulations! A 4-H member has asked you to serve as a project helper. You may be a parent, relative, project leader, friend, club advisor, or another individual important in the 4-H member’s life. Your duties begin with helping the youth create and carry out a project plan, as outlined in the Member Project Guide. This is followed by helping the youth focus on each activity, providing support and feedback, and determining what was done well, what could have been done differently, and where to go next.

As a project helper, it is up to you to encourage, guide and assist the 4-H member. How you choose to be involved helps to shape the 4-H member’s life skills and knowledge of the importance of exploring the outdoors.

Your Role as Project Helper

Your contributions are critical to delivery of the 4-H program, which is committed to providing experiences that strengthen a young person’s sense of belonging, generosity, independence and mastery. It is essential that your interactions support positive youth development within the framework of these Eight Key Elements:

1. Positive relationship with a caring adult
2. Welcoming environment
3. Opportunity to value and practice service
4. Opportunity for mastery
5. Physically and emotionally safe environment
6. Opportunity for self-determination
7. Engagement in learning
8. Opportunity for self-determination

For more information on the Eight Key Elements, please refer to the Advisor Handbook available online at ohio4h.org. On a practical level, your role as a project helper means you will …

• Guide the youth and provide support in setting goals and completing this project.
• Encourage the youth to apply knowledge from this project book.
• Serve as a resource person.
• Encourage the youth to go beyond the scope of this 4-H project book to learn more about exploring the outdoors.
What You Should Know About Experiential Learning

The information and activities in this book are arranged in a unique, experiential fashion (see model). In this way, youth are introduced to a particular practice, idea, or piece of information through an opening (1) experience. The results of the activity are then recorded in the accompanying pages. Youth then take the opportunity to (2) share what they did with their project helper, (3) process the experience through a series of questions that allow the learner to (4) generalize and (5) apply the new knowledge and skill.

What You Can Do

• Review the Learning Outcomes (project skill, life skill, educational standard, and success indicator) for each activity to understand the learning taking place. See the inside back cover for the Summary of Learning Outcomes.

• Become familiar with each activity and the related background information. Stay ahead of the learner by trying out activities beforehand.

• Begin the project by helping the learner establish a plan for the project. This is accomplished by reviewing the Member Project Guide.

• After each activity, conduct a debriefing session that allows the learner to answer the review questions and share results. This important step improves understanding from an experiential learning perspective.

• Help the learner celebrate what was done well and to see what could be done differently. Allow the learner to become better at assessing his or her own work.

• In the Member Project Guide, date and initial the activities that have been completed.
Thank you for taking the *Explore the Outdoors* project! This introductory project is designed for youth of all ages interested in Ohio’s wildlife and ecosystems. This project helps you explore plants and wildlife in the woodlands, fields, wetlands, bodies of water and the geology of Ohio.

Check your county’s project guidelines (if any) for completion requirements in addition to the ones below, especially if you plan to prepare an exhibit for the fair.

**Project Guidelines**

**Step 1**: Complete all nine activities and the Talking It Over questions.

**Step 2**: Take part in at least two learning experiences.

**Step 3**: Become involved in at least two leadership/citizenship activities.

**Step 4**: Complete a project review.

**Step 1: Project Activities**

Complete all nine activities and the Talking It Over questions. The checklists are provided to get you started on your observations when exploring the outdoors. Take your project book with you whenever you go outside to learn about plants and animals in nature. The More Challenges activities are optional. Jot down the date when you complete an activity and review your work with your project helper. Then, ask your project helper to initial and date your accomplishment.

Field guides make identification of plants and animals easy and fun! Ask friends and family if you can borrow theirs, look for apps for the mobile device you may have, or check out some from the library. Here is a list to get you started.

- **Peterson Field Guide to Birds of Eastern and Central North America** by Roger Tory Peterson
- **The Field Guide to Wildlife Habitats** by Janine M. Benyus
- A variety of guides are available at the Ohio Department of Natural Resources’ website at [wildlife.ohiodnr.gov/education-and-outdoor-discovery/conservation-education-project-wild/education-materials](http://wildlife.ohiodnr.gov/education-and-outdoor-discovery/conservation-education-project-wild/education-materials)
### For Out-of-State Explorers

If you do not live in Ohio you may need field guides that are different from the ones listed on page 4. Adjust any activities that do not fit with your surroundings. For instance, if you live in the desert, activities 2 and 3 about the woodland may not be helpful for you. Selecting field guides for your area is the best place to start before you explore the outdoors. **Be sure to know how to identify harmful plants and animals in your part of the country.**

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<table>
<thead>
<tr>
<th>Activity</th>
<th>Date Completed</th>
<th>Project Helper Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Area: Outdoor Adventure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Trip Prep</td>
<td></td>
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<tr>
<td>Talking It Over</td>
<td></td>
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<tr>
<td><strong>Project Area: Wild, Wild Woods</strong></td>
<td></td>
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</tr>
<tr>
<td>2. Woodland Wildlife</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Woodland Trees and Plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodland Organisms Checklist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talking It Over</td>
<td></td>
<td></td>
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<tr>
<td><strong>Project Area: Visit a Field</strong></td>
<td></td>
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</tr>
<tr>
<td>4. Wildflowers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Field Animals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Organisms Checklist</td>
<td></td>
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<tr>
<td>Talking It Over</td>
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<tr>
<td><strong>Project Area: Visit the Water</strong></td>
<td></td>
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<tr>
<td>6. Fins, Skin and Scales</td>
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<tr>
<td>7. Feathers and Fur</td>
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<td>8. Wetlands</td>
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<tr>
<td>Water Organisms Checklist</td>
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<tr>
<td>Talking It Over</td>
<td></td>
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<tr>
<td><strong>Project Area: Glaciers and Ohio</strong></td>
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<tr>
<td>9. Land Shaped Long Ago</td>
<td></td>
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<tr>
<td>Talking It Over</td>
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</tr>
</tbody>
</table>
Step 2: Learning Experiences

Learning experiences are meant to complement project activities, providing the opportunity for you to do more in subject areas that interest you. What are some learning experiences you could do to show the interesting things you are learning about? Here are some ideas:

- Attend a clinic, workshop, demonstration or speech related to natural resources.
- Help organize a club meeting based on this project.
- Go on a related field trip or tour.
- Host a workshop to share tips about protecting Ohio plants and wildlife.
- Host a workshop to share facts about regional Ohio wildlife.
- Prepare your own demonstration, illustrated talk, or project exhibit.
- Participate in county judging.

Once you have a few ideas, record them here. Complete at least two learning experiences. Then, describe what you did in more detail. Ask your project helper to date and initial in the appropriate spaces below.

<table>
<thead>
<tr>
<th>Plan to Do</th>
<th>What I Did</th>
<th>Date Completed</th>
<th>Project Helper Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstration</td>
<td>Demonstrated the function of a wetland.</td>
<td>5/5/YR</td>
<td>M.T.</td>
</tr>
</tbody>
</table>
Step 3: Leadership and Citizenship Activities

Choose at least two leadership/citizenship activities from the list below (or create your own) and write them in the table below. Record your progress by asking your project helper to initial next to the date each one is completed. You may add to or change these activities at any time. Here are some examples of leadership/citizenship activities:

- Teach someone about plants or wildlife in Ohio.
- Help another member prepare for his or her project judging.
- Help organize a club field trip to a field, stream, wetland, or wooded area.
- Organize a conservation event in your area.
- Encourage someone to enroll in Explore the Outdoors.
- Arrange for a club trip to an animal rehabilitation center.
- Plan your own leadership/citizenship activity.

<table>
<thead>
<tr>
<th>Leadership/Citizenship Activity</th>
<th>Date Completed</th>
<th>Project Helper Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organized a club field trip to Dawes Arboretum.</td>
<td>5/12/YR</td>
<td>M.T.</td>
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</tbody>
</table>
**Step 4: Project Review**

Completing a project review helps you assess your personal growth and evaluate what you have learned.

Use this space to write a brief summary of your project experience. Be sure to include a statement about the skills you have learned and how they may be valuable to you in the future.

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Now, set up a project evaluation. You can do this with your project helper, club leader, or another knowledgeable adult. It can be part of a club evaluation or it can be part of your county’s project judging.
The great outdoors has all kinds of surprises and interesting things waiting for you! What makes an outdoor adventure even better is taking some supplies so you are comfortable and protected from pesky bugs and not-so-perfect weather.

What to Do
Here’s a list of basic supplies to get you started. Gather these items, and add others as you see fit. Take a picture or make a drawing of them, and put the image in the space below. Then, pack the items you won’t be wearing in the backpack.

- Backpack
- Binoculars
- Camera
- Compass
- Field guides
- First-aid kit
- Granola bar
- Hat
- Insect repellent
- Long pants
- Long-sleeved shirt
- Notebook and pen
- Socks and sturdy shoes
- Sunglasses
- Sunscreen
- This project book
- Trail guide or map
- Water/bottle

FOR USE IN 2021
Background

Being prepared for a trip outdoors is essential. Even if you are familiar with an area, you still need to make sure you are careful and safe. Protect yourself against poisonous plants, wild animals, and stinging or biting insects by bringing the appropriate equipment for your trek. Bringing water to drink is a must.

In addition to packing your bags, pay attention to your surroundings. Is it early spring? Ponds may be covered in thick and strong ice in the winter, but now cannot support your weight. Late summer? It could be very dry, or very humid, and more than likely very hot.

If it is dry, be careful not to do anything that could start a fire. Bring a map and a compass, and make sure you let someone know about your travel plans and your schedule.

More Challenges

The basic supplies list on page 9 is a general one. Choose a specific location and customize your supply list for it. If you bring something that isn’t on the list, explain why. See if your project helper can add anything to your list.

Glossary

Words in bold throughout this book are defined in the glossary.

Did you know?

In the past, insecticides contained DDT, a chemical harmful to birds of prey because it made their eggshells thinner. In 1972, the Environmental Protection Agency prohibited the use of DDT. Since then, these bird populations have steadily increased. In fact, bald eagles were removed from the endangered species list in 2007.

Learning Outcomes

Project skill: Gathering necessary items for a trip into nature
Life skill: Planning and organization
Educational standard: NGSS Cross Cutting Concepts: People depend on various technologies in their lives; human life would be very different without technology
Success indicator: Assembles and documents appropriate travel materials
Project Area: **Outdoor Adventure**

**Talking It Over**

**SHARE** Which supply do you think is the most important? Why?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**REFLECT** What would happen if you didn’t have all the supplies you need?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**GENERALIZE** How did you decide which supplies to take and which to leave at home?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**APPLY** In what other areas of your life can you use this type of preparation and packing?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
Sometimes the male and female animal of a species look the same. For example, it’s difficult to see the difference between a male turtle and a female turtle. But, often size and color differences help us figure out the animal’s gender. Many species have major appearance differences between the sexes. Birds are a good example—let’s start there!

Your first checklist is for Woodland Organisms on page 19. You might want to take a peek at it now and look up some of the organisms listed using your field guides. It helps to have a head start when you make your way outside!

Learning Outcomes

Project skill: Learning about animal markings
Life skill: Processing information
Educational standard: NGSS 3-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction
Success indicator: Identifies and recreates field markings
What to Do

Use your field guide or the Internet to find images of the following birds, and then color in the outlines below with their proper colors. Pay attention to the field markings and place them correctly. If the male and female of a species are different, label your drawing to indicate which one it is.

- American Robin
- Black-Capped Chickadee
- Blue Jay
- Downy Woodpecker
- Mourning Dove
- Northern Cardinal
- Red-Tailed Hawk
- White-Breasted Nuthatch
- Wild Turkey
Background

More than 100 species of birds use Ohio's woodlands for shelter, food, and breeding grounds. Owls, hawks, woodpeckers, wild turkey and songbirds all live in Ohio's woods. While some of these species are easy to identify such as owls and turkey, songbirds can be more of a challenge. Songbirds are smaller and some species have big differences in coloring between the males and the females. The scarlet tanager male is a beautiful scarlet with black wings, but the female is yellow with black wings. In some species the differences aren’t as obvious, like the downy woodpecker. Male downy woodpeckers have a spot of red feathers on the back of the head, and females do not.

In addition to birds, a great variety of wild animals live in Ohio’s woodlands. Lizards live in cavities in trees and lay eggs under rotting logs. Cottontail rabbits live on the edges of the woods and in shrubby fields. White-tailed deer use the woods to find food and shelter, as well as woodland edges and fields.

The coloring of animals is often critical to their survival. Bright, flashy feathers of many male birds help attract females during the mating season. However, the duller grays and browns of the female birds are just as important. These more neutral colors help the females blend in with their surroundings while sitting on the nest. Other species, such as the snowshoe hare, shed their brown summer coats for white fur during the winter. This helps them blend into a snow-covered landscape and avoid predators.
Explorer Alert!

Know how to identify Ohio’s three venomous snakes before you head out on your first hike. Using a field guide or the Internet, look up the timber rattlesnake, the northern copperhead, and the massasauga rattlesnake. Research each species to see if it lives in your part of the state.

All of these snakes have a deep pit between their eyes, their pupils are vertical slits, and their heads are triangular. These identifying features can be subtle, so make sure to learn their markings to be aware of what’s around you before you get too close! As a general rule, you should never handle a snake unless you are 100 percent sure of the species and that it is not venomous.

Did you know?

When a predator catches a five-lined skink, the skink’s tail breaks off and continues to wriggle. While the moving tail distracts the predator, the skink makes a (nearly) clean getaway.

Resource

Visit the birds category of the Ohio Department of Natural Resources (ODNR) Species Guide Index at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index.

Source

wildlife.ohiodnr.gov/species-and-habitats/species-guide-index
Each ecosystem you visit is home to a unique variety of organisms. The plants you find in the woods are well adapted to where they live. The woods are home to trees, moss, ferns and fungi.

**What to Do**

Research the tree leaves shown below and find more photos of them from the Internet or from another resource. Once you have a good idea of how to spot these leaves, go over the list and mark which leaves are deciduous, by placing a “D” next to the leaf, or put a “C” by it, noting it is coniferous.

- **Black Walnut**
- **Cherry**
- **Eastern Hemlock**
- **Mulberry**
- **Red Oak**
- **Sugar Maple**
- **Sycamore**
- **Weeping Willow**
- **White Pine**

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**Learning Outcomes**

**Project skill:** Researching two categories of trees  
**Life skill:** Processing information  
**Educational standard:** NGSS 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death  
**Success indicator:** Categorizes trees as coniferous or deciduous

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*FOR USE IN 2021*
Background

The trees of the world can be divided into two categories: coniferous trees and deciduous trees. Coniferous trees such as pines and hemlocks have seeds that develop inside cones. Coniferous trees have needle-shaped leaves and are evergreens, which means they do not lose their leaves in the fall and stay green all year (or evergreen). Deciduous trees or broad-leaf trees such as oaks, hickories and maples, lose their leaves every year. The leaves of deciduous trees come in many shapes, sizes and textures, all of which help to identify each species. However, there are exceptions to the rule. Some trees are neither coniferous nor deciduous. For example, larches have cones and needles but shed their needles at the same time every year. Also, holly trees have simple leaves, not needles, but don’t shed their leaves.

Most of the counties in southeastern Ohio’s Hill Country are 50 percent forested. Before Ohio was settled, the state was 96 percent forested. After settlement, Ohio was reduced to 13 percent forested. Fortunately, the state’s forest cover has increased to 33 percent.

More Challenges

Do a soil sample. Using a can, collect soil from the woods and from a field. What is each type of soil made of? Is one type of soil more absorbent than the other? Share your findings with your project helper.

Did you know?

Vinton and Lawrence counties are the only two Ohio counties that are more than 75 percent forested.

Resource

Visit msue.anr.msu.edu/news/identifying_poison_ivy_isnt_always_easy_to_do for a detailed description of poison ivy.

Sources

ohiodnr.com/DivisionofForestryHomepage/tabid/4803/Default.aspx
ohioline.osu.edu/forests/forst_6.html
Explorer Alert!

Knowing how to identify poisonous plants can save you lots of trouble! The most common one you’re likely to encounter is poison ivy. Memorize the characteristics below, and avoid the plant if you see it!

**Poison Ivy**

Be sure you can identify poison ivy in all four seasons.

- Groupings of three leaflets (three leaves on one stem). Keep this old saying in mind, “Leaves of three—let it be.”
- Bright red leaves and white berries in autumn

**Poison Sumac**

- Woody shrub or small tree
- Grows in marshy or swampy areas
- Groups of 7 to 13 leaflets
- Glossy, dark green leaves in summer

**Native vs. Invasive Species**

Not all species of plants and animals in Ohio are native to the state. **Native species** are ones that live in an area naturally, and arrived there without any human involvement. Species that have arrived in an area because of humans, such as zebra mussels that attach themselves to boats, are called **non-native species**. When these non-native species cause damage to their new habitats and threaten the health of organisms native to the area, they are called **invasive species**.

*Source: theoec.org*
Woodland Organisms Checklist

Keep your eyes open for plants and animals as you explore your neighborhood or a park. If you see species on the lists below, place a check next to it. Blanks are provided for additional organisms that you see.

### Trees

- Black Walnut
- Cherry
- Eastern Hemlock
- Mulberry
- Red Maple
- Red Oak
- Shaubark Hickory
- Sugar Maple
- Sycamore
- White Oak
- Weeping Willow
- White Pine

Visit [forestry.ohiodnr.gov/trees](http://forestry.ohiodnr.gov/trees) for more information.

### Birds

- American Robin
- Black-Capped Chickadee
- Blue Jay
- Downy Woodpecker
- Mourning Dove
- Northern Cardinal
- Red-Tailed Hawk
- White-Breasted Nuthatch
- Wild Turkey


### Mammals

- Cottontail Rabbit
- Coyote
- Eastern Chipmunk
- Gray Squirrel
- Groundhog
- Raccoon
- Striped Skunk
- Virginia Opossum
- White-Tailed Deer


### Reptiles

- Black Rat Snake
- Common Five-Lined Skink
- Snapping Turtle
- Box Turtle
- Copperhead
- Water Snake
- Broad Headed Skink
- Garter Snake


### Amphibians

- American Toad
- Bull Frog
- Gray Tree Frog
- Marbled Salamander
- Red-Backed Salamander
- Red-Spotted Newt

Project Area: Wild, Wild Woods

Talking It Over

SHARE What is the main difference you saw between coniferous and deciduous leaves?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

REFLECT What time of the year did you complete this activity? How does the time of year affect what is happening in the woods?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

GENERALIZE How many of the birds on page 13 have you seen in the wild?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

APPLY What types of household items can you find around your house that were made from trees?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Fields in Ohio are home to a large variety of plants. Some fields are natural and some have been cleared for farming or recreation—either way, you’re bound to find some plants you recognize. Now is your chance to learn their names, if you don’t know them already. Let’s find a field and see what’s out there!

Explorer Alert!
Do not touch or eat any plant you are not familiar with. Wash your hands after walking in the woods.

Your next checklist is for Field Organisms and it’s on page 26. Have it ready when you start exploring the outdoors!

Learning Outcomes
Project skill: Categorizing information
Life skill: Being a responsible citizen
Educational standard: NGSS 3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change
Success indicator: Collects, identifies and analyzes wildflower characteristics
What to Do

Find four different flowers in a field or neighborhood park, but don't pick them. If you visit private property, ask for permission before you start exploring.

In the space below, attach a drawing or photograph of the wildflowers you found. Include where and when you found the plant, and any features that stand out. Using the following characteristics, study your flowers.

Field guides and websites are sometimes arranged by the following categories.

**Color:** Pink, Red, Blue, Purple, Yellow, Orange, White

**Flower Cluster:** Spike, Single on Stem, Multiple on Stem, Ball

**Flower Petal Number:** 1–6, more than 6

**Bloom Month:** March, April, May, June, July, August, September, October

Visit [www.discoverlife.org/mp/20q?guide=Wildflowers](http://www.discoverlife.org/mp/20q?guide=Wildflowers) or a similar site for examples of these characteristics.

My Flower Findings

**Example:** A yellow flower with radial symmetry, more than six petals, with a single flower on a stem describes a daffodil.

Did you know?

In 1784, Common Foxglove was used to create a medicine for heart conditions. Extracts from these plants are still used today to treat a variety of heart problems. Be careful! According to the National Institutes of Health, foxglove can be poisonous and should not be eaten directly from the plant.
Background

Flowering plants help make the air easier to breathe. They remove harmful carbon dioxide and produce life-giving oxygen for humans and animals to use. Sometimes, plants and trees are called “the lungs of the earth.”

Wildflowers can help us breathe easier in other ways by playing a role in the production of foods and medicine. For example, honey made by bees using pollen from local wildflowers can help reduce allergies in those who suffer from them. Purple coneflower, also known as Echinacea, was used as medicine by the Native Americans. Its use continues today as a way to fight infections, headaches and colds.

Humans aren’t the only creatures to enjoy specific benefits from wildflowers. Monarch butterflies, which prefer to feed on milkweed, benefit from the poisonous qualities of milkweed sap. The sap is safe for the butterflies to eat, but is toxic to animals that eat either the plant or the butterfly. As a result, monarch predators have learned to leave both the plant and the butterflies alone.

Resources

For more information on wildflowers in Ohio, visit osumarion.osu.edu/prairie_wildflowers.

The U.S. Environmental Protection Agency offers helpful information about native plants at epa.gov/greenacres/nativeplants/factsht.html.

Need help identifying a wildflower? Check out discoverlife.org/mp/20q?guide=Wildflowers.

More Challenges

Visit a different type of field. For example, if you visited a park, ask a farmer if you can visit a cornfield. Share with your project helper any similarities and differences between the places you visited.

Sources

nlm.gov/medlineplus/ency/article/002878.htm
Field animals come in many shapes and sizes. From small insects to large birds of prey—all organisms play an important role in their ecosystem. We’ll look at small but mighty insects first, then mammals and birds.

What to Do

Step outside and look for insects. Finding insects in the warm months will be easier than at other times of the year. When it’s warm, they may be flying near you, pollinating a flower, or resting in the shade. When you find one, use your field guide to look it up. Observe it for a few minutes, then document what you found in the table below.

Insects

<table>
<thead>
<tr>
<th>Name of insect</th>
<th>Location and time</th>
<th>Where did you find insect?</th>
<th>Notes</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Bumble bee</td>
<td>Backyard at 8 a.m.</td>
<td>On a lilac bush</td>
<td>Bee’s legs had lots of pollen on them</td>
<td>5/25/YR</td>
</tr>
</tbody>
</table>

More Challenges

Make a kill jar to kill insects so you can create an insect collection. All you need is a wide-mouthed jar, some cut-up rubber bands (if you don’t have plaster of Paris), nail polish remover with acetone, and cotton balls or a thick piece of cardboard as absorbing material. Visit this site for details: entomology.osu.edu/kids/4kids/Makingakilljar.html.

Learning Outcomes

- **Project skill**: Looking for insects to observe
- **Life skill**: Completing a project
- **Educational standard**: NGSS 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction
- **Success indicator**: Creates a survey of insects in the neighborhood
Now turn your attention to any mammals and birds you see around you. Checking where there is a water source will give you an advantage!

### Mammals/Birds

<table>
<thead>
<tr>
<th>Name of animal</th>
<th>Location and time</th>
<th>Where did you find animal?</th>
<th>Notes</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Mockingbird</td>
<td>At the library at 3 p.m.</td>
<td>At the top of a tree</td>
<td>It was singing almost nonstop</td>
<td>6/12/YR</td>
</tr>
</tbody>
</table>

### Background

Fields are a great place to see the food chain in action! At the start of every food chain is some sort of plant. You’ve already learned about some of plants’ important roles, but one of their biggest contributions to the ecosystem is their ability to provide food. Prey animals, such as insects and some mammals, eat plants. Larger mammal predators eat insects and small mammals, and the largest of all survive on the other animals around them. Each member of their food chain survives because of the organism beneath them, and plants provide the foundation of this chain.

Insects also play a special role in this process. They are responsible for pollinating plants, which allows the plants to reproduce. Plants rely on insects to help them reproduce. For example, honeybees use flowers for food. As they travel from plant to plant, they carry pollen with them. Pollen contains the reproductive cells of a plant. When the male pollen cells from one plant’s stamen come into contact with the female pistils of the same species of plant, a seed is formed. A plant forms from the seed, allowing the food chain to function.

### Did you know?

Of the more than one million insects and spiders in the world (and maybe more that haven’t been discovered yet)—Ohio is home to 222 species.

### Sources

- wildlife.ohiodnr.gov/species-and-habitats/species-guide-index
- insectidentification.org
Field Organisms Checklist

Some nature enthusiasts keep a life list of birds, plants, bugs—whatever interests them. A life list is a list of plant or animal species made by one person. Each time some new species is viewed, it goes on the life list. See how many field organisms you can find. Whether they are on the list below or not, your life list grows with each sighting! Blanks are provided for additional organisms that you see.

Native Plants

___ Big Bluestem
___ Black-Eyed Susan
___ Common Milkweed

___ Dutchman’s Breeches
___ Early Goldenrod
___ New England Aster

___ Ox-eye Daisy
___ Trillium
___ Virginia Bluebells

Visit plantnative.org and select Regional Plant Lists, then choose Ohio for a list of Flowering Perennials.

Birds

___ American Crow
___ Eastern Bluebird
___ Eastern Meadowlark

___ Field Sparrow
___ Indigo Bunting
___ Red-Tailed Hawk

___ Red-Winged Blackbird
___ Ring-Necked Pheasant

Select Birds at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index.

Mammals

___ Big Brown Bat
___ Eastern Chipmunk
___ Eastern Cottontail Rabbit
___ Eastern Gray Squirrel

___ Eastern Mole
___ House Mouse
___ Striped Skunk

___ Virginia Opossum
___ White-Tailed Deer
___ Woodchuck

Select Mammals at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index.

Resource

Project Area: Visit a Field

Talking It Over

SHARE How many insects did you find on or around plants? Were you more likely to see them in the sun or shade?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

REFLECT What traits did the animals living in the field share?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

GENERALIZE What did you do when you didn’t recognize a plant or insect right away?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

APPLY Do you think the animals’ traits make it easier or harder for them to live in the field? Explain your answer.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Now let’s focus on animals that spend most or all of their time in the water. Some live on the surface of the water, some swim in the stream, and some dwell on the bottom. Once you pick out a stream, look under lots of rocks and crevices above ground and underwater. The more you find, the more you’ll learn!

What to Do

Three pieces of equipment will make your outing a success: a **seine**, a plankton net, and a bottom rake. You can buy these tools at local sporting goods or outdoors stores, or you can make them. Instructions for making all three are in the Bonus Feature on page 44.

List what you find on each pass through the stream. Then, check off what you spotted on the Water Organisms Checklist at the end of this section.

Use the plankton net to capture small organisms such as plankton or algae. Go to a clear part of the stream and throw the plankton net in the water. You can let the water flow through on its own, or you can pull the net upstream from the bank. After several minutes, haul the net in and rinse it by pouring water in the opposite direction that the stream flowed through the stocking and into the pan. What do you see?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

**ACTIVITY 6**

**Fins, Skin and Scales**
Use the seine to capture animals living in the stream water. With a partner holding one of the seine’s poles (also called brails) spread the seine out, put it in the water, and walk upstream to capture animals. What did you catch?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Use the bottom rake to capture animals living in the streambed. Scrape the rake against the current on the bottom of the stream. What did you find?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Be sure to release everything you capture back where it came from. Clams, mussels or sport fish (crappies, bass or blue gills, for example) may not be taken or collected for any purpose.

Explorer Alert!
Take care when you explore near bodies of water. Do not wade in fast-moving streams with water above the knees. Stay away from water during thunderstorms and avoid rising rivers after a rainfall.
Background

Different species of animals live at different depths of a stream. Dragonflies and water striders land and move about on the surface. Waterfowl such as ducks or geese visit here too. Many kinds of fish prefer the middle depth of the stream, and creek beds are home to snails and crayfish.

Different types of streams appeal to various types of animals. Slow-moving streams and ponds are likely to have turtles sunning themselves on rocks just above the water’s surface. To find frogs, check along shallow streams and still waters. Salamanders are often under large, flat rocks along the banks of streams, creeks and seeps.

Some streams flow year round, and some develop in late spring as snow melts, or only after periods of heavy rain. Keep this in mind as you go exploring. The stream you saw in April may not be there in July.

Did you know?
A turtle’s sex is determined by the temperature of the soil in which the eggs were laid.

More Challenges

Using the Ohio Department of Natural Resources (ODNR) Species Guide Index at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index, research the animals you found. Are any native to Ohio or are any endangered? Discuss your findings with your project helper.

Resources

Visit wildlife.ohiodnr.gov/species-and-habitats/species-guide-index and explore the fish, reptiles and amphibians categories.

senr.osu.edu/research/schiermeier-olentangy-river-wetland-research-park

wildlife.ohiodnr.gov/species-and-habitats/species-guide-index
Water is a necessity of life for the fish living in it and the animals drinking from it. For this reason, many warm-blooded creatures, such as birds and mammals, make a life near bodies of water. Take some time to observe the drier side of stream life.

What to Do
Visit a stream and focus on the animals that come to its banks. Keep a list and take pictures of what you find. Identify the creatures you observed. Research any animals that are not familiar to you. Take a look at each of the animals listed below and match them with the adaptations that help them survive in or near the water.

Animal Clues
A. Long legs make it easy for this graceful wader to move through the still waters where its prey lives.
B. This hard worker has webbed feet, a waterproof fur, and a clear “third eyelid” allowing it to see underwater.
C. Many sharp teeth help this strong swimmer catch its prey.
D. Speed provides protection for this swimmer and sunbather that its soft shell cannot offer.
E. These cold, clear water dwellers have short gills. The warm, muddy water dwellers have long bushy gills.
F. Having one claw larger than the other makes this creature stand out. The bigger claw is used for capturing food, attacking, and defending.
G. Here is a water dweller with two types of fur in its coat: one is short and warm, and the other is long and waterproof.

Write the letter of the animal’s clue next to each animal’s name.

___ Crayfish
___ Beaver
___ Heron
___ Eastern Spiny Softshell Turtle
___ Mudpuppy
___ Walleye
___ Muskrat

Did you know?
The ruby-throated hummingbird migrates close to 3,000 miles to its wintering grounds in Central America—every year!

Learning Outcomes
Project skill: Classifying animals
Life skill: Critical thinking
Educational standard: NGSS 4-LS1-2: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction
Success indicator: Matches each trait to the animal that displays that adaptation
Background

Birds and mammals both display adaptations specific to where they live. Aquatic birds, such as great blue herons, have long legs for wading through shallow water, and long beaks for catching fish. Other aquatic birds, such as ducks, have webbed feet to help them move quickly and easily through the water. They also waterproof their feathers with their oil-producing glands.

Aquatic mammals often have thick fur to help them stay warm in cool water. Mammals also have oil glands to waterproof their coats. Badgers have short, stout bodies perfect for digging and creating tunnels. Eastern chipmunks have cheek pouches that expand to carry dirt away when they dig their tunnels, and to bring nuts and food back to their burrows. Virginia opossums play dead when a predator threatens them, and this convinces the predator to leave them alone. Each of these animals uses its specific traits to help it survive in the habitat it calls home.

More Challenges

Research which birds and mammals live in a different part of Ohio from where you live. What are some differences? What are some similarities? Let club members know what you discovered at your next meeting.

Source
wildlife.ohiodnr.gov/species-and-habitats/species-guide-index
Explorer Alert!

If you like dragonflies, visit a wetland on a warm, sunny day in summer. They like to bask in the sun near standing water. Have your field guide and your camera ready!

Resource

Visit wildlife.ohiodnr.gov/species-and-habitats/species-guide-index and look for the mammals, insects, fish, reptiles and amphibians sections.
Wetlands are the utility players in Ohio habitats. They filter water, provide homes for animals, and prevent flooding. Let’s find out how they function in their surroundings.

**What to Do**

Building your own wetland may help you understand their value, how they work, and why efforts are being made to preserve them.

Let’s start with gathering the following supplies:

- **13” x 9” metal pan**
- **Pitcher**
- **Cup or jar**
- **Clay**
- **Dirt**
- **Water**
- **Turkey baster**

![Diagram of a wetland with water flowing through a 13” x 9” metal pan, clay, dirt, and carpet strip.](image)
Instructions

1. Spread a layer of clay across half of the metal pan. Make it slope toward the center of the pan, smoothing it along the sides of the pan to seal the edges. The clay represents land.

2. Cut a strip of carpet the same width of the pan, but only one fourth of the length of the pan, so it covers half of the area without clay. This represents the wetland. Do not put the carpet in the pan yet.

3. Pour water into a cup and mark how much is in it. Using a turkey baster, pour the water slowly over the clay. This represents rainfall. Where does the water go?

4. Use the turkey baster to return the water from the model into the cup. Is the water at or close to the same level as before?

5. Now put the strip of carpet in the pan, right at the edge of the clay. This represents the wetland. What do you think will happen to the water when it runs through this time?

Use the baster to pour more water onto the clay. Describe what happens.

6. Return the water to the cup. Were you able to collect it all, or did the wetland absorb some?

7. Now add dirt to the cup to make the water muddy. Use the baster to pour water over the clay. How does the water that made it through the wetland compare to the muddy water in the jar?
Background
Streams and rivers are not the only types of aquatic habitats in Ohio. Many small wetlands are located throughout the state—each one home to a large variety of plants and animals. Sedges and reeds are some of the most common wetland plants. Sedges are grass-like plants with triangular stems and leaves that grow in threes. Reeds are similar to sedges, but have round stems. Other wetland plant life includes marsh marigolds and skunk cabbage.

Wetlands are located in watersheds, which are areas of land that drain into a specific body of water, such as a river or lake. For example, Burton Wetlands in Geauga County is part of the Cuyahoga River Watershed. The Olentangy Wetlands in Columbus are part of the Olentangy River Watershed. Wetland plants act as filters keeping harmful substances from entering water sources. These wetlands are vital to Ohio ecosystems because they help prevent the Great Lakes and Ohio River from becoming contaminated with chemicals.

Ohio used to be covered in wetlands. Unfortunately, nearly 90 percent of Ohio’s original wetlands are gone, according to the Ohio Department of Natural Resources. However, the Ohio Wetland Foundation’s website states it has restored more than 2,400 acres of wetlands since 1992.

More Challenges
Go online and find a wetland near you. Coordinate a club visit to the wetland, or go on your own. Keep a log of what you observe. Tell your project helper about any new discoveries.

Did you know?
The four different types of Ohio wetlands are swamps, bogs, marshes and fens.

Resource
Visit nhptv.org/natureworks/nwep7f.htm for more information.

Sources
epa.gov/gmpo/education/pdfs/Activity-WetlandPan.pdf
epa.ohio.gov/Portals/42/documents/AA%20wetlands%201%20fixed.pdf

Learning Outcomes
Project skill: Building a mini wetland
Life skill: Completing a project
Educational standard: NGSS 5-ESS2-1: Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere and/or atmosphere interact
Success indicator: Builds a wetland and describes its function
Water Organisms Checklist

This list is longer because water is a necessity for all plants and animals! If you explore in the warmer months, you are likely to see more organisms than during the colder months. Check off the species you see on the lists below, otherwise use the blank lines for any additional organisms you find.

### Dragonflies and Damselflies

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>American Rubyspot</td>
<td>Double-Striped Bluet</td>
<td>Familiar Bluet</td>
</tr>
<tr>
<td>Blue Dasher</td>
<td>Eastern Amberwing</td>
<td>Twelve-Spotted Skimmer</td>
</tr>
<tr>
<td>Blue-Fronted Dancer</td>
<td>Eastern Pondhawk</td>
<td>Violet Dancer</td>
</tr>
<tr>
<td>Common Whitetail</td>
<td>Ebony Jewelwing</td>
<td>Widow Skimmer</td>
</tr>
</tbody>
</table>

### Insects and Larvae

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Dragonfly Nymph</td>
<td>Mayfly Nymph</td>
<td>Water Strider</td>
</tr>
<tr>
<td>Giant Water Bug</td>
<td>Water Boatman</td>
<td>Whirligig Beetle</td>
</tr>
</tbody>
</table>


### Fish

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Bluegill Sunfish</td>
<td>Green Sunfish</td>
<td>Smallmouth Bass</td>
</tr>
<tr>
<td>Bluntnose Minnow</td>
<td>Johnny Darter</td>
<td>Spotfin Shiner</td>
</tr>
<tr>
<td>Channel Catfish</td>
<td>Largemouth Bass</td>
<td>White Crappie</td>
</tr>
<tr>
<td>Common Carp</td>
<td>Pumpkinseed Sunfish</td>
<td>White Sucker</td>
</tr>
<tr>
<td>Creek Chub</td>
<td>Silverjaw Minnow</td>
<td></td>
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</tbody>
</table>


### Reptiles

#### Snakes

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Common Watersnake</td>
<td>Queensnake</td>
<td>Red Slider</td>
</tr>
<tr>
<td>Common Ribbonsnake</td>
<td>Racer (group)</td>
<td></td>
</tr>
</tbody>
</table>

#### Turtles

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Eastern Musk Turtle</td>
<td>Midland Painted Turtle</td>
<td></td>
</tr>
<tr>
<td>Eastern Spiny Softshell</td>
<td>Northern Map Turtle</td>
<td>Snapping Turtle</td>
</tr>
</tbody>
</table>

Amphibians

Salamanders

___ Common Mudpuppy
___ Longtail Salamander
___ Northern Dusky Salamander
___ Redback Salamander
___ Red-Spotted Newt
___ Two-Lined Salamander

Frogs and Toads

___ American Bullfrog
___ American Toad
___ Cope's Gray Treefrog
___ Fowler's Toad
___ Eastern Gray Treefrog
___ Northern Green Frog
___ Northern Leopard Frog
___ Smallmouth Salamander
___ Spotted Salamander
___ Spring Peeper
___ Western Chorus Frog

Select Amphibians at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index.

Birds

___ Bank Swallow
___ Belted Kingfisher
___ Common Yellowthroat
___ Great Blue Heron
___ Killdeer
___ Marsh Wren
___ Northern Waterthrush
___ Prothonotary Warbler
___ Red-winged Blackbird
___ Spotted Sandpiper
___ Swamp Sparrow
___ Wood Duck
___ Yellow-throated Warbler

Select Birds at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index.

Mammals

___ American Mink
___ Beaver
___ Little Brown Bat
___ Meadow Vole
___ Muskrat
___ Northern Long-Eared Bat
___ Raccoon
___ River Otter
___ Silver-Haired Bat
___ Star-Nosed Mole

Select Mammals at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index.

Other Invertebrates

___ Crayfish
___ Freshwater Mussel*
___ Isopod (sowbug)
___ Snail
___ Worm

*If you find any freshwater mussels—look, don’t touch!

Select Insects, Spiders and other Invertebrates at wildlife.ohiodnr.gov/species-and-habitats/species-guide-index.
Talking It Over

**SHARE** How did the carpet function like a wetland? What did it do?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**REFLECT** How have the last three activities helped you to think differently about streams, ponds, lakes, or all three?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**GENERALIZE** What are some differences between stream-dwelling birds and birds from the other habitats you visited?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**APPLY** Some animals prefer to live near wetlands instead of rivers. Think of a couple of reasons for this.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

Project Area: **Visit the Water**
Land and keeps a diary of geological events. Clues of each geological period are all around us. If you know how to look, you can learn the history of a place without even opening a textbook.

What to Do

Label each region on the map (see page 41 for descriptions). When you learn which region you live in, find an example of your region’s land characteristics near where you live. Take a picture and attach it in the space provided on this page.

Learning Outcomes

Project skill: Learning about the physiographic regions of Ohio
Life skill: Critical thinking
Educational standard: NGSS 5-ESS2-1: Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere and/or atmosphere interact
Success indicator: Identifies and photographs the type of land surface near home
ACTIVITY 9  Land Shaped Long Ago

Lake Plains
- The Lake Plains occupy a narrow strip of land along the Lake Erie coast in northeastern Ohio, and widen west of Cleveland.
- This region is flat with no hills. It was once the bottom of an ancient lake known as Lake Maumee.
- Sandy beach ridges and dunes formed along the shore as the waters of Lake Maumee rose and fell.
- Glaciers moved through this area.

Till Plains
- The Till Plains region is a fertile area in western Ohio, south of the Lake Plains, and features gently rolling hills.
- Most hills are a series of moraines (or mounds of rock and soil created by glaciers) and can be up to 100 feet high and six miles wide.
- The glaciers created terraces along the valley's sides as well as new drainage patterns, including today's Ohio River.

Glaciated Appalachian Plateau
- East of Cleveland, the Portage Escarpment's steep rise separates the Appalachian Plateau and the Lake Plains. Examples of this rise include the Cedar and Mayfield Hills in the Cleveland suburbs.
- This region has more hills than the Till Plains but less than the Appalachian Plateau.
- Glaciers that moved through the region created bogs, kettle lakes, and small sand and gravel hills called kames.

Unglaciated Appalachian Plateau
- Untouched by glaciers, this southeastern Ohio region features deep valleys, high hills, and winding streams.
- Sandstone, which doesn't erode easily, is found in cliffs, gorges, natural bridges, and waterfalls throughout the region, such as at Hocking Hills State Park.
- Although the region has thousands of forested acres, the land is rough and much of the soil is infertile.

Bluegrass
- The Bluegrass Region is a small region extending from Kentucky into southern Ohio's Adams County.
- Flat-topped hills and uplands rimmed by cliffs define the area. Limestone, dolomite, and shale bedrock are common in the region.
- The landscape moves from gentle slopes to steep slopes, depending on erosion.
- Some uplands are marked by sinkholes, formed in rocks made of chalk.

More Challenges
Plan a trip to see evidence of how Ohio was shaped geologically. For example, you can see glacial grooves on Kelley’s Island, or visit Rock Bridge State Nature Preserve in Rockbridge, Ohio, near Hocking Hills to see an example of unglaciated land.

Sources
neogeo.kent.edu/munro/glacial/notes09/Ohio.pdf
nsidc.org/cryosphere/glaciers/information.html

FOR USE IN 2021
Background
Ohio is split between the Glaciated Region and the Hill Country. The Glaciated Region, once covered by glaciers, makes up about three-quarters of the state. The Hill Country was untouched by glaciers, and is located in southeastern Ohio. The northern part of Ohio used to be covered by a giant lake extending from Indiana to Pennsylvania. The Great Lakes are filled with water from melting glaciers and are the largest glacial lakes in the world.

Glaciers also affected the soil in certain regions. They picked up sediment from the land they scraped across, and deposited it as the glacier melted. The soil and sediment is called till. This means some soil in Ohio may be more similar to soil much farther away from its current location. For example, glaciers may have brought deposits from Canada to the Till Plains of western Ohio. Native soil can be found in southeastern Ohio where the glaciers didn’t enter, so the soil in western Ohio may be more similar to Canadian soil than to the soil in southeastern Ohio.

Did you know?
According to the National Snow and Ice Data Center, glaciers cover 10 percent of the land in the world.
Project Area: Glaciers and Ohio

Talking It Over

SHARE Which land feature did you photograph? How do they represent your region?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

REFLECT Which features of your region, if any, did you notice before doing this project?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

GENERALIZE Why is it important to learn the history of the land around you?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

APPLY What factors affect the shape of land more quickly than glaciers?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
**Insect Net Instructions**


1. With a handsaw, cut a wooden broom handle just above the brush.

2. Drill two holes into the end of the handle, 1/8 inch in diameter and 2 inches deep. They should be about 1/4 inch apart.

3. Make a loop from a piece of wire and insert each end into one of the holes.

4. Wrap this end of the handle with fine wire.

5. Drive a nail or screw in between the end holes to wedge the wire in tightly.

6. Use a piece of cloth to make a net. Stitch it to the loop with heavy thread. The net should be long enough to fold over the wire and trap the insects inside.

**How to Build a Seine**

1. Open the seams on a burlap sack, or some other sturdy piece of fabric.

2. Position the fabric long ways (so it is wider than it is high) and sew or staple the fabric to poles.

3. Place the seine in the water and move upstream, against the current.

4. Pay close attention to what you catch!

Minnow seines and dip net regulations state the square mesh must not be larger than ½ inch on a side. For information about size limits, please visit [wildlife.ohiodnr.gov/fishingregulations](http://wildlife.ohiodnr.gov/fishingregulations) and review the Minnow Seines and Dip Net Regulations of the Ohio Fishing Regulations.

**How to Build a Plankton Net**

1. Make a hoop from a piece of wire, such as an old clothes hanger.

2. Find an old pair of tights or pantyhose and cut one leg from them.

3. Tie three short strings equally spaced on the hoop.

4. Tie the ends of the strings together, and tie a longer string to the point where the small strings connect.

5. Sew the open end of the pantyhose around the hoop.

6. Run the net through the water and empty what you collect into a shallow, light colored pan.
**How to Build a Bottom Rake**

To build a bottom rake, you need a rake and an old burlap sack.

1. Tie the top of the bag to the rake handle, several inches above the head.

2. Tie the bottom end of the bag to the metal bar of a garden rake, securing it on each side. Make sure the tines of the rake curve away from the bag.

3. Scrape the seine upstream along the bottom of the stream and see what you catch!

Using the bottom rake: Scrape along a stream bed so the current flows into (filling) the bag. Then, observe and record the creatures caught in the bag.
**Glossary**

- **bog.** An area with a wet, spongy, acidic bottom layer made of sphagnum moss and peat.
- **coniferous.** Needle- or scale-leaved evergreens that bear cones. Gymnosperms.
- **deciduous.** Trees with leaves that fall off at a specific stage in growth.
- **erode.** To wear something away gradually.
- **escarpment.** A long steep slope, especially one at the end of a plateau, separating land of different heights.
- **fen.** A wetland similar to a bog, but less acidic, and with more water flow. Soil is more nutrient rich.
- **field markings.** Stripes, patterns, colors, and special features that help identify an animal in the wild.
- **insecticide.** A chemical substance used to kill insects.
- **invasive species.** A non-native organism that causes economic or environmental harm to its new surroundings. Not every non-native organism is harmful to its environment. The emerald ash borer is an example of an invasive species.
- **kame.** A small hill or ridge made of gravel and sand deposited by a melting glacier.
- **marsh.** Soft, wet, low-lying land with grassy vegetation. Often forms a transition zone between water and land.
- **moraine.** Buildup of boulders, stones, or other debris carried and deposited by a glacier.
- **native species.** An organism that lives in an area naturally, without having been introduced by humans. Also referred to as indigenous. Oak and hickory trees are examples of native species.
- **non-native species.** An organism introduced by human involvement outside its natural habitat. The roadside plant Queen Anne’s Lace is an example of a non-native species.
- **nymph.** The larval form of certain insects, usually resembling the adult but lacking fully developed wings.
- **predator.** An organism that lives by preying on other organisms.
- **prey.** An animal hunted or caught for food.
- **radial.** Arranged like rays around a circle. Lines sharing a common center.
- **seine.** A large fishing net made to hang vertically in the water by weights at the lower edge and floats at the top.
- **swamp.** A seasonally flooded bottomland with more woody plants than a marsh and better drainage than a bog.
- **terraces.** A series of flat areas of earth on a slope; often looks like steps. Can be created by a glacier.
- **till.** Sediment left by a glacier that is typically made of clay, sand, pebbles and boulders.
- **watershed.** An area of land where all the water that is underground or that drains off of it flows into the same place, such as into a river, ocean or sea.
Activity 7: **Feathers and Fur**

F. Crayfish  
B. Beaver  
A. Heron  
D. Eastern Spiny Softshell Turtle  
E. Mudpuppy  
C. Walleye  
G. Muskrat

Activity 9: **Shaped Long Ago**

- Lake Plains
- Till Plains
- Bluegrass
- Glaciated Appalachian Plateau
- Unglaciated Appalachian Plateau

**Answer Key**

For USE IN 2021
<table>
<thead>
<tr>
<th>Activity</th>
<th>Project Skill</th>
<th>Life Skill</th>
<th>Educational Standard*</th>
<th>Success Indicator</th>
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<tbody>
<tr>
<td>1: Trip Prep</td>
<td>Gathering necessary items for a trip into nature</td>
<td>Planning and organization</td>
<td>NGSS Cross Cutting Concepts: People depend on various technologies in their lives; human life would be very different without technology</td>
<td>Assembles and documents appropriate travel materials</td>
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<tr>
<td>2: Woodland Wildlife</td>
<td>Learning about animal markings</td>
<td>Processing information</td>
<td>NGSS 3-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction</td>
<td>Identifies and recreates field markings</td>
</tr>
<tr>
<td>3: Woodland Trees and Plants</td>
<td>Researching two categories of trees</td>
<td>Processing information</td>
<td>NGSS 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death</td>
<td>Categorizes trees as coniferous or deciduous</td>
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<tr>
<td>4: Wildflowers</td>
<td>Categorizing information</td>
<td>Being a responsible citizen</td>
<td>NGSS 3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change</td>
<td>Collects, identifies and analyzes wildflower characteristics</td>
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<tr>
<td>5: Field Animals</td>
<td>Looking for insects to observe</td>
<td>Completing a project</td>
<td>NGSS 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction</td>
<td>Creates a survey of insects in the neighborhood</td>
</tr>
<tr>
<td>6: Fins, Skin and Scales</td>
<td>Capturing and observing stream life</td>
<td>Navigating your environment</td>
<td>NGSS 3-LS4-3: Construct an argument with evidence that in a particular habitat, some organisms can survive well, some survive less well, and some cannot survive at all</td>
<td>Provides lists of organisms found using stream-examining equipment</td>
</tr>
<tr>
<td>7: Feathers and Fur</td>
<td>Classifying animals</td>
<td>Critical thinking</td>
<td>NGSS 4-LS1-2: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction</td>
<td>Matches each trait to the animal that displays that adaptation</td>
</tr>
<tr>
<td>8: Wetlands</td>
<td>Building a mini wetland</td>
<td>Completing a project</td>
<td>NGSS 5-ESS2-1: Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere and/or atmosphere interact</td>
<td>Builds a wetland and describes its function</td>
</tr>
<tr>
<td>9: Land Shaped Long Ago</td>
<td>Learning about the physiographic regions of Ohio</td>
<td>Critical thinking</td>
<td>NGSS 5-ESS2-1: Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere and/or atmosphere interact</td>
<td>Identifies and photographs the type of land surface near home</td>
</tr>
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*The educational standards cited here are from the Next Generation Science Standards. These are available in their entirety at nextgenscience.org.
I pledge
My head to clearer thinking,
My heart to greater loyalty,
My hands to larger service, and
   My health to better living,
For my club, my community,
my country, and my world.