

National Whitetail Deer Education Foundation

& Deerassic Park Education Center

2015 School & Group Field Trip Options

For scheduling and availability, please contact:

Brooke Johnson

Education Coordinator

740-435-3335

brooke@deerassic.com



National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

Phone: (740) 435-3335 ~ Fax: (740) 435-3338 ~ 14250 Cadiz Road, Cambridge, Oh 43725

www.deerassic.com

School & Group Field Trips

Deerassic Park Education Center is dedicated to providing high quality outdoor education experiences to youth to encourage them to be active in the outdoors and to nurture an appreciation for all the opportunities nature and the environment have to offer.

Below is a list and description of the outdoor activities and education that school and group field trips can be involved in at Deerassic Park Education Center. Please let us know which programs and activities your group would be interested in pursuing.

|  |  |  |  |
| --- | --- | --- | --- |
| ***Program*** | ***Description*** | ***Max/Min*** | ***Grades*** |
| ***400-Acre Wood***  (50 minutes) | Students will play the role of managers of a 400-acre (162 hectare) piece of public forest. Through this role, students will begin to understand the complex considerations that influence management decisions about forest lands. | 26/4 | 7th-8th |
| ***Are You Me?***  (20-40 min.) | Students will recognize various young stages of aquatic animals and match them with corresponding adult stages. Using picture cards, students match pairs of juvenile and adult aquatic animals. | 26/6 | 3rd+ |
| ***Archery I***  (30-60 min.) | Hay bales and targets/balloons are set so students can use several different styles of compound bows to work on their target shooting skills | 26/4 | 3rd+ |
| ***Archery II:***  ***SAFE Archery***  (30-60 min.) | This inflatable option can be done inside or out depending on the weather. Four “floating” balls become the targets as students shoot modified arrows with recurve bows. Excellent option for “Beginners” with no shooting experience. This can also be turned into a competition for the advanced shooter. | 26/4 | Pre-K+ |
| ***Butterfly Exploration***  (15-30 min.) | Youth are invited to examine examples of the changes that happen throughout the lifecycle of native butterflies. Seasonally available, our live butterfly enclosure allows students to walk through the habitat and see these creatures up close. | 26/4 | Pre-K+ |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Program*** | ***Description*** | ***Max/Min*** | ***Grades*** |
| ***Stream Studies***  ***“Creeking”***  (30-90 min.) | Walk in the bottom ravine of our property where the creek runs. Depending on the season and amount of rainfall, students will be able to catch salamanders and crawdads. Nets, containers, and identification sheets make identifying all the critters easy. This field inquiry lesson will introduce students to many aquatic vertebrates, invertebrates, and to the concept that their presence or absence can help us determine the quality of the water in streams, rivers, lakes, and ponds. This activity will require students to use field equipment, take data, and draw conclusions with a focus on amphibians and macroinvertebrates. | 26/4 | Pre-K+ |
| ***Canoeing***  (30 min. – 8 hrs.) | Available for small groups or as a station, participants have the opportunity to spend some time on the water exploring the sport of canoeing. Classes range from a quick start on the water experience to a full ACA Introduction to canoeing class. | 14/4 | 3rd+ |
| ***First Impressions***  (30-50 minutes) | Students visit our live deer herd and learn fascinating facts about the whitetail deer including its interrelationship with humans through history, life cycle and habits. Can be combined with field game, Oh Deer! This presentation can also include a classroom component if the weather isn’t cooperating. | 25/6 | Pre-K+ |
| ***Fishing***  (30-90 min.) | Utilizing our large floating dock, three acre stocked pond, cane poles and worms; youth will be exposed to the basics of fishing, with an opportunity to catch bluegill and bass. All materials are provided by the park. | 24/4 | Pre-K+ |
| ***Forest Consequences***  (30-45 minutes) | This activity portrays that good habitat is the key to wildlife survival, a population will continue to increase in size until some limiting factors are imposed, limiting factors contribute to fluctuations in wildlife populations, and nature is never in “balance,” but is constantly changing. | 25/10 | 1st+ |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Program*** | ***Description*** | ***Max/Min*** | ***Grades*** |
| ***Get in Touch with Trees***  (30 minutes) | Using a “mystery box,” students will explore their sense of touch and discover different shapes and textures in nature | 26/6 | Pre-K+ |
| ***Got Water?***  (40 min.) | Have you ever considered what an ant has to go through just to get a drink of water? | 25/6 | 3rd-5th |
| ***Hiding in Plain Sight***  (30-40 min.) | Students play a game of hide and seek to learn about important adaptations in many wild animals. | 25/6 | Pre-K+ |
| ***Invasive Species***  (30-50 minutes) | Students will research invasive species to determine how these species got to their new locations and what characteristics make them so challenging. | 26/6 | 5th-8th |
| ***Lunch for a Bear***  (30-50 minutes) | Children identify the kinds of food that black bears eat by creating a plate of “bear food.” Students are introduced to the concept of limited resources. Students are also introduced to the concept of omnivores and how they require a variety in their diet to survive. | 25/4 | Pre-K+ |
| ***Marksmanship &***  ***Firearm Safety***  (30-60 min.) | Working with air rifles, students learn the basics of firearm safety along with basic marksmanship utilizing hay bales and targets/balloons. | 26/4 | 3rd+ |
| ***Migration Headache***  (45 minutes) | If you were a bird, would you survive your winter trek down south? | 26/6 | 6th-8th |
| ***Nothing Succeeds Like Succession***  (30-50 minutes) | Students will read a story about succession and investigate the connection between plants, animals, and successional stages in a local ecosystem | 26/4 | 4th-8th |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Program*** | ***Description*** | ***Max/Min*** | ***Grades*** |
| ***Oh Deer!***  (30-45 minutes) | Students portray deer and habitat components in a physical activity. This activity portrays that good habitat is the key to wildlife survival, a population will continue to increase in size until some limiting factors are imposed, limiting factors contribute to fluctuations in wildlife populations, and nature is never in “balance,” but is constantly changing. Can be a standalone activity or combined with “Wonders of the Whitetail.” | 25/10 | 1st+ |
| ***Owl Pellets***  (30-50 minutes) | Students will dissect an owl pellet and learn about what owls eat. An owl pellet is a dense mass of bones, fur, and feathers an owl coughs up after digesting a meal. It is odor-free and safe for children when properly prepared, offering a real-life look at owls and their diet. An owl pellet also illustrates who eats what in a simple food chain. | 26/6 | Pre-K+ |
| ***Plant Diversity***  (50 minutes) | Students will pretend they are visitors from outer space, viewing life on Earth for the first time. By describing in minute detail all the life they find in a small plot of land, they will become more aware of the diversity and abundance of life on Earth and will better understand its importance. | 26/6 | 4th-6th |
| ***Pollution Search***  (30-50 minutes) | Students take a hike around and through the woods to get a closer look at pollution: what it is, what its sources are, and what people can do to reduce it. | 25/5 | 2nd+ |
| ***Sounds Around***  (15-30 minutes) | This activity helps students “tune in” to the sounds in their environment and helps them identify and lessen local noise problems. They also learn how different sounds in nature have inspired cultural stories. | 26/6 | Pre-K-K |
| ***The Closer You Look***  (50 minutes) | All students, no matter how young, have an idea of what a tree looks like. But, many are unfamiliar with the actual structure of a tree. In this activity, students will go outdoors or view pictures to take a closer look at trees and their parts. | 26/6 | Pre-K-6th |
| ***Program*** | ***Description*** | ***Max/Min*** | ***Grades*** |
| ***Pond Studies***  ***“Tadpoling”***  (30-90 min.) | Utilizing nets, students will be able to catch some of the macroinvertebrates that inhabit our pond. Identification guides are provided to determine if pond life is at a good level or in need of assistance. Amphibians are also on the possible to be caught list, depending on the season. Many tadpoles are caught in various stages of metamorphosis. | 26/4 | Pre-K+ |
| ***Trees as Habitats***  (50 minutes) | Students will inventory the plants and animals that live in, on, and around trees and discover how plants and animals depend on trees in many ways. | 26/4 | 3rd-8th |
| ***Water Canaries***  (45 minutes) | What are the “water canaries” telling you about local water quality? | 26/6 | 6th-12th |
| ***Where Does Water Run?***  (45-60 minutes) | Take a closer look at what happens when it rains. | 26/6 | 6th-12th |
| ***Wonders of the***  ***Whitetail Deer***  (30-60 min.) | Students visit our live deer herd and learn fascinating facts about the whitetail deer including its interrelationship with humans through history, life cycle and habits. Can be combined with field game, Oh Deer! This presentation can also include a classroom component if the weather isn’t cooperating. | 25/6 | Pre-K+ |

***We can also come to you!***

***Classroom and On-Site presentations are also available depending on season***

Traveling to your classroom or site, we can provide our hands on education kit of hides, bones, antlers and artifacts, accompanied with an instructor to present. This presentation examines the important role of Whitetail Deer throughout North American history ranging from pre-historic native cultures through the modern day.

***To schedule your trip to Deerassic Park Education Center or to arrange for us to come to you, please call (740) 435-3335 or email brooke@deerassic.com***

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

|  |  |
| --- | --- |
| ***Ohio Science Standard*** | ***Lesson Plans*** |
| ESS Kindergarten |  |
| PS Kindergarten | Get in Touch with Trees, The Closer You Look |
| LS Kindergarten | Are You Me?, Butterfly Exploration, Stream Studies: Creeking, First Impressions, Hiding in Plain Sight, Lunch for a Bear, Owl Pellets, Sounds Around, Wonders of the Whitetail |
| ESS 1st Grade |  |
| PS 1st Grade | Get in Touch with Trees |
| LS 1st Grade | Are You Me?, Butterfly Exploration, Stream Studies: Creeking, Lunch for a Bear, Oh Deer!, Owl Pellets, The Closer You Look, Wonders of the Whitetail |
| ESS 2nd Grade | Pollution Search |
| PS 2nd Grade |  |
| LS 2nd Grade | Are You Me?, Butterfly Exploration, Stream Studies: Creeking, Get in Touch with Trees, Lunch for a Bear, Owl Pellets, The Closer You Look, Wonders of the Whitetail |
| ESS 3rd Grade | Got Water?, Pollution Search |
| PS 3rd Grade |  |
| LS 3rd Grade | Are You Me?, Butterfly Exploration, Stream Studies: Creeking, Get in Touch with Trees, The Closer You Look, Trees as Habitats, Wonders of the Whitetail |
| ESS 4th Grade | Got Water?, Pollution Search |
| PS 4th Grade |  |
| LS 4th Grade | Butterfly Exploration, Stream Studies: Creeking, Get in Touch with Trees, Nothing Succeeds Like Succession, Planet Diversity, The Closer You Look, Trees as Habitats, Wonders of the Whitetail |
| ESS 5th Grade |  |
| PS 5th Grade |  |
| LS 5th Grade | Butterfly Exploration, Stream Studies: Creeking, Get in Touch with Trees, Got Water?, Oh Deer!, Nothing Succeeds Like Succession, Planet Diversity, Pollution Search, The Closer You Look, Trees as Habitats, Wonders of the Whitetail |
| ESS 6th Grade | Pollution Search |
| PS 6th Grade | Where Does Water Run? |
| LS 6th Grade | Butterfly Exploration, Stream Studies: Creeking, Forest Consequences, Get in Touch with Trees, Migration Headache, Nothing Succeeds Like Succession, Planet Diversity, Pollution Search, The Closer You Look, Trees as Habitats, Water Canaries, Wonders of the Whitetail |
| ESS 7th Grade | Where Does Water Run? |
| PS 7th Grade |  |
| LS 7th Grade | 400 Acre Wood, Butterfly Exploration, Trees as Habitats, Migration Headache, Nothing Succeeds Like Succession, Oh Deer!, Stream Studies: Creeking, Water Canaries, Wonders of the Whitetail |
| ESS 8th Grade |  |
| PS 8th Grade | Where Does Water Run? |
| LS 8th Grade | 400 Acre Wood, Butterfly Exploration, Trees as Habitats, Migration Headache, Nothing Succeeds Like Succession, Oh Deer!, Stream Studies: Creeking, Water Canaries, Wonders of the Whitetail |

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**400-Acre Wood**

*In this activity, students will play the role of managers of a 400-acre (162 hectare) piece of public forest. Through this role, students will begin to understand the complex considerations that influence management decisions about forest lands.*

**Levels Duration**

Grades 7-8 50 minutes

**Background**

Public and private forests cover nearly one-third of our nation’s land. More than just trees, forests are made up of a wide variety of species that interact to create a thriving ecosystem. They provide habitats for many species of plants and animals as well as vital resources for people. People use forests in many ways such as harvesting timber, camping, hiking, hunting, and fishing. Forests also provide clean water by anchoring the soil and preventing soil erosion.

One way to determine the value of wildlife is to measure its contribution to the forest’s economic value. Calculate this value by finding out the species of wildlife that live in the forest and if those animals consist of game (hunted) species like deer, turkey, or quail. Then determine the income generated from hunters through licenses, guns, equipment, lodging, and travel. Wildlife’s economic value might include other uses that generate income such as wildlife photography and bird watching.

**Objectives**

1. Students will experience the analysis and decision making involved in managing forest land.
2. Students will understand that any land-use decision has a number of consequences for people, wildlife, and plants.

**Equipment**

Copies of student pages colored markers calculators (optional)

yellow marker masking tape overhead projector (optional)

chart paper transparencies (optional)

**Directions**

1. Introduce the activity by explaining that students will look at several complex issues that face forest managers. Help students brainstorm a list of activities that take place on forest land. List their ideas on the board. Include uses  like hunting, reading, taking pictures, camping, rocking climbing, skiing, snowmobiling, logging, grazing, or mining. Ask the class to look at the list and decide if any activities would conflict with each other if done on the same piece of land.
2. Discuss these questions:
   1. Which activities would cost the most to provide on forest land?
   2. Which would bring the most visitors?
   3. Which would have the greatest impact on the forest ecosystem? On the wildlife there? Would this effect be permanent or temporary?
   4. Which would cause fragmentation?
   5. Which would provide for society’s most critical needs?
3. Have students read the “If You Were the Boss” student pages. Divide the group into teams of four or five, and explain that each team will decide the best use (or uses) of 400-Acre Wood, which has been donated to the community. Each team will develop a land management plan that will serve the best interests of the entire ecosystem. Make sure students understand that their team can use the entire 400 acres (162 ha) for one use, or can divide it up for multiple uses. For example they may devote 200 acres (81 ha) to wilderness and hiking, 80 acres (49 ha) for harvesting timber or hunting.
4. Before students begin, ask these questions:

* Which forest uses in “If You Were the Boss” are compatible with other uses? (for example, building a campground and hiking trail next to each other)
* Which might be incompatible with each other? (hunting near a campground)
* What could you learn by figuring out the costs, revenues, trees, wildlife populations, and number of visitors for each plan? (how the plan affects different forest values)
* Are owls, wood rats, and salamanders the only wildlife in the forest? (no) What could you learn about the forest ecosystem by analyzing the population of these three species? (By looking at three animals with different habitat requirements, you get an idea of the general health of the forest ecosystem.)

1. Give each team a map (grid) of the 400-acre wood. Also give each team a copy of “What’s the Score?” student pages. Each team should discuss various strategies for managing the forest. When the team arrives at a consensus on how the land should be managed, direct members to use “What’s the Score?” for a cost and benefit analysis of their plan. They should discuss what impact their plan would have in terms of visitors, wildlife, trees, and cost and revenue.
2. When the teams have completed their management plans, they should use crayons or colored markers to illustrate their plans on the grids. Remind them to include a key showing what different colors and symbols mean.
3. Ask teams to present their plans to the entire group, making clear how they decided on their plans. Have them also report the findings of their “What’s the Score?” student pages. Post the maps around the room.
4. Use the large grid map to lead a group discussion of different plans. Ask these questions:

* Which plan enables the most people to enjoy the forest? What is the monetary cost in attracting the most visitors? Are there any other costs besides money?
* Which plan does the most to preserve the forest in its original state?
* What plan has the most impact on the wildlife and fragmentation? Why should we care if one animal species leaves the forest?
* Which plan seems to provide the best balance of money, trees, wildlife, and visitors?
* Which do you think is more important having the most trees, the most wildlife, or the most visitors? What makes you think so?
* What will be the long-term effects of each plan? How will costs or revenue change in the next year? Will the numbers of trees, wildlife, or visitors change?

**Enrichment**

1. Repeat the activity and have each team extend its management plan into the next year, and calculate the effect on money, trees, wildlife, and visitors for the second year.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson Adapted from Aquatic Wild*

**Are You Me?**

*Students will recognize various young stages of aquatic animals and match them with corresponding adult stages. Using picture cards, students match pairs of juvenile and adult aquatic animals.*

**Levels Duration**

Grade 3 20-40 minutes

**Background**

Many animals look significantly different in their earliest stages of development when compared to adulthood. This difference is especially apparent for some aquatic insects. Many aquatic insects undergo metamorphosis, which means change, during growth.

Some insects experience complete metamorphosis, while others undergo simple metamorphosis. In simple metamorphosis, the insect egg develops into a nymph. Nymphs resemble adults but can vary considerably from their adult form in coloration or appendages like wings. Insects that experience complete metamorphosis begin as eggs that develop into larvae. The larvae grow through several stages and then into larvae. The larvae grow through several stages and then change into pupae. Pupae are usually encased in a protective cover for their next stage of growth. From the pupae emerge the soft-bodied, often pale-colored adults. They differ remarkably in appearance from their earlier forms but are not yet completely formed. Gradually, the soft, pale bodies develop firmness and color. In complete metamorphosis, there is little resemblance between adult and earlier forms.

There are also remarkable similarities and differences between other aquatic animals in different life stages. The eggs of many animals hide their eventual form (e.g. alligators, turtles, bids). Pelican hatchlings, for example, closely resemble miniature dinosaurs. Aquatic mammals often are easier to recognize. In general, they do not change as dramatically as other animals in overall appearance as they grow from young to adult stages.

**Objectives**

The major purpose of this activity is for students to recognize differences in the life stages of aquatic animals. Students will increase their appreciation of the diversity of wildlife as well as their understanding of growth and change in animals.

**Equipment**

Adult Animal Cards Adult Human Cards

Juvenile Animal Cards Child Human Cards

Table (2x or more) Art Supplies (blank paper, markers)

**Directions**

1. Divide the class into small groups of three or four students and have each group stand around a table. Have students at each table place the adult-child human pictures on the table and mix them randomly. Have group members attempt to match pairs of adult-child photos.
2. Are the matches correct? Ask students to change any pairs that are not correctly matched. Discuss how difficult or easy it was to correctly match pairs. Introduce the idea that many animals look remarkably different as adults from how they appeared in younger forms. Ask students to think of any young animals that look different as adults. Tell students they are about to learn how to match young and adult forms of many different kinds of aquatic animals.
3. Introduce the aquatic animal cards, and divide the class into groups. Designate one group as “adults” and the other half as “young animals.” Give each student in the adult group an adult animal image. Make sure there is a corresponding match, adult or juvenile, for each card given. Instruct students to look for their match by pairing appropriate adult and juvenile forms.
4. When all students have made their choices, let the group check that the matches are correct.
5. Have all students examine the correctly matched pairs. Look for the similarities and differences in how aquatic animals grow and change, such as in number of legs, presence of wings, or body shape.

**Evaluation**

Choose two aquatic animals. Draw a picture of each animal as an adult and another picture of each animal as it looks when it is young, circling any physical changes that are different between the two stages. Discuss how these changes may make it easier for the adult to live in its habitat.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

**Butterfly Exploration**

*Featuring a classroom exploration of the world of butterflies, youth are invited to examine examples of the changes that happen throughout the lifecycle of native butterflies. Seasonally available, our live butterfly enclosure allows students to walk through the habitat and see these creatures up close.*

**Levels Duration**

Grades k-8 15-30 minutes

**Background**

Adult butterflies have large, often brightly colored wings, and a conspicuous, fluttering flight, but few consider the beginning parts of their life cycle—the time spent as an egg, caterpillar, and chrysalis. Butterfly fossils have been found from 40-50 million years ago. Some butterflies will migrate over long distances and are a truly incredible species that are in danger because of human impacts.

**Objectives**

Students will:

1. Learn about the butterfly lifecycle:
   1. Learn why and where a butterfly lays eggs
   2. Learn how they know what is the host plant
   3. Discover how many eggs butterflies lay in their lifetime
   4. Learn how many of these actually hatch into caterpillars
   5. Discover how many days it takes to go from the first stage until it hatches into a caterpillar
   6. Explore what happens as the caterpillar outgrows its skin
   7. Discover what the caterpillar does when it is ready to begin the chrysalis stage
   8. Learn about the chrysalis stage
   9. Discover the signs and what happens to the chrysalis when it is time for the butterfly to emerge
2. Experience butterflies and native plants first hand by a walk through the enclosure

**Equipment**

Butterfly Nets (Not to be used in the enclosure, but around the area to catch wild butterflies)

Monarch life cycle poster

Butterfly life cycle cards

**Directions**

1. Begin by discussing safety rules with students, making sure they understand the boundaries of the investigation. Students are not permitted to touch butterfly wings because they can get damaged, and they are only permitted to walk on the designated path. Students may ONLY handle butterflies by putting their hand next to the butterfly and waiting for the butterfly to crawl onto their hand. Clarify that butterflies will land on the ground and students need to be VERY careful to not step on them.
2. Why do butterflies lay eggs? Discuss life cycle and ask students to give examples of life cycles (seed, seedling, plant). Explain that butterflies lay eggs on host plants, which act as caterpillar food as it grows.
3. Discuss host plants and how butterflies know which plants are the host plants by tasting them with their feet.
4. Explain that female Monarch Butterflies can lay approximately 500 eggs within their lifetime and that there are other butterflies that can lay up to 1600 eggs!
5. Discuss that eggs are sticky so they stick to leaves and are about the size of a tiny, round candy sprinkle. Explain that only about 1% of eggs laid will actually hatch. Touch on life cycles again by explaining what happens to the other eggs.
6. Explain that it takes 3-10 days for eggs to hatch and discuss how temperature can affect hatching time.
7. Discuss molting and how caterpillars can get too big for their skin and explain that they eat their skin when it comes off. Explain that it takes about 9-14 days for caterpillars to pupate. Explain that caterpillars leave the host plant to find a protected place to attach and start pupating.
8. Explain that caterpillars will attach themselves to a plant, branch, or surface by “spinning” a sticky silk “button” to which it attaches its bottom. Once the caterpillar is attached, it waits until the button dries and it is safely attached, then gradually releases its legs and falls into a “J” position.
9. Explain that when butterflies emerge from the chrysalis their wings are all shrivels and its body is fat with fluid. It starts to pump that fluid into the wings and they start to “grow” until the wings are big. The butterfly will hang very still for a few hours while its wings dry and then it will fly away
10. Provide students the opportunity to experience butterflies firsthand by allowing a few students at a time to walk through the enclosure.

**Conclusions**

1. Check for understanding of objectives

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson Adapted from Growing up Wild*

**First Impressions**

*Children combine movement and art to show how they think and feel about animals.*

**Levels Duration**

Pre-k – 2 30-50 minutes

**Background**

People respond differently to different animals. For instance, some people don’t like spiders and may automatically recoil if they see one. Other are fascinated by spiders and may lean in to get a closer look.

Our response to a particular animal species depends on a number of factors, including our personality, our life experiences, and our culture. Children’s reactions to animals are strongly influenced by those of their parents and other important adults.

Certain wildlife species are generally less liked by people and will frequently cause a fear response. Wolves, snakes, spiders, and bats elicit fear among many people of all ages in many cultures. But, reactions to even these species may vary among individuals and between cultures. Bats, for example, are seen as good luck in some Chinese cultures.

Accurate information about animals and pleasant experiences with them help promote positive feelings. For example, learning that most spiders are harmless and that they are important for healthy ecosystems may lessen an initial fear.

**Objectives**

This activity is designed for children to notice their first reactions to different animals and then to see whether their reaction changes when they learn more about the animal.

**Equipment**

Masking Tape Pictures of Animals

Expression Faces Paper, Pen, Clipboard for recording

Art Supplies for Drawing

**Directions**

1. Have children stand away from the masking tape circles on the floor. Tell them to name each expression of the faces in the masking tape circles. “Smiley,” “Frowny,” “Unsure.” Allow children to infer their own meanings for these words.
2. Hold up a picture of an animal. Ask children to stand in the circle with the face that best describes how they feel about the animal. Once inside the circle, they may sit down and make the face that shows how they feel.
3. Have students count how many is in each circle. Which has the most? Record.
4. Encourage children to fully discuss their feelings regarding the animal. Provide vocabulary as needed. Why do they feel as they do? What do they already know about this animal and what would they like to find out?
5. When discussion is over, ask students to step away from the circles on the floor. Have them stand within the circle of the face that best describes how they feel about the animal now. Has anyone changed their minds? Why?
6. Repeat for each animal you have chosen.
7. Provide art supplies and allow children to draw their favorite animal or an animal that scares them. As they create, allow them to explain their feelings and ideas about the animal. Why is it special to them?

**Evaluation**

1. At first, which animals did you feel “Smiley,” “Frowny,” or “Unsure” about?
2. Did anything you learn about an animal change your feelings about it?
3. Ask family and friends about the animals they like best. Are there any they don’t like? Why do they feel the way they do about these animals?
4. Visit the library and learn something new about an animal that you or someone in your family things is scary or unattractive.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Forest Consequences**

*Few issues, if any, have simple solutions-- and resolving them usually involves compromise. In this activity, your students will learn about some of the effects that human activities can have on a forest. They will explore some of the trade-offs involved in working out a land use issue.*

**Levels Duration**

Grades 6-8 30-50 minutes

**Background**

Just like forest ecosystems, forest issues are varied and complex. Solutions to forest problems are not always obvious or satisfying to everyone. In most conflicts involving forests, or ***open spaces*** in general, many individuals, organizations, and agencies have different perspectives and beliefs on how the land should be managed in a ***sustainable*** way. Perspectives also vary on what laws and regulations, if any, should govern the use of forests, or other open space, that is not currently within protected lands. These divergent viewpoints have created an open space/development debate.

**Objectives**

1. Students will evaluate the options of managing or using a piece of forest land.

2. Students will make a land use decision and explore the consequences of that decision.

**Equipment**

Copies of student page (optional, you can make up your own scenarios… refer to directions #3, might be better with a local twist to it rather than the suggested plans ex. oil wells, coal mining, deforestation).

**Directions**

1. Have students imagine that they have been given a large piece of forestland on the outskirts of town. They can do anything they want with it. What would they do? Give students, or team of students, time to think. Then have them share their ideas.
2. Ask students what consequences their plans might have on the neighboring community and environment. Did they consider those consequences when they decided on a plan? Explain that they will take a closer look at a particular situation as they explore the consequences of various land use decisions.
3. Read aloud the scenario written in italics written on the student pages.
4. Divide students into teams of four, and explain that members of each team should work together to decide what the Morrisville Town Council should do. Each team member should agree with the team’s decision and be able to explain it to the rest of the group.
5. Pass out copies of the student pages, which contain written proposals presented to the Town Council on how land should be used. As the teams read through each proposal, they should ask themselves the questions listed on the student pages. Afterwards they should decide either to accept one proposal or to make a compromise or alternate proposal.
6. Give students plenty of time to work out a solution. Afterward, have each team present its decision to the entire group.
7. After all teams have presented their decisions, discuss the following questions:
   1. Was it difficult or easy to decide what to do? Explain your answers.
   2. What were the most important points raised by each proposal?
   3. What else do you need to know to make a good decision?
   4. If you knew the Morrisville was in a severe economic recession would it have changed your team’s plan? If yes, how? If no, why not?
   5. If you knew that a rare plant grew in several sections of the forest, would that fact have changed your team’s plan? If yes, how? If not, why not? What if a rare species of squirrel lived in the forest? What if a rare species of mosquito lived there?
   6. What differences might exist between the way you made your decision and the way a real town council would have made a decision like this?

**Enrichment**

1. Students can present their own news article with their opinion of the project.
2. Students identify a local environmental issue and conduct research to learn about the various positions on the issue. They may ask a local forester or check the newspaper to identify an issue.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Get in Touch with Trees**

*By the way of trees in the neighborhood and a mystery box, students will explore their sense of touch and discover different shapes and textures in nature.*

**Levels Duration**

Pre-K through Grade 6 30 minutes

(Adaptable to college students)

**Background**

***Bark*** is a very important part of a tree. It acts as a protective coating, warding off insects and diseases, and it protects the inner tissues against damage from storms or extreme temperatures. The bark of certain species also protects the tree from fire. Bark descriptions are based on color, texture, thickness, pattern, and other relevant details. The bark of some species changes significantly with age.

**Objectives**

1. Students will describe a variety of textures.
2. Students will demonstrate how they use their sense of touch to explore and respond to the environment around them.

**Equipment**

Chart paper medium-sized book (no smaller than a shoebox)

natural objects containers for collecting “tree parts”

Blindfolds or masks (one for each pair)

Fill shoebox with a walnut, buckeye nut, and nut casings or the outside of nuts, a piece of bark, and other natural forest findings. Place objects in shoebox, bag, or sock.

**Directions**

1. Have students imagine and describe what different parts of a tree might feel like. Have each student write down/or say their description. Then ask students how touch is important to people in their daily lives.
2. Take the students outside and divide them into pairs, giving each pair a blindfold.
3. Explain that partners will take turns wearing the blindfold and examining a tree using only the sense of touch. (Students can just close their eyes if they’re uncomfortable with using a blindfold.)
4. Have partner lead the blindfolded one to a tree, or their hand to the mystery box.

**Enrichment**

1. Have students work in pairs to make their own mystery boxes. Ask another teacher to have his or her students also prepare mystery boxes, and have your students exchange boxes with them. After using the other class’s mystery boxes for a period of time, have students from each class address the other class and say why an item they put in the box was special to them. Have them exhibit the object as well.
2. As a side topic, students could describe what it was like to be blindfolded. Were they scared?

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Aquatic Wild pg. 24*

**Got Water?**

*Have you ever considered what an ant has to go through just to get a drink of water?*

**Levels** **Duration**

Upper Elementary (Grades 3-5) Approximately 45 minutes

**Background**

All animals need food, water, shelter, and space, for survival. The area where animals find the arrangement of food, water, shelter, and space suitable to their needs is called their habitat. Wild animals must find their own food, water, and shelter. The more they spend meeting their needs (i.e., the further they travel to gather food, water, and shelter), the more energy they use, leaving less energy available for health maintenance and reproduction. They are also more exposed to predators and the elements when searching for food and water. Therefore, the arrangement of food, water, and shelter in an animal’s home range is critical to the survival of the individual animal, as well as the population of that animal. Biologists have determined an average home range for many wildlife species based on the entire area (space) the animal, such as a spider or deer mouse, is much smaller than that of a large animal, like a bear.

Food supplies the energy an animal need to survive. Shelter is important for safety and reproduction. Water is critical an animal’s survival for a variety of reasons, from maintaining overall health to cleaning fur or feathers. Water helps animals to digest food and regulate body temperature. Snakes need water to keep their skin moist when shedding. Amphibians need water for taking in oxygen through their skin, so they can lay their eggs, and for larval development. And for fish, staying in water is the only way to breathe oxygen!

How much water does an animal need to survive? Does the animal have to drink from a creek or will a small puddle do? Does the water have to be pure and of high quality? Where does an animal find its water? Does the animal even drink its water? Answers to these questions vary greatly for different species.

When evaluating an area to determine if it provides suitable habitat for a species, wildlife managers look at type, quality, and quantity of water, food, and shelter, as well as how they are arranged. The lack of any of these components within a given area will limit the number and types of animals that can live there. The component (food, water, shelter, space, disease, predation, climatic conditions, pollution, hunting, etc.) that limits the number or type of animals in an area is called a limiting factor. Therefore, an important consideration in a habitat evaluation is the distance between sources of water and other habitat components.

As discussed earlier, home range of different species vary in size, so measuring the distance between habitat components for different species may require different tools. For the squirrel, a long string marked in meter increments, a tape measure (like those used for track and field events), or a surveyor’s wheel would work well. On the other hand, ruler or shorter tape measure would work better for measuring a caterpillar’s home range. In the case of a large animal- coyote, raccoon, or opossum- a hand-held Global Positioning System (GPS) unit might be the best tool to determine distances between its food, water, and shelter. **NOTE:** Use measuring devices with which students are familiar, or have a separate lesson before the investigation to learn how to use chosen devices.

**Objectives**

1. Students will be able to explain the importance of accessible water to the survival of an animal
2. Students will describe the types and locations of three habitat components (food, water, shelter) for two different species.
3. Students will measure the distance between the sources of food, water, and shelter for each species.
4. Students will compare and contrast the home range for two species and discuss differences.
5. Students will evaluate a habitat to determine if the sources of food, water, and shelter are in an appropriate arrangement for an animal to survive.

**Equipment**

Field investigation clipboards pencils field guides

computer for research (or could already have animals picked and research printed off)

**Directions**

1. Begin with a discussion of wildlife that students have seen near school and in their neighborhoods. What animals (big and small) do students commonly see? Make a class list of wild animals students have seen in the area. Why are the animals there? (If needed, review the definition of habitat and its basic components: food, water, shelter, space. Discuss the importance of each component for the animal’s survival.) Where in the area do students think animals find food? Shelter? Water? Point out that when we examine animals habitats, water sources often are overlooked. Have students brainstorm where different species of animals might get their water and record the answers. Ask students how far they think each of the animals listed might travel to meet its needs for food, water, and shelter. Animals need energy to maintain body temperature, to move, and to reproduce. How does the distance between basic needs in an area affect their use of energy? (**NOTE:** the more energy used to travel and meet its basic needs, the less energy an animal has to grow and reproduce.) How might changes in an animal’s habitat (flood, drought, development, etc.) affect the amount of energy it needs? Why? Discuss how animals find what they need to survive in their habitats and distances they may need to travel to meet their needs. Explain to students that all animals (and plants) have a habitat. Even the students have a habitat! Where do they get their water? Where do they get their food? Where do they get their shelter (be open-minded about this- house, apartment, schools, tent, car, trailer, etc.)? Explain that different animals different habitats, but they also have differently-sized home ranges. The area (distance) the animal travels to survive and reproduce is its home range. For a chipmunk that lives in a forest, the forest is the chipmunks habitat. But, how far does the chipmunk travel to find its needs? Will a chipmunk travel ten miles or less than one mile? How far would you travel to find your needs? Ask students to list all of the places found in their home range. Using a road map of your surrounding study site area, have each student use a different color marker to draw lines between where students travel for food, water, and shelter. Compare and contrast their home ranges.
2. Provide each student the opportunity (or assign for homework) to research one species from the classroom list that live in their area. From the information gathered, have each student create a short paragraph, list, drawing, or presentation detailing the natural history of his or her animal including habitat, food requirements, typical water sources, and the size of the home range. Because finding information on home range may be difficult, examples of home range sizes for different types of animals are provided in this activity (see *Home Range and Habitat*).
3. Next, ask students to share their information with a partner. Pair those students who researched really small animals with those who researched a larger animal, like a chipmunk or frog. Ask each student pair to develop a chart or Venn diagram to compare and contrast habitat, food, water, shelter, and space (home range) of the two animals. Students should notice that different animals live in different habitats and have different needs. Different species also have different home range sizes and therefore require different amounts of space to survive. Re-emphasize that food, water, shelter, and space need to be in the proper arrangement for an animal to survive. Discuss how animals obtain what they need to survive, with a special focus on the importance of water to animals. Ask student to make a list of different water source animals might use.
4. Explain to students that partner pairs will go outside to investigate and evaluate wildlife habitat for the two species they researched. Show students an aerial map to identify boundaries and give a visual reference of the study site (Google Maps, Google Earth, or a local environmental agency are good source of aerial maps). Ask students what they know from the previous visits to the site or what they can observe from the aerial photograph or map. Discuss where the species they researched might be found.
5. Before going to the study site, provide each student pair with a clipboard, pencils, graph or drawing paper, and one ***Habitat Evaluation Date Form***. Have student pairs complete the Part 1 sections of the ***Habitat Evaluation Data Form*** using the natural history information they previously researched about their species. You can also provide field guides if students want to look up more information about their species, or do additional research in the library or online. Ask students what types of devices they might use to measure distances between food, water, and shelter for the species they researched. Collect enough suggested devices (measuring tapes, rulers, Global Positioning System, etc.) to enable students to have multiple measuring device options.

(Actual extensions to the lesson plan consist of a classroom research and create maps listing where certain objects were found, as well as chart consisting of results from the site studies.)

**Extensions**

1. Ask students if people have impacted habitat on the study site in any way. How? Did these impacts improve or degrade the habitat? Have each student write a short paragraph explaining his or her point of view that includes evidence from observation at this site.
2. Have groups of students make a scale drawing of the study site. Be sure they label each of their species’ sources of food, water, and shelter on their scale map. Then, have students draw lines between the habitat components and label the distance.
3. Visit a new area. Take a few minutes to compare your initial study site with this new site. What animals might be found at this site but not at your initial study site? Why? Students should include evidence from their observations that support their claims.
4. Have students choose another native animal found in your area. Have students draw a map of the “perfect” habitat for this species. Or, draw a picture labeling the animal’s food, water, and shelter.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson Adapted from Growing up Wild*

**Hiding in Plain Sight**

*Children play a game of hide and seek to learn about important adaptations in many wild animals.*

**Levels Duration**

Pre-k – 2 30-40 minutes

**Background**

Animals come in all shapes and sizes. They live in all kinds of environments. Animals that have features or behaviors that are well suited to their environment are more likely to survive in that environment and pass on the genes for these traits to their young. We call these special features or behaviors **adaptations**.

In order to survive, wild animals must find food and avoid being eaten. Many adaptations help wild animals accomplish these important tasks. One of the most widespread and varied of these adaptations is natural camouflage. Generally speaking, camouflage refers to any special coloring, marking or physical feature that allows a wild animal to blend in with its surroundings. Camouflaged prey animals are better able to escape detection by predators, while predators that blend in with their environment are better able to ambush or sneak up on their prey.

Examples of camouflage abound. Many animals have fur, feathers, or other body coverings in earth tones that blend in well with many natural environments. Other animals like White-Tailed Deer fawns, zebras, and tigers display disruptive coloration—patterns of light and dark that break up the shape of the animals’ bodies. This makes them hard for color-blind predators or prey to detect against patterns of light and shadow in the environment. Many insects, amphibians, and reptiles exhibit color patterns and/or shapes that very closely mimic the patterns and shapes in their environments.

The color of some animals even changes to match changing environmental conditions. For instance, Green Anoles, common lizards found in the southeastern United States and sometimes sold in pet stores as “chameleons,” change colors from green to shades of brown, gray, or black depending on their environment. Snowshoe Hares, Arctic Foxes, and some other northern species change color with the seasons. They are brown in the summer and white in the winter to blend in with the snow.

**Objectives**

1. Children learn about important adaptations in many wild animals

**Equipment**

Small animal replicas Chair Blindfold (optional)

Preparation: Hide two identical animal replicas in plain sight. Place one where it will blend in with its surroundings. Place the other where its coloration will stand out against the background

**Directions**

1. Tell children they are going to play a game of hide and seek with animal replicas. If possible, play the game outside to increase authenticity.
2. Choose a child to be “It.” S/he will be a predator. Have the “predator” sit with eyes losed (or blindfolded) in a chair in the center or to one side of a play space. Explain that this hungry predator will try to find “prey” to eat
3. Select a small group of children to hide prey animal replicas “in plain sight.” Encourage each to find a place that matches what his or her animal looks like. The “prey” may be partially hidden, but they must be able to “see” the predator. Each “prey” will try to hide so that it won’t be eaten by the “predator.” Stress that prey animal replicas should not be completely hidden from view.
4. After the children have hidden the prey animals, regroup near the “predator.” Encourage the predator to open his or her eyes (or remove the blindfold) an point to the animals s/he can see from the chair. Have the children retrieve the prey animals for the predator as s/he points them out. The predator must remain touching the chair.
5. Which animals were the easiest to find? The most difficult? Why? Encourage all children to join the discussion and report on their observations of the simulation
6. Repeat the game with a new “predator.” Select another group of children to find new hiding places for the prey animal replicas (you might use different prey replicas). Do the results differ? How? Why?

**Conclusion**

1. What color is camouflage?
2. Who can give an example of a real animal that is well camouflaged?
3. What does the animal look like?
4. What does its habitat look like?
5. What would YOU wear to be camouflaged in front of your school? In your classroom? In a park? Why?

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Invasive Species**

*Throughout history, people have intentionally and unintentionally moved plants and animal species to new environments. Some of these species have proved beneficial, but others invade natural habitats causing environmental, and sometimes economic harm. Students will research invasive species to determine how these species got to their new locations and what characteristics make them so challenging.*

**Levels Duration**

Grades 5-8 30-50 minutes

**Background**

A ***native species*** is plant or animal that occurs naturally in a certain area. Because it evolved with other species that served to keep its population in check through predation, competition, or disease.

***Non-native species*** (also known as exotic species or alien species) are ones that have been introduced or moved by human activities to an area where they do not naturally occur. A non-native species is not necessarily harmful, and in fact, some non-native species are beneficial (e.g., apple trees). However, when a non-native species overruns or ***outcompetes*** native species in natural communities or ecosystems and causes ecological or economic problems, it is called an ***invasive species.***

**Objectives**

1. Students will learn what invasive species are, why they are problematic, and how to prevent their spread.

**Equipment**

Copies of “Alien Invaders” student pages

World Map

Internet Access

(The Ohio Invasive Species powerpoint works well too… [www.oipc.info/Assets/**InvasivePlants**4aR.**ppt**](http://www.oipc.info/Assets/InvasivePlants4aR.ppt)powerpoint owned and created by Ohio Invasive Plants Council/Hamilton County Park District.)

**Directions**

1. Begin the activity by asking the students what the word “invasion” means. Ask them whether they have heard the term “invasive species” and what they think it might mean. “Why might invasive species be a problem?”
2. Divide students into teams and give each team two or more different species from the student pages (you may have students work on only one species). Have students read about their species to determine:
   * 1. Where is the native region of that species?
     2. Why or how did the species get to its new location?
     3. How far did it travel from its native home?
     4. What characteristics have helped it thrive in its new location?
     5. What effect does it have on other species or on the environment?
3. Ask teams to discuss:
   * 1. What do these species have in common? How do they differ?
     2. What are typical characteristics of invasive species?
     3. What ways do invasive species spread?
4. Explain to the students that they will now research an invasive species (different from the ones on the cards) that is a problem in your area. After learning about this species, they will create a poster, video, brochure, door hangers, skit, or other presentation to inform friends, family, neighbors, or city councils about the invasive species, its effects on the environment, and how to prevent its spread. Their presentations should include:
   * 1. Where the species originated.
     2. How and why it got to your area.
     3. The characteristics that help it thrive.
     4. Its effects.
     5. What people can do to get rid of it or prevent it from spreading further.
5. Give students time to research and create their presentations, and then share them with the class and the community.

**Enrichment**

1. Have students participate in an invasive species control project. Contact your local parks or natural resources department to find out about projects in your area. Older students can work together to devise a long-term invasive species control plan for their school or community.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Growing up Wild*

**Lunch for a Bear**

*Children identify the kinds of foods that black bears eat by creating a plate of “bear food”*

**Levels Duration**

Pre-k – 2 30-50 minutes

**Background**

Black Bears are quiet, shy animals that can be found throughout much of the United States and Canada and even in part of Mexico. These bears may be black, brown, cinnamon, blond, or blue-gray in color. Black Bears are omnivores, which means they will eat both plant and animal matter. Most of their diet is made up of a variety of plants and plant parts like leaves, berries, and nuts.

What Black Bears eat depends on where they live and what is available at that time of year. In early spring, they eat grasses, shoots, and other greens. They will also eat insects, maggots, and sometimes the carcasses of dead deer or other animals. In late spring and early summer, they eat honey, berries, and leafy plants, as well as ants, wasps, and grubs. Occasionally, they will kill and eat small animals such as mice, squirrels, fish, frogs, and larger ones such as elk calves and fawns. In late summer and early fall, they eat mostly calorie-rich nuts and acorns. At that time of year, bears must add lots of fat to their bodies so that they can make it through the winter months without eating.

In order to survive, Black Bears, just like all wild animals, must have all their needs met by their habitat. They require large areas with lots of different foods. They also need streams, ponds, or other sources of water for drinking and cooling. They prefer forested and shrubby areas as cover for hiding and for keeping warm. In winter, Black Bears need a den, which may be a hollowed-out tree cavity, a hole under a log or rock, a small cave or culvert, or simply a shallow depression in the ground.

**Objectives**

1. Children identify the kinds of foods that Black Bears eat
2. Children are introduced to the concept of limited resources
3. Children are introduced to the concept of omnivores and how they require variety in their diet to survive

**Equipment**

Copies of Food for Black Bears Glue Crayons

Envelope or paper bag for “bear stomachs” Paper Plates

**Directions**

1. Show students the Food for Black Bears sheet. Have them name the foods shown. Which bear foods come from animals? Which come from plants? Explain that Black Bears are called omnivores because they eat foods that come from both plants and animals. Omnivores need a variety of different foods in their diet to stay healthy. Can children think of any other omnivores? (people)
2. Spread the bear food cards on the ground in a large, open area. Tell children they will play Black Bears finding food to eat. Give them paper bags or envelopes to serve as “bear stomachs.” Explain that each child should collect one of each of the cards, putting the cards in his or her “stomach.”
3. Ask children what might happen if Black Bears cannot find enough different foods to eat. To demonstrate, spread the cards on the ground for children to collect again, but this time use only about half of the cards. Point out that when bears cannot find enough food they might move to a different area or die.
4. Spread out the remaining cards and have children collect any they might be missing. Have children color the cards and glue them to paper plates.
5. You may wish to extend the lesson by introducing or reviewing the concept of habitat. What would happen if Black Bears cannot find enough water, shelter, or space?

**Conclusion**

1. What different kinds of foods do bears eat?
2. Looking at the plate you made, what bear foods do you like to eat, too?
3. What might happen if a bear’s habitat does not have the food it needs? The water, shelter, or space it needs?

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Aquatic Wild pg. 18*

**Migration Headache**

*If you were a bird would you survive your winter trek down south?*

**Levels Duration**

Middle School (Grades 6-8)Approximately 45 minutes

**Background**

Birds that migrate depend not just on having one suitable habitat, but two and often three habitats. For example, some birds nest and raise their young in the northern limits of their ranges. The same birds may also require suitable habitat in the southern limits of their ranges to live during winter. Because migrating birds travel hundreds or thousands of miles between nesting and wintering grounds, resting and feeding sites (known as stopovers) are crucial.

A variety of remarkable migrating shorebirds and waterfowl inhabit the skies and waters of the United States. Many migrating birds- ducks, geese, cranes, herons, rails, terns, and plovers, for example-require wetlands in their breeding, stopover, and wintering grounds. Without wetlands, dozens of species of waterbirds face loss of necessary habitat.

Over the past 150 years, waterbird populations have been threatened by the alteration of habitats and direct mortality of birds. Numerous populations of waterbirds have declined, some significantly. Destruction of wetland habitat reduces the quantity of suitable nesting, feeding, and resting areas. Alteration of wetland habitat often reduces their quality, making them unsuitable for waterbirds. Wetland habitat, usually found in low, fertile plains along watercourses, was horizontally prized for conversion to farmland and settlements. Agriculture and development, both residential and industrial have reduced the number and quality of natural wetlands.

Direct mortality of waterbirds occurs in various ways. The migration routes of North American waterbirds are well known. Before the passage of regulations regarding the hunting of waterbirds that concentrated at strategic points along these routes. Pollution, through insecticides and herbicides, for example, has also taken a toll. Birds may ingest poisons that have been concentrated as they move through the food web, sometimes with lethal effects. In some cases, pesticides also kill the birds’ food, reducing their food supply.

Many international federal state, and private groups recognize the importance of wetland habitat to wildlife habitat to wildlife conservation. In the early 1900s, several laws and treaties were enacted that regulated the hunting of waterbirds and protected the habitat on which they depended. Laws that conserve and enhance wetland habitats have slowed the alteration of these habitats. The Clean Water Act of 1977 and the Farm Bill of 1985 are two major pieces of such legislation. In addition, techniques have been developed to build new wetlands as well as enhance the quality of existing wetlands. The U.S. Fish and Wildlife Service (USFWS) has principal legal responsibility in the United States for managing migratory wildlife at the federal level. State wildlife agencies share some responsibilities with the USFWS for conserving migratory waterbirds.

The effects on natural occurrences and human management efforts during the 1990s have produced mixed results. The North American Waterfowl Management Plan, coordinated by the USFWS, has worked through private-public partnerships to conserve and enhance waterfowl habitat in Canada, Mexico, and the United States. This effort, aided by several years of plentiful rain and snow, has allowed populations of many species of waterfowl (ducks, geese, swans) to rebound from near record lows in 1980s and early 1990s to near historic high numbers. In fact the populations of many waterfowl species were larger in 2012 than they were in 1986. Conversely, shorebirds live plovers, terns, and the Red Knot continue to suffer losses because of habitat loss and alteration along coastal regions. In 2001, the U.S. Supreme Court removed isolated wetland ecosystems such as Texas pocket prairies from protection under the Clean Water Act and determined that waterfowl cannot be the sole justification for preserving natural space. In 2006, the Supreme Court once again suggested narrowing the scope of the Act by only including waters with a relatively permanent flow. Many organizations are working to reverse these decisions.

In addition, many waterfowl conservationists are now studying predicted effects of climate change on waterbirds. Rising sea levels could contribute to coastal habitat loss and unusual weather conditions may disrupt migration patterns for many waterbird species. Increasingly warmer seasons across the upper Midwest have altered some insect life cycles, affecting the timing of food availability for arriving birds. Resources and research are needed to understand shifting conservation concerns for waterbirds in decades to come.

In this activity, each student (assuming a class of 30) represents thousands, if not tens of thousands, of waterbirds. Thus, occasional losses to predation and other events of relatively minor magnitude during the course of migration are not emphasized in the simulation. The major purpose of this activity is for students to dynamically experience some important factors that affect habitat quality and the associated survival of migratory waterbird populations.

**Objectives**

1. Students will list limiting factors affecting habitats and populations of migrating waterbirds.
2. Students will predict the effects of such limiting factors.
3. Students will describe the effects of habitat loss and degradation on populations of migrating waterbirds.
4. Students will make inferences about the importance of suitable habitat for migrating waterbirds.

**Equipment**

Large playing field or gymnasium

one base (paper plates or carpet squares, for examples) for every two or three students

**Directions**

1. Select a large playing area about 70 feet in length. Place an equal number of bases in three areas on the playing field as shown below: Choose the number of bases so that there is one base for every two or three students at each of the three areas on the field.
2. Explain to students that they are waterbirds and will migrate between these three students areas at your signal. Tell students that the bases represent wetlands. These wetlands provide suitable habitat for waterbirds. At the end of each migration, students will need to have one foot on a base in order to be allowed to continue (survive). Tell students that only two (or three as decided in Step 1) waterbirds can occupy a habitat (base) at one time. If they can find a habitat that isn’t “filled,” that means they have not found any suitable habitat. They “pass away,” and have to move, at least temporarily, to the sidelines. During migration, students may want to “flap their wings,” moving their arms like birds in flight.
3. Explain to students that many factors will limit the survival of populations of migrating waterbirds. Some involve changes in the wintering, stopover, and nesting habitats. There will be periods of time when food, water, shelter, and space are suitably arranged to meet the habitat requirements of the birds. There will be other times when the habitat is stressed, with many factors limiting the potential for the birds’ survival.
4. Begin the activity with all students at the wintering habitat. Announce the start of the first migration. Have students migrate slowly until they become familiar with the process. They can speed up. On the first try, all the birds will successfully migrate to the stopover habitat.
5. Explain that most waterbirds need these areas to rest and eat before continuing the migratory journey. Then have them migrate from the stopover habitat to the nesting habitat. Explain that there has been no loss of available high-quality habitat in the area. Thus, a successful nesting season is at hand.
6. Before students migrate back “south,” remove one base from the stopover habitat. Explain that a developer has received a permit to drain a wetland to build a mall. Repeat the instruction to migrate, and send the birds to the stopover habitat. Have students who could not find available habitatstand on the sideline. Tell students that these birds died as a result of habitat loss. Remind any “deceased” birds that they will have a chance to get back into the activity. They can come back to surviving hatchlings when favorable conditions prevail and there is habitat available in the nesting ground.
7. Continue the migration by reading *Habitat Scenarios* at the end of this activity. Educators may want to appoint two students as monitors to remove and add bases (habitats) as required for each scenario.
8. After the activity, ask students to identify factors that caused waterbird populations to decline or increase. What are the short and long-term effects of the decline or increase? Which factors are human-caused? Which are natural? Which factors reduced or enhanced the quality of the habitat? What are the benefits and liabilities related to these factors for the community?

**Evaluation**

1. Name two human activities and two environmental factors that might interfere with waterbird migration. For each activity and factor, describe the possible effects on waterbirds.
2. Distinguish between effects on individual birds and effects on populations of birds. Indicate if an effect is short term or long term.
3. Why is suitable habitat important for migrating waterbirds? Include in your response a description of the different kinds of habitat that are needed by migrating waterbirds.
4. Is habitat loss a greater threat to the survival of migrating populations than for stationary populations of wildlife? Explain your answer.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Nothing Succeeds Like Succession**

*Succession is a natural pattern of change that takes place over time in a forest or other ecosystem. In this activity, students will read a story about succession, and investigate the connection between plants, animals, and successional stages in a local ecosystem.*

**Levels Duration**

Grades 4-8 30-50 minutes

**Background**

The scientific word for this change in community composition over time is ***succession.*** The type of disturbance that sets succession in motion determines whether it is considered primary or secondary. ***Primary succession*** can be thought of as starting with a blank canvas-it occurs when plants, animals, and other organisms colonize an area where soil and plant life did not previously exist-such as when a glacier melts and exposes bare rock or when a lava flow cools after a volcanic explosion. The initial organisms (called pioneers) that inhabit the site must be able to grow in very harsh conditions. Non-vascular plants, such as mosses and lichens, are often the first to grow on sites as they do not have a root structure that needs to be anchored in soil in order to uptake food and water.

Gradually, often over hundreds or thousands of years, soil builds up on the site, and seeds that have blown or dispersed to the area from surrounding vegetated areas begin to establish themselves. These initial species are herbaceous (or nonwoody) and are often sun-loving, fast growers, such as annual plants that complete their life cycle and set seed in one year. They are able to more effectively compete for available resources at the site, such as light, water, and nutrients, than woody species.

Eventually, though, these plants may alter the habitat to a point where the conditions change(such as increase in shade due to dense growth) or slower growing species may outcompete them, leading them gradually dominated by woody species. The structure of the community also becomes more stratified as certain trees will dominate the overstory, or canopy. Depending on site conditions, shade-tolerant trees may form an understory underneath the canopy, and a shrub and herbaceous ground layer may also develop.

**Objectives**

1. Students will explore basic relationships between species diversity and ecosystem changes.
2. Students will identify successional stages in ecosystems based on plant and animal species.
3. Students will draw conclusions about the process of succession based on study test plots in different stages of succession.

**Equipment**

Paper rope hammers felt board copies of student pages

crayons clippers string transparencies

pencils stakes felt transparency markers

**Directions**

1. Take your students on a field trip through an area that has several types of vegetative communities (for example, an urban park with wooded areas). Have them try to find where plant communities appear to be changing in composition. Tell them not to worry about plant or tree names, only types (i.e., grasses, non-woody herbaceous plants, woody shrubs, trees).
2. Have them look for animals and signs or sounds of animals. They should also look for evidence of disturbance (such as erosion, tire tracks, fire, and construction) that might have altered the natural succession. They can try and look for the following compositions (Note: not all of these may be present at your site or in discrete locations):
   1. Grasses and nonwoody plants only
   2. Grasses and woody and nonwoody plants
   3. Grasses and shrubs, with young tree saplings (stem <½” [1.3cm])
   4. Ground vegetation and young trees (stem ½” to 2” [1.3 cm to 5cm])
   5. Mature trees (stem >2” [5cm] can still be under canopy)

3. Call the group together and define the stages of succession evident at your site. Discuss

disturbances that could change the vegetation you currently see at the site, including disease,

insects, fire, wind, lightning, pollution, and drought.

1. Divide the groups into teams of three students. Have students draw a general map of the study area, including major landmarks (such as major trees, trail junctions, parking lots, benches, creeks, etc.), and then identify and draw areas on the map that fall into the different categories of succession identified in the preceding step.

**Enrichment**

Assign teams for each of the successional areas studied in the activity. Have teams use different colors of felt to cut out the shapes of plants and animals that are characteristic of the plant community they examined. Have each team write a few sentences to describe it. Create a large felt board, in which the bottom third is brown (for soil) and the top two thirds are blue (for sky). Have groups come up and place their plants and animals in appropriate places on the felt board and tell their stories (felt naturally sticks to felt). Your class can re-create the story of succession. Be sure to include the idea of major disturbances affecting their created ecosystem.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Wild*

**Oh Deer!**

*Students portray deer and habitat components in a physical activity.*

**Levels Duration**

Grades 5-8 30-45 minutes

**Academic Content Standards**

LS Grade 1, LS Grade 5-8

**Background**

Carrying capacity refers to the dynamic balance between the availability of habitat component and the number of animals the habitat can support. A variety of factors related to carrying capacity affect the ability of wildlife species to successfully reproduce and to maintain their populations over time. The most fundamental of life’s necessities for any animal are food, water, shelter, and space in a suitable arrangement. Without these essential components, animals cannot survive.

However, some naturally caused and culturally induced limiting factors serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. Disease, predator and prey relationships, varying impacts of weather conditions from season to season (e.g., early freezing, heavy snows, flooding, drought), accidents, environmental pollution, and habitat destruction and degradation are among these factors. An excess of such limiting factors leads to threatening, endangering, and eliminating whole species of animals.

This activity illustrates that:

1. Good habitat is the key to wildlife survival
2. A population will continue to increase in size until some limiting factors are imposed
3. Limiting factors contribute to fluctuations in wildlife populations
4. Nature is never in “balance,” but is constantly is changing

Wildlife populations are not static. They continuously fluctuate in response to a variety of stimulating and limiting factors. We tend to speak of limiting factors as applying to a single species, although one factor may affect many species. Carrying capacity limitations can result in competition among domestic animals, wildlife, and humans.

Natural limiting factors, or those modeled after factors in natural systems, tend to maintain populations of species at levels within predictable ranges. This kind of “balance in nature” is not static, but is more like a teeter-totter than a balance. Some species fluctuate or cycle annually. Quail, for example, may start with a population of 100 pairs in early spring, grow to a population of 1,200 birds by late spring, and decline slowly to a winter population of 100 pairs again. This cycle appears to be almost totally controlled by the habitat components of food, water, shelter, and space, which are also limiting factors. Habitat components are the most fundamental and the most critical of limiting factors in most natural settings.

This activity is a simple, but powerful way for students to grasp some basic concepts: first, that everything in natural systems is interrelated; second, that populations of organisms are continuously affected by elements of their environment; and third, that populations of animals are continually changing in a process of maintaining dynamic equilibrium in natural systems.

**Objectives**

Students will:

1. Identify and describe food, water, shelter, and space as the four essential components of habitat
2. Describe factors that influence carrying capacity
3. Define “limiting factors” and give examples
4. Recognize that some fluctuations in wildlife populations are natural as ecological systems undergo constant change

**Equipment**

Large area Flagging or Tape (optional) Habitat Cards (optional)

Flip Chart/chalkboard Writing material

**Directions**

1. Tell students they will be participating in an activity that emphasizes the most essential things animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space in a suitable arrangement.
2. Ask students to count off in threes. Have all the “ones” go to one area; all the “twos,” “threes,” “fours,” and “fives” go together to another area. Mark two parallel lines on the ground or floor 10 to 20 yards apart. Have the ones line up behind one line; the rest of the students line up behind the other line, facing the ones.
3. The group of “ones” all become “deer.” All deer need good habitat to survive. Again, ask the students what the essential components of habitat are (food, water, shelter, and space in a suitable arrangement). The deer (the “ones” group), need to find food, water, shelter, and space to survive. When a deer is looking for food, it should clamp its “hooves” over its stomach. When it is looking for water, it puts its “hooves” over its mouth. When it is looking for shelter, it holds its “hooves” together over its head. When it is looking for space, it holds its “hooves” out from its sides as far as it can. A deer can choose to look for any one of its needs during each round or segment of the activity; a deer cannot, however, change what it is looking for (e.g., when it sees what is available during that round). It can change what it is looking for in the next round, if it survives. Alternatively, pass out the habitat cards to assign each student a component to discourage cheating.
4. The “twos,” “threes,” “fours,” and “fives” are food, water, shelter, and space—components of habitat. Each student is allowed to choose at the beginning of each round which component he or she will be during that round. Students depict which component they are in the same way as the deer.
5. The activity starts with all players lined up behind their respective lines (deer on one side, habitat components on the other side)—and with their backs facing the students along the other line.
6. Begin the first round by asking all of the students to make their signs—each deer deciding what it is looking for, and each habitat component deciding which component it will become. Give the students a few moments to put their hands in place—over stomachs, over mouths, over heads, or stretched out to their sides.
7. When students are ready, say “Oh Deer!” Each deer and habitat component turn to face the opposite group, continuing to hold their signs clearly.
8. When deer see the habitat component they need, they should run to it. Each deer must hold the sign of what it is looking for until getting to the habitat component student with the same sign. Each deer then reaches its necessary habitat component takes the “food,” “water,” “shelter,” or “space” back to the deer side of the line. “Capturing” a component represents the deer successfully meeting its needs and successfully reproducing as a result. Any deer that fails to find its food, water, shelter, or space dies and becomes part of the habitat. That is, any deer that died will be a habitat component in the next round and so is available as food, water, or shelter to the deer that are still alive. (NOTE: When more than one deer reaches a habitat component, the student that arrived there first survives. Habitat components MUST stay in place until a deer chooses them. If no deer needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. The habitat component can change which component it is from round to round.)
9. Record the number of deer at the beginning of the activity and at the end of each round. Continue the activity for approximately 15 rounds.
10. At the end of 15 rounds, bring students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they saw a small herd of deer begin by finding more than enough of its habitat needs. However, because the population of deer expanded over two to three rounds of the activity until it exceeded the carrying capacity of the habitat, there was not sufficient food, water, shelter, and space for all members of the herd. At that point, deer starved, died of thirst or lack of shelter, and returned as part of the habitat. Such things happen in nature also. (NOTE: in real life, large mammal populations might also experience higher infant mortality and lower reproductive rates.)
11. Using a flip chart pad or chalkboard, post the data recorded during the activity using a line graph, like this example:

The number of deer at the beginning of the activity and at the end of each round represents the number of deer in a series of years. That is, the beginning of the activity is year one; each round is an additional year. Students will see this visual reminder of what they experienced during the activity: the deer population fluctuated over a period of years. This process is natural as long as the factors that limit the population do not become excessive to the point where the animals cannot successfully reproduce. The wildlife populations will tend to peak, decline, and rebuild—as long as there is good habitat and sufficient numbers of animals to reproduce successfully.

1. (Optional) After students have played several rounds of “Oh Deer!,” introduce a predator such as a mountain lion or wolf into the simulation. The predator starts in a designated “predator den” area off to the side. The predator has to skip or hop. The predator can tag deer only when they are going toward the habitat and are between the habitat and deer lines. Once a deer is tagged, the predator escorts the deer back to the predator den. The time it takes to escort the deer simulates the time it takes to eat. The “eaten” deer is now a predator. Predators that fail to tag someone die and become habitat. During each round, keep track of the number of predators as well as the number of deer. Incorporate those data into graphs, like this one:
2. What is realistic and unrealistic about this simulation? (Deer that do not survive DO become recycled as nutrients, but it is not instantaneous. Deer need ALL habitat components in order to survive. Poor habitat usually results in a weakened individual that succumbs to disease, not instant death.)
3. In discussion, ask students to summarize some of the things they learned from this activity. What do animals need to survive? How do these components influence carrying capacity? What are some “limiting factors” that affect the survival of animals? How do factors that limit carrying capacity affect the health, numbers, and distribution of animals? How do these factors affect competition within a species? Why is good habitat important for animals? Are wildlife populations static, or do they tend to fluctuate as part of an overall “balance” of nature? Is nature ever really in “balance” or are ecological systems involved in a process of constant change?

**Evaluation**

1. Identify three essential components of habitat.
2. Define “limiting factors.” Identify three examples.
3. Identify causes of population change.
4. Explain what a balanced population would actually look like on a graph.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson Adapted from Growing up Wild*

**Owl Pellets**

*Children dissect an owl pellet and learn about what owls eat.*

**Levels Duration**

Pre-k – 2 30-50 minutes

(adaptable to higher)

**Background**

An owl pellet is a dense mass of bones, fur, and feathers an owl coughs up after digesting a meal. It is odor-free and safe for children when properly prepared, offering a real-life look at owls and their diet. An owl pellet also illustrates who eats what in a simple food chain.

Owls are predators, which means they kill and eat other animals. The animals they eat—their prey—are usually small mammals such as mice, shrews, or rabbits. Owls may also eat frogs, lizards, other birds, and insects. Owls swallow their prey mostly whole—bones, fur, and all. They digest the soft parts, but 6-12 hours later, they cough up the rest in the form of a pellet. The pellets may contain bones and fur, as well as feathers, beaks, teeth, claws, and hard parts of insects.

Owl pellets vary in size, shape, color, and contents, depending on the meal and the size of the owl. By looking at the specific bones and other things in an owl pellet, one can learn what the owl ate. Scientists use pellets to study the diets of different species of owls, and to monitor the types and numbers of small mammals living in an area.

Most owls are nocturnal, which means they are active at night. Their large eyes help them see prey in the dark. They have very acute hearing. Many species have a circle of facial feathers that funnels sound to their ear openings behind the eyes. Although some owls have “ear tufts” that look like ears on top of their heads, these are actually just feathers. Owls also have sharp claws or talons, and a hooked beak, which helps them catch and kill prey.

There are 19 owl species in North America, including the Barn Owl, Screech Owl, Great Horned Owl, and Barred Owl. Many owl pellets available commercially are from Barn Owls, which are common throughout North America.

**Objectives**

1. Children learn about owls and what they eat

**Equipment**

Owl Pellets Tooth Picks Owl photograph

Paper Plate Bone Chart Cups

**Directions**

1. Show children one of the owl pellets, without telling them what it is, and explain that it is something made by a bird. Ask them what they think it might be.
2. Provide each pair of children an owl pellet on a paper plate, tooth picks, and a small container.
3. Explain to children that they may touch and gently pull apart this object with their hands. They may also use the tooth picks to help them see what is inside. As they pull apart the object, they may separate and sort different kinds of things on the plate or in the container.
4. As children examine their pellet, ask:
   1. What do you notice about this object?
   2. What is inside of it?
   3. What does it feel like?
5. Allow groups to share their ideas and discoveries. Continue to ask questions about their observations to help them guess what the objects are.
   1. How might the bird have gotten the fur and bones?
   2. What kind of bird could do this?
6. Introduce the term “predator” (an animal that eats other animals, known as “prey”), and ask them if they can think of any birds that are predators.
   1. How were the objects made?
   2. Why do they think so?
7. Have children wash their hands. Show a picture of an owl and explain that the pellets came from owls.
   1. Has anyone ever seen an owl?
   2. What do they think owls eat?
8. Using information from the Background section, explain how the pellets are made.

**Conclusion**

1. What different things did you find inside your pellet?
2. What can we tell from the things we find in an owl pellet?

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Planet Diversity**

*In this activity, students will pretend they are visitors from outer space, viewing life on Earth for the first time. By describing, in minute detail, all the life they find in a small plot of land, they will become more aware of the diversity and abundance of life on Earth and will better understand its importance.*

**Levels Duration**

Grades 4-6 50 minutes

**Background**

All organisms on Earth can be classified by ***species.*** A species is a group of organisms that resemble one another in appearance, behavior, chemical makeup, and genetic structure. To be considered the same species, organisms that reproduce sexually must also be able to interbreed and produce fertile offspring.

One of Earth’s most valuable resources is its ***biodiversity.*** This resource is made up of these components, genetic diversity, species diversity, and ecological diversity.

**Objectives**

1. Students will investigate the diversity of plants and animals on small plot of land.
2. Students will compare their data with others in the class to conclude what factors influence the abundance or lack of diversity.
3. Students will explain the value of a diversity of life forms in a particular ecosystem.

**Equipment**

Part A:

measuring tape or yard stick copies of student pages

string or ribbon for marking plot boundaries pencils

clipboards or writing tablets tweezers

magnifying lenses

Part B: (per team) Paper and poster boards

**Directions**

1. Ask students what they think the word “diverse” means and have them share their thoughts about why “diversity” might be a good thing-both in nature and in human communities.
2. Tell students to imagine that they’re scientists from a planet called Deevoid. Deevoid has a similar atmosphere, climate, and mineral composition to Earth, but has very little diversity of life with only a few different species. Deevoid scientists have long hypothesized that the planet Earth is rich with a variety of life forms. To test this hypothesis, several teams of scientists have been sent on an exploratory mission to Earth. By studying the life on Earth, the Deevoid scientists hope to discover ways to improve the biodiversity and the quality of life on their own planet.
3. Explain that each team of scientists will study a plot for its variety of life forms. They will record and describe all the life forms they find. They can also draw conclusions about the diversity of life on Earth.
4. Explain that when the scientists arrive back on Deevoid, they will present their findings at a scientific conference. Since Earth organisms are completely unknown to their colleagues back on Deevoid, the scientists back on Earth must be careful to make detailed observations while on Earth. For example, they will want to record detailed information about what the organism look like, its size, where they found it, how it behaved, and so on.
5. Take the students outside and divide them into teams of four. Assign each team a study plot and hand out copies of the student pages.
6. Point out any possible hazards of the site. Tell students to avoid handling any creatures, and to be especially careful of ones like centipedes or wasps that could bite or sting. They should keep their hands away from the underside of any rocks and logs that they turn over. Also explain how to avoid any irritating or toxic plants. Finally, remind the students to take care not to harm any plants or animals, and to leave things exactly the way they found them.
7. Each team should first describe their study plot and predict what forms of life, if any, they expect to find and write this information on the data sheet.
8. Allow students ample time to examine their plots and record their data.
9. Once students have completed their biological survey, have them return inside to prepare their presentations to each other.

**Enrichment**

1. Write names of plants and animals on separate slips of paper. Mix them up, and let each person pick one. Tell the students to imagine they have a pen pal on a different planet. Have them write letters to their pen pals describing the animals or plants they picked. Afterward, have the students read their letters to the rest of the group (being careful not to say the name of the animal or plant). The “audience” should try to figure out the name of the organism the letter refers to.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Pollution Search**

*Here’s a way for your students to take a closer look at pollution: what it is, what its sources are, and what people can do to reduce it.*

**Levels Duration**

Grades 2-6 30-50 minutes

**Background**

Brown haze wraps around a city. Unwanted tires, appliances, and other refuse float in a stream. Oil washes up on a beach. All of these are examples of ***pollution***. Human-generated chemicals, noise, trash, and heat can all be pollutants, but so can ash spewing from an erupting volcano or smoke spreading from a forest fire. Pollution is any contamination of air, water, or land that affects the balance of the environment. Here’s an overview of three types of pollution- air, land, and water- and a look at pollution controls.

**Air pollution**-Automobiles, incinerators, coal-fired power plants, and factories release carbon dioxide, sulfur oxides, particulates, and other pollutants into the air. Fireplaces and wood-burning stoves add carbon monoxide, ash, and other pollutants to the atmosphere. Other major forms of air pollution include smog and toxins such as benzene, asbestos, and lead.

Air pollutants can cause health problems for people and other living things. Smog can make people’s eyes burn and damage their lungs. ***Acid rain***, caused primarily from the combination of water, oxygen, and atmospheric sulfur dioxide or nitrogen oxide, has poisoned lakes in certain regions, either killing fish or causing chronic stress that makes fish less able to compete for food and habitat. ***Chlorofluorocarbons (CFCs)*** in the stratosphere destroy the ozone layer, allowing more of the sun’s harmful ultraviolet rays to reach Earth, possibly leading to increased rates of skin cancer. Increased amounts of carbon dioxide and other ***greenhouse gases*** in the atmosphere may affect world climate.

**Water pollution**-Years ago, it was common for sewage treatment plants and industrial plants to discharge polluted waste into rivers, bays, and oceans. Known as “point source pollution,” this practice continues unabated in many parts of the world. In the United States, government regulations, voluntary pollution prevention by industry, and citizens’ awareness have helped improve waste disposal methods. As a result, in parts of the U.S., many rivers and streams that were once severely have been polluted have been revived.

Non-point source pollution is pollution that is wide-ranging; for example, fertilizers, pesticides, and oil from cars wash into waterways from streets and agricultural land. People should be aware that any pollutant released in a ***watershed*** or into the atmosphere will eventually find its way into the water cycle.

**Land pollution**-Everything we throw away needs a place to go. Solid wastes that do not contain hazardous materials can be moved to sanitary landfills (about 69% of our solid waste ends up here) or burned to ash in an incinerator and then put in a landfill. Many other items (glass, aluminum, paper, etc.) can be recycled (the U.S. currently recycles about 31% of its solid waste). Items like food scraps and yard waste can be composted, turned into organic material that can then be used as fertilizer for a yard or garden.

**Hazardous wastes**-flammable liquids, volatile or corrosive chemicals, and radioactive by-products pose special disposable problems. Certain hazardous materials can be incinerated; other must be sealed in long-lasting, leak-proof drums; and others, like radioactive waste which may remain hazardous for generations, must be secured underground in complex, concrete reinforced structures.

**Pollutions controls**-By definition, pollution is bad. However, some pollution is also unavoidable. Natural events that we can’t control, such as volcanic eruptions and decomposition in wetlands, can generate pollution. And much of our basic lifestyle generates pollution: producing goods, washing clothes, driving to work, watching television, growing food, rinsing things down the sink, fertilizing lawns, and so on. However, we can reduce the amount of pollution we produce by changing aspects of our lifestyles and by adopting new pollution-reducing technologies. For example, scrubbers in the smokestacks of coal burning power plants greatly reduce the amount of sulfur and nitrogen oxides such plants release. Wastes stored in properly designed and maintained facilities can also be kept out of water supplies. Technological advances in the auto and petroleum industries, such as improving fuel efficiency, development of hybrid vehicles and cleaner fuels, are leading to less polluting and energy consuming vehicles. By riding bikes or walking instead of driving, people can further reduce the pollution they generate.

**Objectives**

1. Students will identify forms of pollution and describe the effects that various pollutants can have on people, wildlife, and plants.
2. Students will describe relationships between various forms of pollution and human actions.

**Equipment**

Magazines scissors copies of student pages

Tape poster board

**Directions**

Neighborhood patrol

1. Ask students to describe what life would be like without clean air. What about life without clean water?
2. Ask students to list as many things as they can that might contaminate, or make unsafe, the air we breathe or the water we drink. List their ideas where everyone can see. Ask students what words people use to describe the types of things they’ve listed (“pollutants” or “pollution”). Discuss what the term “pollution” means.
3. Take students on a walk (outdoors or indoors) to look for and record pollution, pollutants, or pollutant sources of pollution. During your walk, have the students identify pollution they can see (liter, smoke); hear (honking horns, airplanes); or smell (diesel fumes, fresh paint). Alternatively, have students find examples of pollutions of land (litter, animal wastes), in the air (car exhaust), and in water (pollutants that could wash into storm drains). Have them create a data collection chart using the identified categories. As students spot different examples, have them explain how each one could pollute. What kinds of plants or animals (including people) could be affected by each one?

Also ask students what might have caused each form of pollution. For example, how did a piece of litter get on the ground? How did oil get on the pavement? Have students research pollution prevention strategies that are being implemented by local industries, community groups, government agencies, etc. (Students can create bar graphs depicting the number of pollutants they have recorded in each category.)

1. Back inside have students go over their data and check to see that they have at least one

example for each category identified earlier (sight, smell, sound; or air, land, water). They can continue their search by looking through magazines for other examples of pollution. As an option, have students to draw pictures of the pollution they identified on the walk.

1. Create a large chart on posters board or chart paper with columns for each different category of

pollution identified in step 3. Have students take turns placing the items they recorded into the pollution categories.

1. As a group, review and discuss the finished chart. Depending on the level of your group, asks

students some of these questions:

* 1. Do any of the same items appear in different categories? If so, do you agree with where those items were placed? Can something pollute two different things, such as air and water, or land and water? How?
  2. Can people always see, hear, or smell pollution?
  3. Which examples on the chart might affect people’s health? Which ones might affect plants or animals? In what way?

1. One at a time, point out several examples on the chart and ask students how each form of pollution might be prevented. (To prevent litter, people could dispose of their trash properly; to prevent oil leaks, they could keep cars in good running order; and so on.) Depending on the level of your students, you might also have them discuss the fact that we cannot prevent all pollution. Explain that we have developed technologies to reduce the amount of pollution we generate, and people are constantly working to develop new technologies.

**Enrichment**

1. Have students take digital pictures of the pollution they see around the neighborhood , and then use presentation software to create a slideshow about the various types of pollution and what can be done.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Sounds Around**

*Our ears are constantly being bombarded with sound-so much so that we automatically “tune out” a lot of it. Some sounds are “music to our ears,” while others can annoy us and even damage the delicate structures in our ears. This activity helps students “tune in” to the sounds in their environment and helps them identify and lessen local noise problems. They also learn how different sounds in nature have inspired cultural stories.*

**Levels**

Pre-K through Kindergarten

**Background**

Sound is a form of energy that travels in waves. Sound waves can be transmitted only when molecules (like air or water) are present. Sound energy causes molecules to vibrate and bump into each other, creating a wave that travels through the “sea of molecules.” If molecules are not present, as in outer space, sound waves cannot exist. That’s why space explorers must use radio transmitters to talk with each other when taking a space walk.

When sound waves reach our ears, they are funneled down the ear canal to the eardrum. The eardrum is a circular membrane that is stretched across the ear canal and vibrates when sound waves strike it. It separates the outer ear from the middle. The middle ear contains three tiny bones, the first of which is attached to the eardrum. Vibrations of the eardrum pass through three bones. The third bone rests on the cochlea, a structure in the inner ear.

Sounds vary not only in their loudness or softness-which is measured in decibels (dB)-but also in their pitch. Sounds with slower vibrations (or lower frequency) have a lower pitch, while those faster vibrations (or higher frequency) have a higher pitch.

**Objectives**

1. Students will identify sounds and map their location in the environment.
2. Students will explain how noise can be a problem in the community.
3. Students will create and carry out a plan to lessen a local noise problem.

**Equipment**

Copies of student page clipboards (or cardboard and paper clips or notebooks)

Paper noise meter or tape recorder

Crayons or markers

**Directions**

1. Ask the students about their experiences listening in the dark.
2. Have the students sit quietly in a circle (either in the classroom or outside) with their eyes closed to listen for sounds.
3. After a brief interval, ask them what they are hearing and what they think is making each sound. You can have them point in the direction each sound is coming from.
4. You can also have them imitate the sounds.
5. Have them create a journal and draw pictures of what they think made sounds.
6. Afterwards lead them in a discussion. What was their favorite sound? Which sound was the loudest? Which sound was the softest?

(Transferring the activity to the outdoors-- take the kids/group on a nature hike, have them stop and listen, with their eyes closed, to the sounds of the birds, squirrels, deer, the wind, anything in the nature. Have them identify what they hear. Speak about how bats use echolocation, how some birds sing higher and lower pitch, mimic calls, etc.)

**Enrichment**

1. Have students search for recordings of animal sounds on the internet. Listen to the sounds and compare their frequencies (high or low pitch) and loudness. Discuss how these sounds help the animals survive (eg. protection from predation).
2. Have students investigate how unpleasant sounds, like traffic noise, industrial noises, or loud music are controlled in the community. Have students find out whether your local community has a noise level ordinance and if so, discuss whether it's adequate.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

**Stream Studies: Creeking**

*Walk in the bottom ravine of our property where the creek runs. Depending on the season and amount of rainfall, students will be able to catch salamanders and crawdads. Nets, containers, and identification sheets make identifying all the critters easy. This field inquiry lesson will introduce students to many aquatic vertebrates, invertebrates, and to the concept that their presence or absence can help us determine the quality of the water in streams, rivers, lakes, and ponds. This activity will require students to use field equipment, take data, and draw conclusions with a focus on amphibians and macroinvertebrates.*

**Levels Duration**

Grades k-8 30-60 minutes

**Background**

As our most vital natural resource, water quality and quantity is a topic of great concern to many in Ohio now and will be to greater numbers of Ohioans in the future as they experience first-hand the effects of greater demands for water and greater impacts to water quality as human populations increase. As an initial exploration about water quality, this activity should lead to further investigation by educators and students about local water issues.

**Objectives**

Students will:

1. Use field equipment to gather and identify aquatic vertebrates and invertebrates
2. Take data on the number and kinds of aquatic vertebrates and invertebrates found
3. Draw preliminary conclusions about water quality based on the numbers and types of aquatic vertebrates and invertebrates found
4. Hypothesize about the effects on water quality of development in the watershed of the water body investigated

**Equipment**

Safe footwear for wading Bug Picking Data Sheet

magnifying glasses dichotomous key for educator use

ruler amphibian field guide for educator use

aquatic nets shallow pans for holding and separating specimens

dry erase marker

If students do not have safe footwear to get in the water, they may sample from shore.

**Directions**

1. Begin by discussing safety rules with students, making sure they understand the boundaries of the investigation.
2. Set the stage by discussing the ability of scientists to get a picture of the water quality by looking at the animals that live in the water, with some being very sensitive to pollution and other being very tolerant of most common pollution.
3. Discuss with students the roles vertebrates and invertebrates play in the aquatic ecosystem, providing an important link in the aquatic food chain. At this time, and during the investigation, teachers can also point out special adaptations different organisms have to live in the water, defense mechanisms, and how they get food. The aquatic insects are generally the larval form of adult insects that will have wings. Discuss metamorphosis and life cycle of insects and amphibians.
4. Collection: Demonstrate how students will turn over rocks in the water and return them to their original position. Demonstrate how to use nets to find various vertebrates and invertebrates.
5. Identification and organization: Demonstrate how students will look through debris in the nets to find the small animals and then place them in containers, categorizing them as much as possible by their different physical characteristics.
6. Monitor students closely as they work to discover organisms and to divide them into categories. Help students compare the organisms they find to the ones found on the “Bug Picking Data sheet,” noting on the data sheet which ones were found.
7. When time for looking in the stream is up, ask students to gather together to summarize what they have found and draw conclusions about the probable water quality of the stream, using the questions below as a guide.

Did you find animals that are pollution-sensitive? (Group 1)

None

1-3 species

More than 3 species

Did you find animals that are somewhat-sensitive? (Group 2)

None

1-3 species

More than 3 species

Did you find animals that are pollution-tolerant? (Group 3)

None

1-3 species

More than 3 species

**Conclusions**

**(Remember that the data you are taking will not give conclusive evidence of clean or polluted water, but might indicate the need for further investigation).**

1. What conclusion can you draw if you found species in Group 3, but not in Groups 1 or 2?
2. What conclusion can you draw if you found several different species in each of the groups?
3. What could be happening upstream, on land around the water upstream, or in your present location to affect the water quality where you are sampling?

This water appears to be:

Not polluted/Okay/Polluted

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**The Closer You Look**

*All students, no matter how young, have an idea of what a tree looks like. But, many are unfamiliar with the actual structure of a tree. In this activity, your students will go outdoors or view pictures to take a closer look at trees and their parts.*

**Levels Duration**

Grades Pre-K – 6 50 minutes

**Background**

There’s a lot of variety in the more than 50,000 kinds of trees in the world. For example, some trees tower more than 360 feet (110 m) high, like coastal redwoods, and some reach only 15 feet (5 m), like bluejack oaks. Tree leaves may be needle-shaped, broad and flat, or made of little scales. Tree bark may be smooth, rough, shaggy, or deeply furrowed. Branches may spread out to form a huge, broad crown or may rise narrowly like a column.

**Objectives**

1. Students will understand how observation increases knowledge of tree structure and form.

**Equipment**

Drawing paper

Crayons

Markers

(Tree cookies would also work great for this, as well as internal part identification-- explain heartwood, xylem, cambium, phloem, and outer bark. As well as looking at leaves under microscopes… if the material is obtainable. Bark and leaf rubbings would be good, easy outdoor edition)

**Directions**

1. Give the students drawing paper and crayons or markers. Have students close their eyes and picture a tree. Encourage them to think about the overall shape of the tree, how the branches are connected, and the texture of the trunk and leaves. Ask them to draw a picture of the tree from memory. Tell them to save their pictures for later.
2. Explain to the students that they are going to take a closer look at trees and later they will use their observation to draw a new picture of the tree. Ask them to list different features they might look for when they make their observations. You may use the questions below to guide them. Depending on the level of your group, you may want to use these questions to create a worksheet for your students to use. Students can take notes or make sketches as they make their observations.
   1. What shape is the trunk? Is it tall and straight, or bent and gnarled? Is there only one trunk or do several trunks come out of the ground near the same spot?
   2. What color is the tree’s bark? How does it feel? How does it look?
   3. What shape are the tree’s branches? Are there any thorns or other things on the branches or twigs?
   4. What shapes are the tree’s leaves? What color are they? Where are the leaves on the tree’s branches? (Only at the tips? All along the branches?) Do leaves grow in groups or singly? How do they feel?
   5. Are there any seeds, flowers, fruits, nuts, or cones on the tree?
   6. What shape is the tree’s crown as a whole? (Round, pointy, shapeless, oval?)
   7. What other plants or animals live on or live in the tree?
3. Take the students outside and have them examine the trees you located in “Getting Ready”, or have them examine the tree pictures you collected. (Encourage students to pick a tree that is similar to the one they drew in Step 1.)
4. When the students have finished their observations, have them draw a second tree picture. Encourage them to include as much detail as they can.
5. Hang each student’s pair of drawings (from steps 1 and 4) around the room. Let students walk around as they compare and contrast each pair of drawings. What new details, for example, appeared in the second drawing? Was anyone’s second picture radically different from the first? Have students compare and contrast drawings done by different students. What characteristics were similar?

**Enrichment**

1. Have students make a model of a tree using construction paper, toilet paper rolls, straws, aluminum foil, tissue paper, and the like. Students should include and label all the tree parts they’ve learned about. Encourage them to be as creative as possible while still being accurate.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Learning Tree*

**Trees as Habitats**

*From their leafy branches to their tangled roots, trees provide a habitat for a host of plants and animals. In this activity, your students will inventory the plants and animals that live in, on, and around trees and discover how plants and animals depend on trees in many ways.*

**Levels Duration**

Grades 3-8 50 minutes

**Background**

A habitat is the place where a plant or animal gets all the things it needs to survive, such as food, water, shelter, and space for having and raising offspring. A habitat maybe 100 square miles (259 km2) of grassland for a lion or a single plant for an insect. A tree may serve as part of an organism’s habitat, or it may be the organism’s entire habitat. For example, an oak tree may provide food for squirrels or nest sites for crows. But lichens and moss get everything they need right on the tree.

Even snags or standing dead trees, provide habitats for a number of different species. Tree frogs and beetles live under a snags bark. Woodpeckers and other birds feed on the insects that live in snags. Chickadees nest in cavities created by woodpeckers. Squirrels and deer mice store food in them.

**Objectives**

1. Students will describe ways animals and plants depend on trees for survival and, in turn, influence trees.
2. Students will identify interrelationships between the organisms using a tree.

**Equipment**

Chart paper

clipboards or cardboard with paper clips

(optional: field guides for trees, shrubs, insects, or birds; hand lens; bug boxes; binoculars)

**Directions**

Life in a Tree

1. Take students outside and show them a tree. Ask them to name some plants and animals that might depend on the tree. List their answers on the chart paper.
2. Tell the students that they are going to study the tree to find out which plants and animals depend on it or use it in some way. Explain that they should try to determine which animals (including humans) only visit the tree, and which plants actually live on it or in it. They should watch for clues and signs such as chewed leaves, holes in the bark, or carved initials. They should be sure to record where on the tree they find either living things or  signs of life.
3. Distribute paper, pencils, clipboards, and hand lenses or bug boxes. Students can work individually or in teams to examine the tree. Encourage them to draw pictures of all the plants and animals they find, especially those they cannot identify. Also encourage them to use their sense of hearing to find plants and animals.
4. You may want to have field guides on hand to help students identify the organisms they find. You may also want to give them binoculars so they can get a closer look at life in the tree tops.
5. Back in the classroom, have the students organize their collected information into a booklet, portfolio, or other format. You might suggest organizing the data by type of organism; by where on the tree the organism is found (roots, trunk, or leaves); by whether it visits the tree or lives on it; or by any other classifications. Have students identify how each plant and animal they observed in Step 3 benefits from the tree, and how it affects the tree. They may need to make more observations of their tree or collect more research about the plants and animals they observed. Encourage students to make charts, tables, or graphs that illustrate their findings.
6. Have students or teams present their data to the rest of the group. You can record each group’s data on the board, and set up tables or graphs that summarize the entire group’s findings afterward. Discuss these questions with the students:
   1. What did you find on the trees trunk?
   2. What did you find in the trees branches?
   3. How might the tree be affected by the plants and animals that live on it? Which of these organisms seemed to have harmed the tree? Do you think any of the plants and animals observed seem the have benefit the tree? In what way?

**Enrichment**

1. Give students opportunities to examine their tree or structure at other times during the year. Then ask them to compare their findings from season to season or to work together on a “Tree (or Structure) Habitat” manual.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Aquatic Wild*

**Water Canaries**

*What are the “water canaries” telling you about local water quality?*

**Levels Duration**

Middle & High School (Grades 6-12) Approximately 45 minutes

**Background**

In the early days of coal mining, canaries were brought into mines to be used as indicators of the mine’s air quality. Because canaries are more sensitive than humans to the presence of dangerous gases in the air, their discomfort or death indicated that the air was not safe to breathe. Although this practice no longer exists, it stands as an example of how animals have differing sensitivities to environmental factors. In streams and ponds, the presence or absence of certain organisms, called indicator species, reveals much about water quality. These creatures make up a biotic index (number of living organisms found in an ecosystem). Water with numerous aquatic species is usually a healthy environment, whereas water with just a few different species usually indicates conditions that are less than healthy. The word healthy is used to indicate an environment supportive of life. Pollution generally reduces the quality of the environment and, in turn, the diversity of life forms. In some cases, the actual biomass (the mass of living organisms) will increase because of pollution, but the diversity is compromised as a result of the limited number of types of organisms that can withstand polluted conditions.

**Objectives**

1. Students will identify several aquatic organisms, and
2. Assess the relative environmental quality of stream or pond using indicators of pH, water temperature, and the presence of a diversity of organisms.

**Equipment**

Species i.d. books student worksheets sampling equipment (i.e. nets)

Containers pH testing kits thermometer

white tray tape measure

**Directions**

1. Before the activity, select a small, fairly shallow, slow-moving stream or pond near your school or organization as the sampling site for this activity. Be sensitive to the impact students may have on stream banks and beds, spawning and nesting sites, and vegetation. Have students establish ethical guidelines for their sampling activities. If the stream is not a public site, be sure to obtain permission to visit the site. Advise students in advance to dress for the setting-old shoes and shorts or jeans would be best. **NOTE**: If a site is not possible, modify the activity to be conducted in the classroom.
2. At the sampling site, brief students on habitat courtesies, working from the students’ own list of ethical guidelines for sampling activities. Instruct them on how to minimize the potential for damaging forms of habitat and encourage care in their collecting techniques. Emphasize that all wildlife are to be returned to their habitat unharmed. Educators may choose whether to take some organisms back to school for further study.
3. Begin the activity by observing the water. Identify organisms on the surface and below. Using equipment (nets, trays, sieves, etc.), have students collect, as many different forms of animal life as possible. Ask them to be alert to differing micro-habitats near rocks, in riffles, and in pools. Place the animals to be observed in the white trays for viewing and drawing. The whiteness of the trays allows detail to be seen in the animals collected. Keep an adequate amount of water in the trays, and place them in a cool, shady spot. Change the water as often as needed to keep the animals cool. This is a good time to use the microscope , if available.
4. Using a species-identification book or mobile application (see [***www.projectwild.org/aquatic***](http://www.projectwild.org/aquatic)for more resources), have students identify and draw on *Student Worksheet I* the animals they observed in the aquatic environment and those temporarily removed for observation in the collection containers. Ask them to fill in the number of each kind found and to describe the actual location where the animal was found. Once these observations are completed carefully return the animals to their natural habitat. **NOTE**: If you choose to take some some of the animals to the classroom, be sure there is adequate water as cool as that in the natural setting. To have the entire class view the organisms, place the organisms in petri dishes or any shallow dish. Then use an overhead projector, projection microscope, or video camera with projection equipment to project the images onto a screen or wall.
5. Encourage students to discuss their observations. How diverse were the aquatic organisms? Introduce the concept of diversity, and explain that a variety of different kinds of plants and animals is usually an indication of a healthy ecosystem.
6. Now it is time to test the water at the field site for other indicators of quality. Using the water quality test kit, have students determine the pH and the temperature of the water as well as the air temperature. If you chose to measure the amount of dissolved oxygen as indicated in Extension 1, include those values with water temperature and pH. **NOTE**: Many educators are not able to have students measure the dissolved oxygen (DO) because of the difficulty for younger students. If it is possible, measuring DO contributes greatly to the overall picture of water quality. These data need to recorded on *Student Worksheet II*. Educators may also choose to have students measure stream velocity, which can be accomplished by timing a floating object (e.g., a ping pong ball) as it travels a known distance (e.g., 10 feet).
7. Discuss with students how the values for pH, water, and air temperature affect the diversity of life forms found in aquatic environments. Ask whether they would except the same variety of life in other locations. Help them to understand that predictions of animal diversity can be made from measurements of pH and water temperature (see *Aquatic Conditions Fact Sheet*). Likewise, certain indicator species can also disclose information about pH and water temperature. **NOTE**: A simple water quality test kit can be obtained from scientific supply houses with high school biology supplies. Often a Hydrion or Hach kit can be borrowed from a high school biology teacher. A local wastewater treatment facility may have kits that you can barrow. Local universities or wildlife agencies may also have aquatic insect kits. Ideally, this activity could be repeated at other sites with different characteristics. Biologists examine hundreds of sites with different characteristics. Biologists examine hundreds of sites in order to understand and predict what is happening in natural systems. If another site is visited, it might be useful to divide the class into two groups with one half doing worksheet I and the other half doing worksheet II. When each group is finished, students could come together and mutually predict what the other group had found.
8. Summarize the study with a re-emphasis on the fact that diversity of animals is a useful indicator of habitat quality as well as an overall indicator of environmental quality.

**Evaluation**

1. Draw a simple illustration of one or more of the following organisms: Asellus (water sowbug), water strider, caddisfly larva, crayfish, scud, *Daphnia*, leech, mayfly nymph, midge larva, stonefly nymph, or dragonfly nymph. Identify each organism by writing the correct name beside the picture.
2. You found a trout in a stream with a large variety of other organisms. Predict ranges you would expect to find of pH and water temperature.

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

*Lesson plan adapted from Project Wild pg. 44*

**Where Does Water Run?**

*Take a closer look at what happens when it rains.*

**Levels Duration**

Middle and High School (Grades 6-12 Approximately 45-60 minutes

**Background**

Developing an understanding of precipitation and runoff is an important part of understanding the water cycle (see Diagram A). Rainfall is one form of precipitation and represents one way water re-enters aquatic habitats. Once rain falls upon a surface, water begins to move both laterally outwardand vertically downward. The vertical movement of water, called infiltration, allows water to seep into the soil and porous rock and to recharge groundwater supplies.

The lateral movement of water is runoff, which eventually flows into streams, rivers, lakes, and the ocean. Runoff is the predominant way water flows from one location to another. Runoff waters are necessary to renew many aquatic habitats that depend on inflow of water; for instance, runoff prevent lakes from shrinking because of evaporation or streams from flowing below minimum levels.

Water pollution is often blamed on discharge from pipes; however, runoff can also be a major carrier of pollutants into streams, lakes, rivers, and other aquatic systems that eventually empty into coastal waters. As water moves across streets, fields, parking lots, it picks up litter; paint, oil, garden insecticides, bacteria and nutrients from livestock, and other contaminants. These widely dispersed pollutants are known as nonpoint source pollution and can affect the wildlife and plants living in aquatic ecosystems.

Impervious surfaces such as paved areas, buildings, and compacted soil do not absorb water. Reduced infiltration can greatly affect the surrounding vegetation and the underlying groundwater. With less water seeping into the soil, more water runs off. The more impervious area becomes, the greater amount of runoff.

Although water runoff helps maintain aquatic ecosystems, too much can have detrimental effects. An increase in the quantity and velocity of runoff increases soil erosion, flash flooding, and the potential for water to pick up and carry pollutants. More pervious surfaces, such as natural areas with well-rooted vegetation, allow water to infiltrate the ground.

Water erosion is the wearing away of soil and rock as water moves across it. Improper agriculture, development, and landscaping practices result in soil being washed away. Runoff transports soil sediments to local streams and other surface waters. Sediment can settle in lakes, streams, and rivers or ultimately be carried to the ocean. Too much sediment makes the water murky and prevents sunlight from penetrating the water, which affects plant growth. Sediments can fill in important habitat at the bottom of lakes and reduce lake volumes. They can also clog the gills of fish and affect other aquatic wildlife.

Excess runoff can cause flooding. In areas with buildings, high proportions of paved surfaces, piped drainage systems, over 80 percent of rainfall can become runoff. Steps can be taken to reduce runoff, which flood risks. A few examples of measures towns can adopt includes: permeable or porous pavements for roads and parking lots; retention basins (an artificial lake surrounded by vegetation that helps to hold runoff and prevent flooding); infiltration basins (vegetated depressions that can catch runoff from impermeable surfaces and slowly filter it back into groundwater); and wide buffer strips of deeply rooted natural vegetation along paved areas.

Schools and homeowners can reduce runoff by installing rain gardens and rain barrels (for ideas and resources, visit [***www.projectwild.org/aquatic***](http://www.projectwild.org/aquatic)). Trees, shrubs, and other plants around homes and schools increase infiltration and reduce direct runoff into streams and rivers.

This activity helps students better understand the connection between runoff and the health of aquatic ecosystems. It also encourages them to think about ways to excess runoff can be controlled to benefit the environment.

**Objectives**

1. Students will calculate or research rainfall.
2. Students will measure a study site and calculate impervious cover.
3. Students will develop and write questions and detailed procedures for investigating runoff.
4. Students will collect organize, and analyze data to draw conclusions.

**Equipment**

Notebooks computers graph paper yard sticks

Twine watershed map local rainfall data

**Directions**

1. Discuss the following questions with the students:
   1. How much rain falls here?
   2. How much rain falls at any one time?
   3. Where does water go after a heavy rainfall?
   4. Why does it matter where the water goes?
   5. Does the type of surface that rainwater falls upon affect what happens to water once it lands?
   6. Does falling water affect various types of ground surfaces in different ways? How so?
2. Introduce the “Terms to Know,” such as pervious and impervious surfaces, infiltration, sediment, and nonpoint source pollution. Have students define each term using appropriate resources (online or hard copy dictionaries, science texts, or other reference materials). Discuss the relationship of these concepts and their importance in understanding the health of the local ecosystem.
3. In class or as homework, have students research the annual rainfall for your region, including amounts of rain (in centimeters, meters, or inches), as well as any patterns such as more rain during specific times of year. Students may use various reference materials including:
   1. Annual rainfall data (such as the 30-year average)
   2. Last year’s rainfall
   3. Local report of individual precipitation events (Does most of the annual rainfall occur during a few heavy rains or a greater number of light rains?)

**NOTE:** For long term projects, students can also measure precipitation over a time period using a rain gauge.

4. Students should also research the path water flows as it travels from the vicinity of your study site to the ocean. Students may use maps, books, or online sources such as aerial or satellite images, watershed maps, or topographic maps, In their science notebooks, students can list and/or sketch the names of streams, rivers, or other bodies of water, in the order by which the water flows.

5. Revisit the questions from Step 1. Can students expand their answers to these questions? What information/evidence do they have to support their answers?

6. Discuss plans to further investigate the flow of water on the school grounds or at a local site. Ask students what questions they would like to explore about runoff on the study site. Record questions on a board of flipchart. “Big picture” questions that may arise during class discussion include:

a. How does the flow of water affect plants, wildlife, and people in our region?

b. How does the type of surface or surfaces on our study site affect the environment?

c. How do human activities in our region affect water quality?

d. How do human activities affect wildlife?

7. Prepare to conduct the “Initial Mapping Activity” (as described on the following pages). Explain to students that in order to explore questions they may have about water on their study site, the first phase of the investigation will involve mapping the site to determine the amount of pervious and impervious surfaces and the amount of potential runoff. This knowledge can then help students in further articulating other research questions.

**Evaluation**

1. Have students list other questions they generated during the field investigation that they did not explore. Which of these questions are researchable? How would they find the answers to these questions?
2. Ask students to explain how their conclusions relate to environmental stewardship. Why might it be important to know what was learned? How can knowledge of runoff and types of ground cover be applied to environmental management?
3. What can students do to help reduce problems that are sometimes associated with runoff, such as nonpoint source pollution, erosion, lower recharge rates of groundwater supplies and flooding?

National Whitetail Deer Education Foundation



& Deerassic Park Education Center ®

**Wonders of the Whitetail**

*Students visit our live deer herd and learn fascinating facts about the whitetail deer, including its interrelationship with humans throughout history, life cycle, and habits.*

**Levels Duration**

Grades k-8 15-30 minutes

**Background**

The state mammal for Ohio, the whitetail deer has been ingrained into the lives of Ohioans for centuries. Traditionally used as a food source by humans, the population of this species has been kept under control since the loss of their main predators from the state. Hunting seasons are particularly important to local economies of the state, so it is important for Ohioans to understand and respect this incredible animal.

**Objectives**

Students will:

1. Learn the different names for male, female, and young deer, which deer have antlers, and why they the name “whitetail”
2. Discuss modern day population issues and learn about carrying capacity
3. Understand the different types of habitats that deer can inhabit and why
4. Learn about deer lifecycles and what they eat
5. Students will become detectives and learn of the different signs whitetail deer leave in areas that have inhabited
6. Students will have the opportunity to see and touch live whitetail deer

**Equipment**

Antlers (Deerassic Deer Trunk) chewed antler (Deerassic Deer Trunk)

deer skin (Deerassic Deer Trunk) fox fur (Deerassic Deer Trunk)

deer fur (Deerassic Deer Trunk) coyote fur (Deerassic Deer Trunk)

deer bones (Deerassic Deer Trunk) buckeye nuts (Deerassic Deer Trunk)

Powerpoint (inside lecture only) Photos of deer (outside lecture only)

Oh! Deer! Instructions

**Directions**

1. Begin by discussing safety rules with students, making sure they understand the boundaries of the investigation (loud noises will scare the deer, approach them slowly, etc.).
2. Show students pictures of deer and ask if they can identify the differences between males, females, and young. Ask if they know the names. Elaborate on what antlers are, which deer have them, and the purpose of them. Explain why they are called whitetails.
3. Discuss history in Ohio and what has changed over the years. Many historical predators no longer live in the state (bear, wolves, etc.). Ask students if they or their families hunt and discuss carrying capacity (play Oh! Deer! – Project Wild – if time allows). Humans are doing their part of maintaining a healthy deer herd.
4. Where do deer live? Deer are generalists and can adapt to many different kinds of habitat. Ask students what they like to eat and compare it to what deer like to eat.
5. Explain deer life cycle and how bucks lose their antlers. Discuss what happens to shed antlers and show the chewed antler.
6. Ask students if they know different signs of whitetail (rub, scrape, tracks, scat, etc.).
7. Discuss the deer herd on the Deerassic Property. How many deer? What do we feed them? Explain that deer only need 5 acres of land to survive. Explain why they have tags. Explain how we received the deer and that they are not taken from the wild.
8. Invite students to touch the furs and antlers and offer to answer any questions they may have

**Conclusions**

1. Check for understanding of objectives