



Habitats of North Dakota

Supplemental Activities

Compiled by Sherry Niesar





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2023

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How to Use This Activity Guide

The Habitats of North Dakota Activities Guide is an instructional resource for educators who want to enrich their Habitats of North Dakota curriculum. It can be used by anyone who wants to learn more about the Habitats of North Dakota. It can be used with the HND or as a standalone resource.

Supporting Standards

The activities are intended for use in the classroom and informal settings. The instructional materials are designed to support North Dakota Academic Standards appropriate for grades K-12. The activities can easily be adapted to meet the learning requirements. The activities may be integrated into existing curriculums, or an entire set of activities may serve as the basis for a specific course.

Organization of Materials

The HND Activities Guide is divided into three sections: (1) What is Habitat (2) Adaptations (3) Humans and Habitats and (4) Making A Difference.

Section One: What is Habitat?

Activities found in this section are lessons that focus on the five different habitats found in North Dakota.

Section Two: Wildlife Communities

This section explores the different wildlife species found in North Dakota.

Section Three: Adaptations

This section introduces different animal adaptations and how they help animals survive.

Section Four: Humans and Habitats

Activities found in this section focus on how humans, wildlife and habitats interact.

Section Five: Making a Difference

Activities found in this section are designed to take students from understanding scientific concept to implementing action to establish habitat.

Organization of Each Activity

Each activity includes a statement of the instructional objective, background information, a list of materials, any preparation educators need to do prior to completing the activity, step-by-step instructions, and extensions or additions to the activity.

About the Student Page

Student pages are designed to be reproduced and used in the classroom by students to organize information, record data or complete the lesson. Use them as they are or as a model.

Additional ND Game and Fish Department Resources

The North Dakota Game and Fish Department has many resources that can be excellent supplements for these activities. Print and online resources are found at: <https://gf.nd.gov/publications>.

The Department also has Wildlife of North Dakota trunks available at district offices and local educational cooperatives for check out at no cost. For more information on this resource visit: <https://gf.nd.gov/education/classroom-aids>

What is Habitat?

In this section you will find activities about the 5 unique habitats in North Dakota.



Exploring Habitats

Objectives: Students will identify 5 major habitats in North Dakota and become acquainted with wildlife species, plant communities and threats to each habitat.

Summary: Students will conduct a survey of a North Dakota habitat using the Habitats of North Dakota guides. Information is recorded on a student page and presented to the class

Background: Each habitat is comprised of food, water, shelter and space, regardless if the habitat is terrestrial or aquatic. In addition to these five components of habitat, each of the components need to be in the proper arrangement. For example, any habitat that floods would have water, but is the amount (or arrangement) of the water proper for that habitat? The answer is no.

In each of the Habitat books, there are three sections. The first is an introduction section. In the introduction section, it contains where that habitat is found in North Dakota, how it was formed and what plant species you will find there. In the Badlands book, you will also find information on fossils.

The second section is all about wildlife. You will find descriptions of different birds, mammals, reptiles, amphibians, insects and aquatic life in the Riparian and Wetland books.

The third section is all about conservation of that habitat. You will learn about threats to the habitat and conservation efforts.

Procedure: Explain the different sections of the habitat guides, highlighting what students can find in each section. Divide your class into five groups - one for each habitat. Each group will select a habitat and one animal for the group to learn about. There should be no duplications in the wildlife species in the animal selected by each group. Give students time to fully research their habitat and wildlife species. Have students use the appropriate Habi-

tat book to find answers for their research. Once the research is complete, have each group present their information to the class.

Assessment:

Students will name all five North Dakota Habitats.

Students will identify wildlife species associated with each habitat.

Students will explain threats to habitats.

Extensions:

Once the graphic organizer is complete and students are familiar with their topics, have them create a poster, diorama or multimedia presentation instead of an oral presentation.



Grade: 3-8

Subjects: Life Science, language arts, geography

Habitats: Prairie, wetlands, woodlands, riparian, badlands

Supplies: Pencil, pen

Setting: Indoor

Vocabulary: Adaptations, predator, bioaccumulation, water cycle, habitat, threat, conservation

Student Pages: Exploring Habitats

Student Page: Exploring Habitats

1. Description of Animal
How is this animal suited for its primary habitat?

2. Food Sources



Name of Animal: _____

Animal's Primary Habitat: _____

Description of Primary Habitat: _____



3. What are the threats to the primary habitat?
-How do these threats affect your animal?

What Type of Wetland

Objectives: Students will learn the different types of wetlands and their uses.

Summary: Students will research different type of wetlands, their benefits, plants and wildlife found in each and illustrate a wetland type based on their research.

Background: Prairie potholes or wetlands are found most often in the Upper Midwest, especially North Dakota, South Dakota, Wisconsin and Minnesota. This formerly glaciated landscape is pockmarked with many potholes, which fill with snowmelt and rain in spring. Some prairie pothole marshes are temporary, while others may be essentially permanent. Here, a pattern of rough concentric circles develops. Submerged and floating aquatic plants take over the deeper water in the middle of the pothole while bulrushes and cattails grow closer to shore.

In the Upper Midwest, because of its many shallow lakes and marshes, rich soils and warm summers, is described as being one of the most important wetland regions in the world. The area is home to more than 50% of North American migratory waterfowl, with many species of birds dependent on the potholes for breeding and feeding. In addition to supporting waterfowl hunting and birding, prairie potholes also absorb surges of rain, snowmelt and floodwaters, thereby reducing the risk and severity of downstream flooding.

Procedure: Have students research the types of wetlands using the Wetlands Habitat Guide. Their research should include a list of the wetland types, a description and benefits of each type of wetland. You may wish to use the student page to help them organize their research findings.

Have students identify different species of plants and wildlife they would find in each wetland type.

Assessment:

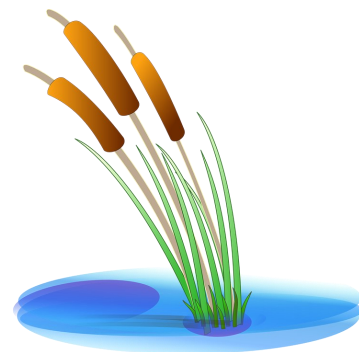
Name the different types of wetlands found in North Dakota.

Name the benefits of each wetland type.

How would the wildlife and area surrounding a seasonal wetland be affected if the wetland was destroyed?

Extensions: Have students draw wetland types, including all elements of the Student Page.

Have students create a food chain/web using information found on the Student Page.



Grade:3-12

Subjects: Life Science

Habitats: Wetlands

Supplies: Paper, pen, pencil

Setting: Inside

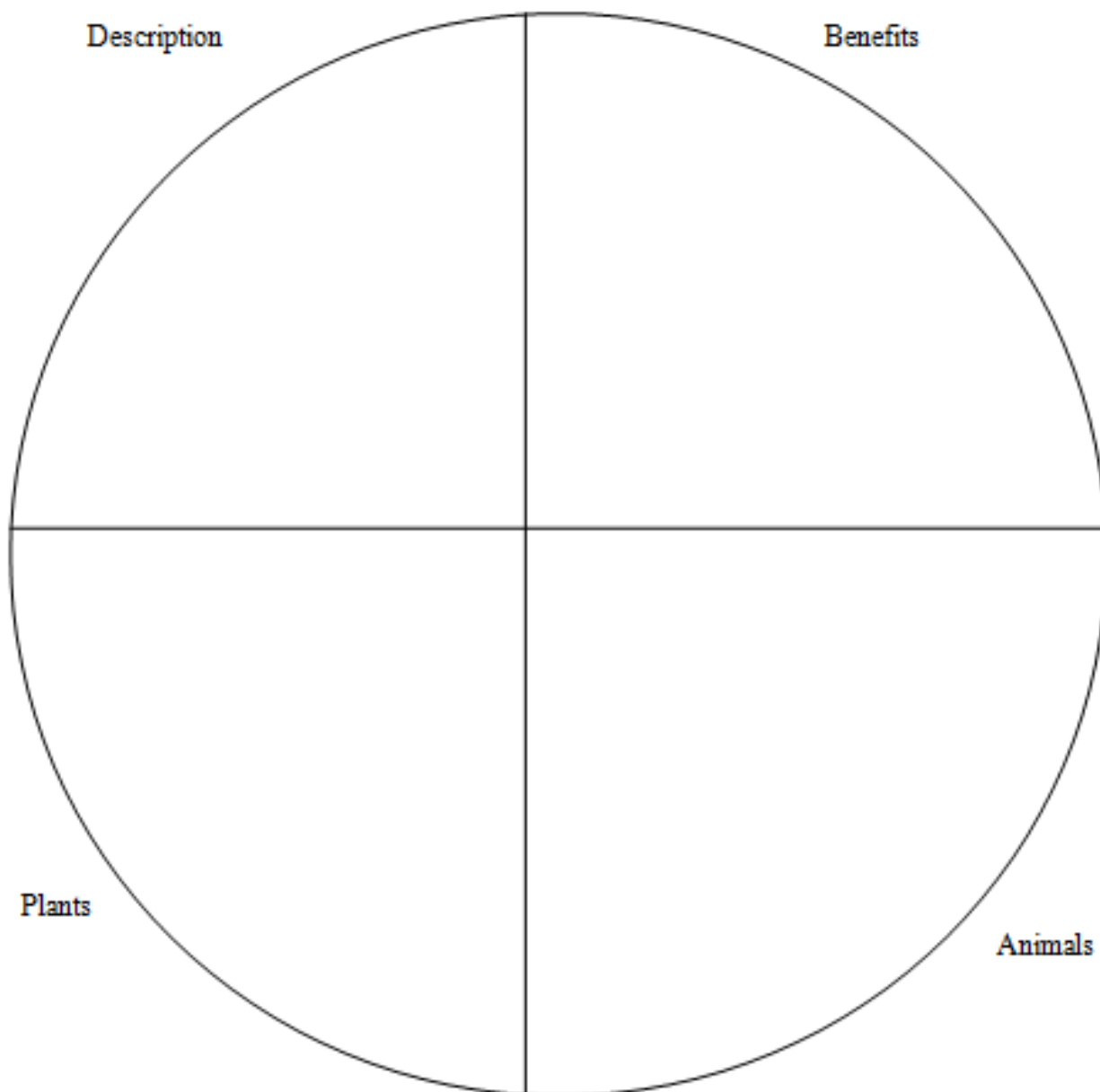
Vocabulary: Wetland, prairie potholes, glacier, waterfowl

Student Pages: What Type of Wetland

Student Page: Wetland Type

Wetland Type _____

Wetland Description _____



A Tree is Habitat

Method: Students will examine trees as a separate habitat for wildlife through observation, writing, and drawing.

Objectives: Students will identify different tree species and the wildlife species that use the trees.

Background: Familiarize students with different parts of the tree and the functions they perform. Trees come in various shapes and sizes, but all have the same basic structure. They have a central column called the trunk. The bark-covered trunk supports a framework of branches and twigs. This framework is called the crown. Branches in turn bear an outside covering layer of leaves.

A tree is anchored in the ground using a network of roots, which spread and grow thicker in proportion to the growth of the tree above the ground. In a mature tree, most of the cells of the trunk, roots, and branches are dead or inactive. All growth of new tissue takes place at only a few points on the tree, by the division of specialized cells. These actively growing areas are located at the tips of branches and roots and in a thin layer just inside the bark. Lastly, trees have reproductive structures, either flowers or cones.

The average growth varies by tree, so check to see what you should expect.

There should be no dead or broken branches.

You can test branches by gently bending them. Living branches will be supple and bend easily. If the branch is dead, it will snap.

The bark should not be loose or peeling in most cases. Exceptions include some species of birch and eucalyptus trees. There should not be fungi growing on the trunk. Trees can be damaged when using garden equipment around trees. The damage to the trunk can leave an open wound where insects and diseases will attack. There should not be large cracks or holes. When a tree is stressed, a common sign

is wilting. The leaves and stems will lose their rigidity and begin to droop. A good indicator of poor tree health is the leaves.

Make sure they are the right color for the season you are in. They should not be stunted or irregularly shaped. These all can be signs of nutrient deficiencies, insect damage, watering problems, pesticide damage and diseases.

Other causes of poor tree health include insects and diseases. Some warning signs to look for include insects visible on tree, lack of fruit or flowers, holes in bark, branches, or leaves, growths on branches, oozing sap, or wilting

Trees can be identified by using field guides from assorted sources, tree cards from the North Dakota Game and Fish Department or an app for your smartphone.

Trees provide homes and habitat for many species of wildlife. They are nesting spots for songbirds, sources of food for birds, mammals and insects, they provide shelter and also through the process of photosynthesis, provide oxygen for all living things.

Procedure

Grade Level: 3 - 7

Subject Areas: Science, language arts, environmental science, visual arts

Materials: Paper, pencil, crayons, colored pencil

Setting: Outdoors

Vocabulary: tree trunk, canopy, leaf, deciduous, evergreen

Student Pages: Trees

Organize students into teams of two to four students. Each student team should have a tree guide to identify their tree, paper and writing materials. Once the class reaches the area to investigate, have each team select a different tree to work with.

Using the student page, have students sketch the tree, making sure they include the canopy, trunk and flowers or berries if they are visible. Students may also want to do a bark rubbing with a crayon to display the pattern and texture of the bark of the tree on the trunk.

Now students should examine the tree from as many different perspectives as possible: underneath, close up, at a distance and all four cardinal directions (north, south, east and west). When examining the tree students should determine if the tree is healthy or not and explain why. While examining the tree, look for signs of wildlife. Include animals in the tree and clues that they have left behind. Clues can be nests, droppings, feathers, fur, and any damage wildlife inflicted on the tree.

Now that students are very familiar with the tree, have them identify it using their reference materials.

Have students write down 10 words to describe the tree. They can include what the tree looks like, color, texture, smell or how the tree makes them feel. These words can then be worked into a paragraph describing the tree.

Now that all the students have completed their student sheets, have them share with the class what they have learned about their tree including the name of the tree, what makes it unique, signs of animal life, if the tree is healthy and the paragraph they wrote about the tree.

Assessment

Have students identify different species of trees using classroom field guides.

Explain how trees benefit both wildlife and man and why they are important.

Extensions

Visit the trees several times during the year. During each visit describe any changes since the last visit. To help document the changes, take photographs during each visit.

Keep a record of the season changes in the tree. Make note of changes such as when the leaves begin to fall, when the leaf buds form in spring or when the seedpods ripen.

Additional Resources:

Trees of North America: a field guide to the major native and introduced species north of Mexico by Christian Frank Brockman, Rebecca A. Merrilees. St. Martin's Press (2001)

The Illustrated Encyclopedia of Wildflowers & Trees of North America By Tony Russell - LORENZ BOOKS (2011)

National Wildlife Federation Field Guide to Trees of North America by Bruce Kershner, Craig Tufts, Gil Nelson, Daniel Mathews, Richard Spellenberg, Terry Purinton. Sterling (2008)

A Field Guide to Trees and Shrubs: Northeastern and North-Central United States and Southeastern and South-Central Canada By George A. Petrides - Houghton Mifflin Harcourt (1973)

National Geographic field guide to the trees of North America By Keith Rushforth, Charles Hollis - Na-

tional Geographic (2006)

North Dakota Trees & Wildflowers: An Introduction to Familiar Species By James Kavanagh - Waterford Press (2010)



Student Page - Trees

Bark Rubbing

Drawing of Fruit and Flowers

Drawing of Tree

1. Name of tree species _____

2. Is the tree healthy? Describe your observations.

3. Write 10 different words that describe your tree.

- | | |
|----|-----|
| 1. | 6. |
| 2. | 7. |
| 3. | 8. |
| 4. | 9. |
| 5. | 10. |

4. Write a paragraph about your tree using the 10 words you wrote down to describe your tree.

5. Examine the tree ecosystem. List below all the living and nonliving things on and around the tree that comprise your tree's ecosystem.

Living and evidence of living things	Non-Living Things

Exploring Badlands

Objectives: Students will learn the different badlands land forms and the species of animals found in each landform

Summary: Students will construct a poster based on research of the different habitats found within the North Dakota Badlands.

Background: The Badlands habitat found in western North Dakota is not just one type of area but a diverse group of landforms that combine to form the Badlands. The different areas include rolling native prairie characterized by short grasses, forbs and cacti and woody draws, which have some trees and bushes along with an understory of grasses and forbs. Woody draws are usually in a crease in the landscape. Sagebrush flats are found in a flat area with sagebrush being the primary vegetation. Sagebrush flats can be found bordering small creeks or below a butte. Caves are an opening in the earth, usually on the side of a sandstone hill and the result of erosion. Rock crevices are a crack in the rocks formed by weathering or erosion. Trees are usually associated with woodlands, but they are also found in the Badlands. Sometimes they are associated with woody draws, but there are also three different types of woodlands found in the Badlands: ponderosa, limber pine and cottonwood.

Animals have different adaptations for different types of environments. Adaptations are traits that help an animal survive. They can be physical traits such as camouflage or body shape or behavioral traits such as being nocturnal or leading a solitary existence. For example, animals found in a cave might be nocturnal, or solitary like bobcats. Those found on a rock crevice might be better suited for arid conditions such as the short-horned lizard.

Procedure: Using the graphic organizer on the student page, have the students divide the Badlands into the six different areas: native

prairie, woody draws, sagebrush flats, caves, rock crevices and trees. Once the graphic organizers are completed, discuss how the animals found in each environment are well suited for that area through their adaptation.

The students should then use the Badlands guide and other resources to list the animals found in each of the landforms. Once students have a complete list of wildlife, have them use the list to complete a diorama of the Badlands.

Students are divided into groups and each group is given a landform to draw. Their drawing should include the landform, vegetation (if any) and wildlife you could find there. When all the groups have completed their drawings, they can be joined together to create a panoramic poster of the Badlands.



Grade: 3-8

Subjects: Life science, earth science, geography, language arts, visual arts

Habitats: Badlands

Supplies: Paper, pencil, markers, colored pencil, paint

Setting: Indoors

Vocabulary: Adaptation

Student Pages: Exploring Badlands

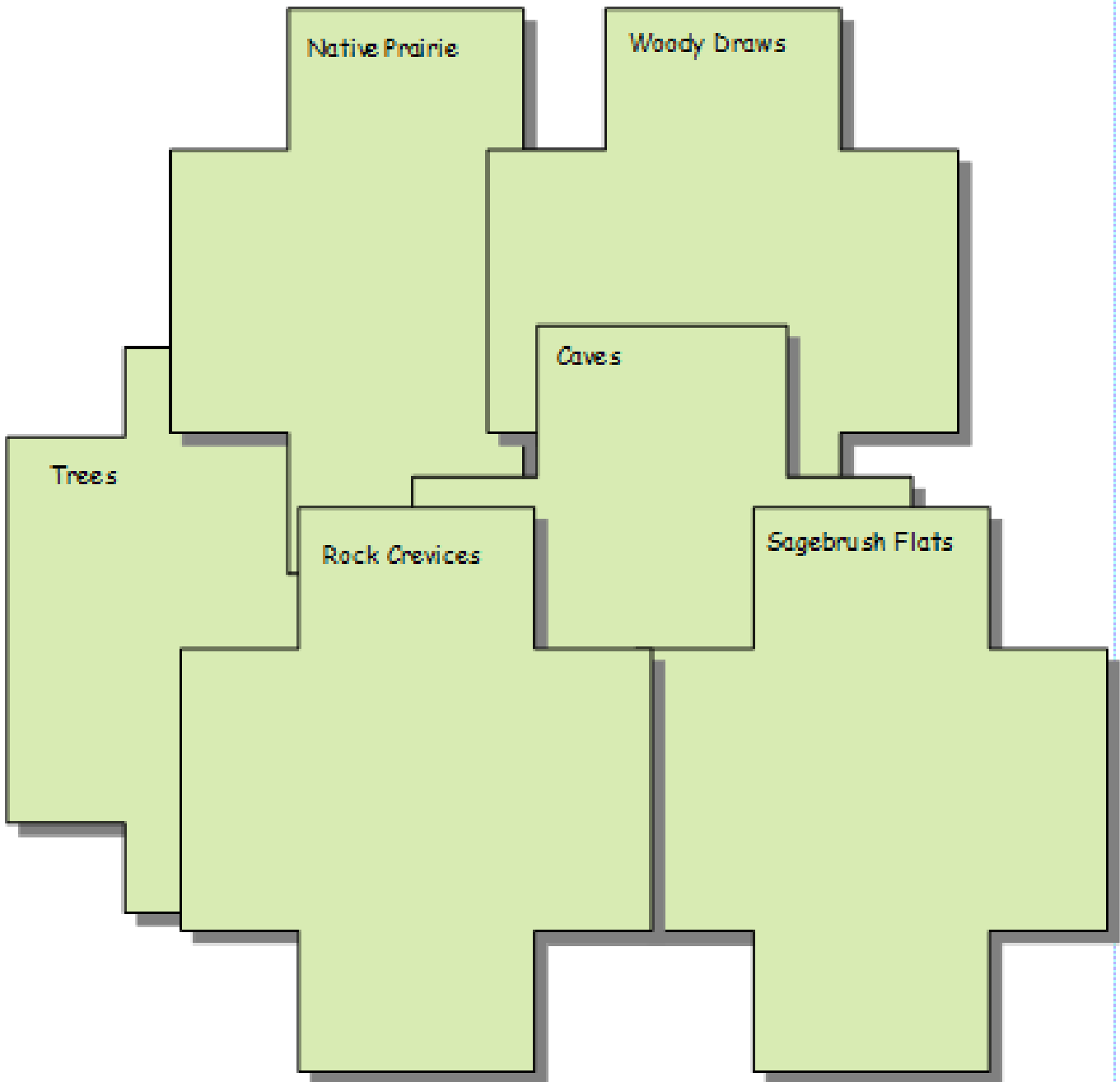
Assessment

Identify the six different habitat types found in the badlands.

What type of wildlife would you find in a cave? A woody draw?

What type of adaptations would help an animal survive in a sagebrush flat in the North Dakota Badlands?

Student Page: Exploring Badlands



Habitat Inventory

Objectives: Students will be able to list all North Dakota habitats, types of vegetation and wildlife found in each habitat.

Summary: Students will make an illustrated map of North Dakota to show the different types of habitat.

Background: North Dakota has five specific types of habitat. They are wetlands, prairie, woodlands, riparian, and badlands.

Wetlands are found throughout the state. A wetland can hold water for days or remain filled year-round making it a permanent wetland. Additionally, manmade wetlands such as reservoirs are also found through the state. Plants found in wetlands are adapted for life in saturated soil conditions. That means their roots are always in water.

North Dakota has short-grass prairie, mixed-grass prairie, and tallgrass prairie. Tallgrass prairie is found in the eastern third of the state where grass can reach heights of 6 feet. Short-grass prairie is found in the southwestern corner of the state and vegetation is approximately 12 inches tall. The remaining prairie is mixed-grass prairie. Vegetation can vary in height from 12 inches to 5 feet depending on soil quality and rainfall.

Riparian habitats pertain to all rivers or streams in the state. This includes the aquatic habitat and the terrestrial areas adjacent to the river. Riparian zones can extend up to 100 feet from the riverbank.

Woodlands are areas covered in trees. In North Dakota, the woodlands can be found along rivers called riparian woodlands, in the Turtle Mountains, near Devils Lake, in the Badlands, and rural and urban tree plantings.

The **Badlands** of North Dakota are found in the southwestern part of the state. Badlands are formed by erosion and have a semi-arid climate.

Procedure: Gather the five habitat guides. Students should use the Student Page: Map outline of North Dakota to identify the location of each habitat in the state and develop a list of plants that are unique to each habitat. Students may be assigned any or all of the habitats to research. Make as many copies of the student page as needed.

Once this information is gathered, students may draw an outline of the state using the North Dakota template. Rivers are depicted on page 6 in the Prairie Guide should be drawn in and labeled. These rivers represent riparian habitat.

Using the information gathered on the Student Page, have students draw different plant species for each habitat. The size of the plant drawings should be relative to the map already created. For example, if the map is drawn on 12" x 17" paper, then the plants should be drawn on paper size 12" x 9" with one fifth of the page for each habitat vegetation. See Diagram 1.

Grade: 3-12

Subjects: Life science, visual arts, environmental science

Habitats: Prairie, wetland, riparian, woodland, badland

Supplies: Paper, pencil, field guides

Setting: Inside and/or outdoors

Vocabulary: Habitat, adaptation

Student Pages: North Dakota Map Outline, Habitat Inventory

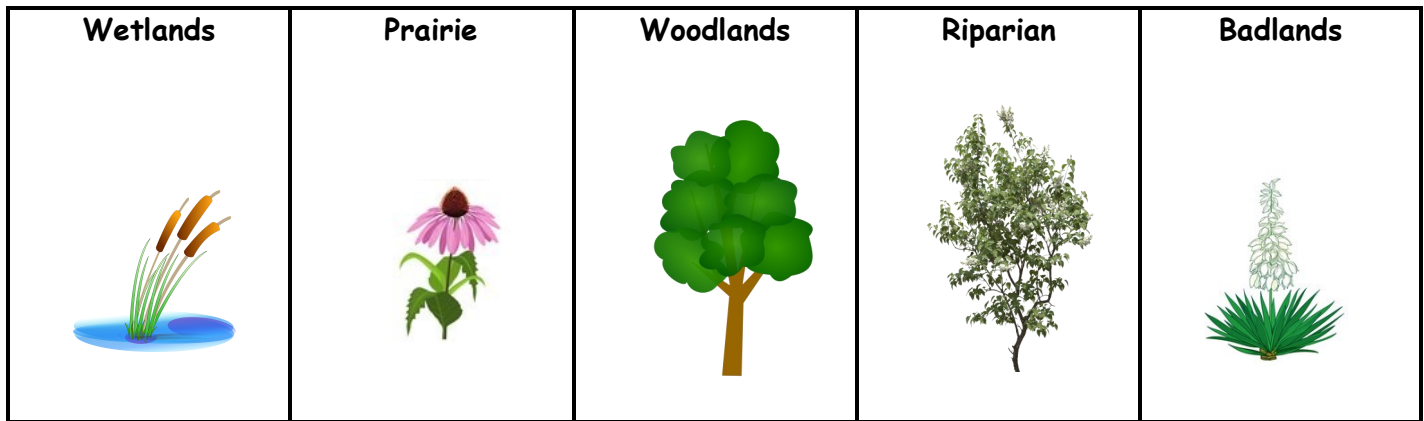


Diagram 1: Divide paper into five sections and have student illustrate plant species in each section.

Once all vegetation has been diagrammed, plants are cut out, placed and glued to the map in the correct location. Label all plants glued to the map.

Students can add additional features to the map, including a compass rose, hometown, highways, state capitol, historical sights, or other noteworthy locations.

Assessment

List the five habitats found in North Dakota.

Locate the 5 habitats of North Dakota on a State map.

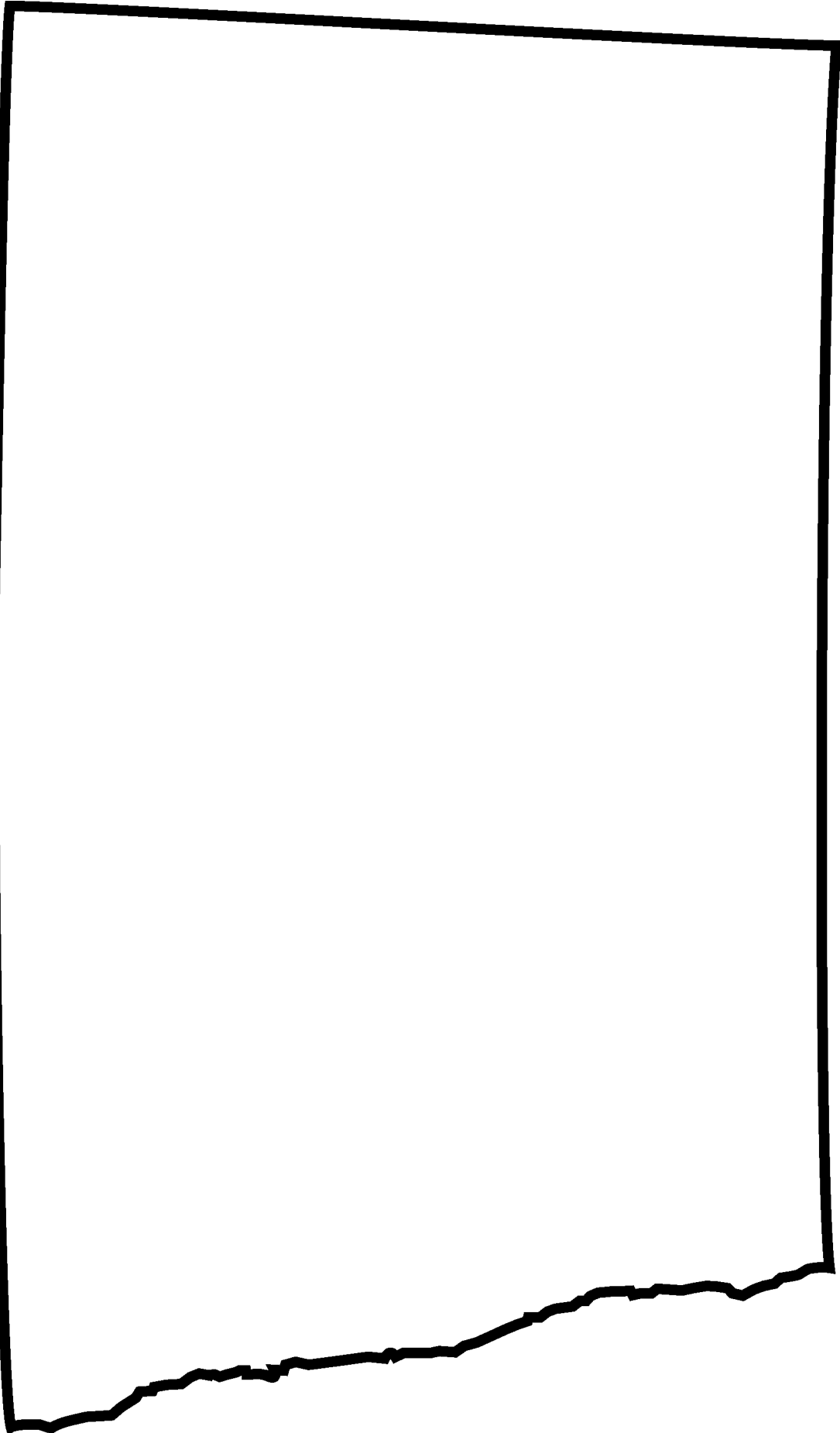
Identify the types of plants found in each habitat.

Name one or more species of plant found in each habitat.

Extensions

Instead of learning about the five habitats, visit the habitat and complete the inventory in person. Be sure to bring field guides to identify species that you are unable to identify.

Student Page: North Dakota Map Outline



Student Page: Habitat Inventory

✂

Name of Habitat:

Location in North Dakota:

What type of plants are found here? List the different plant species.

✂

Name of Habitat:

Location in North Dakota:

What type of plants are found here? List the different plant species.

Modeling Habitat

Objectives: Students will identify general habitat components, and habitat requirements of a wildlife species.

Summary: Students will select an animal from the trunk and build a diorama depicting the animal and its habitat needs.

Background: Each animal from the Wildlife of North Dakota Trunk occupies a unique **niche** (the function or position of an organism or population within an ecological community) in its habitat. Locate the habitat that each species is found and refer to the corresponding *Habitats of North Dakota Guide* for additional information. The habitat for each animal includes space (type of habitat), water, shelter (are they nesting, burrowing, perching, aquatic or terrestrial) and food.

Procedure: Have each student research the animal using the *Habitats of North Dakota* guide and record their information on the student page. Based on the information that students have learned through research of the selected animal, they will build a habitat in diorama format.

Dioramas should contain plants found in the habitat and are important to the animal and to the habitat's health and appearance. Shoebox-sized boxes can be used for the diorama.

Dioramas are three dimensional, building upon a background scene and then sculpting rocks, installing trees or other vegetation or other habitat features. The animal can be drawn or sculpted out of clay or built from other classroom materials.

For example, a monarch butterfly diorama would include the prairie landscape, the larvae on milkweed plants and then the final adult stage of the butterfly, constructed from felt or clay or drawn in detail in the air and migrating south.

Assessment

Have student present their dioramas to the class, explaining what food, water, shelter and space requirements are needed for their animal.

Extensions

Instead of a diorama, have students draw a poster showing all the details that could be depicted in the diorama.

Have students present a written report on the components of the habitat and needs of their wildlife species.



Grade: 3-7

Subjects: Life Science, geography, language arts

Habitats: Wetlands, riparian, prairie, badlands and woodlands

Supplies: Shoe box, paint, modeling clay, other items for the habitats like sticks, rocks, grass and leaves

Setting: Indoors

Vocabulary: Adaptation, habitat, niche

Student Pages: Model Habitat

1. Description of Animal
How is this animal suited for its primary habitat?

2. Food Sources



Name of Animal: _____

Animal's Primary Habitat: _____

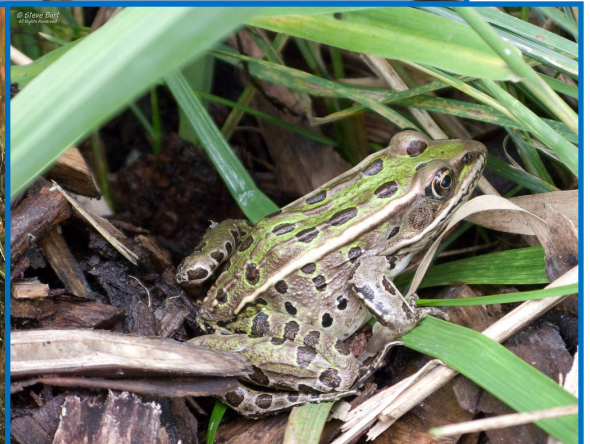
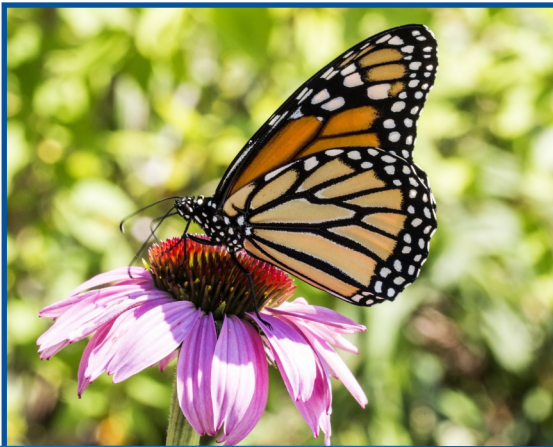
Description of Primary Habitat: _____



3. What are the threats to the primary habitat?
-How do these threats affect your animal?

Wildlife Communities

In this section you will find activities about different wildlife species.



Aquatic Insects & Water Quality

Objectives: Students will identify aquatic invertebrates.

Summary: Students will use aquatic invertebrates to determine water quality based on the type of invertebrates found.

Background: Macro invertebrates are bottom-dwelling (benthic) immature insects that can be used to determine the biological integrity of a water body. Macroinvertebrates are useful because they are sensitive to physical and chemical changes in their habitat; many live in water for more than a year; they cannot easily escape pollution; and they are easily collected in many streams and rivers. The presence or absence of these indicator species can reveal the overall health of the water body.

Streams with good water quality will have macroinvertebrates from different pollution tolerance groups. Diversity is the key to a healthy stream.

Factors that affect the aquatic community will vary as you travel from the source of a river to its mouth. The most significant factors are water temperature, volume, velocity and in-stream habitat. Instream habitat includes stream bottom composition or substrate and food quality.

Pollutants can settle on and suffocate eggs, interfere with feed, and raise the water temperature. Suspended solids will eliminate the most sensitive organisms, reducing the diversity of the community. When this happens, gen-

erally you will see an increase in the more pollution tolerant organisms.

Aquatic Insect Groups

Procedure: Using the aquatic invertebrate lists, sort out the invertebrates based on

Set 1

- Caddisfly Larvae
- Stonefly Nymph
- Mayfly Nymph
- Riffle Beetle
- Clam
- Dragonfly nymph

Set 2

- Clam
- Damselfly Nymph
- Caddisfly Larvae

Set 3

- Leech
- Midge Larvae
- Aquatic Worms
- Snails
- Black Fly Larvae
- Scud

Set 4

- Leech
- Midge Larvae
- Black Fly Larvae
- Snails
- Aquatic Worms
- Scud

their group from the Macroinvertebrate Taxa Groups page. Once the invertebrates are sorted, complete the Macroinvertebrate Cumulative Index Value Page. Based on your calculations, describe your stream quality.

Assessment

Students will be able to draw conclusions on water quality of stream based on the aquatic invertebrates collected.

Students will describe how pollution impacts water quality and the organisms that live in that habitat.

Grade: 6-12

Subjects: Life Science

Habitats: Wetlands, riparian

Supplies: Paper, pencil, calculator

Setting: inside

Vocabulary: Pollution, macroinvertebrate, biological integrity, diversity

Student Pages: Micro Invertebrate Taxa Groups, Cumulative Index Value

Extensions

Instead of using the insect lists provided, visit a stream, wetland or river and collect macro invertebrates using a d-net or by turning over rocks on the bottom of the stream.

Collection Methods:

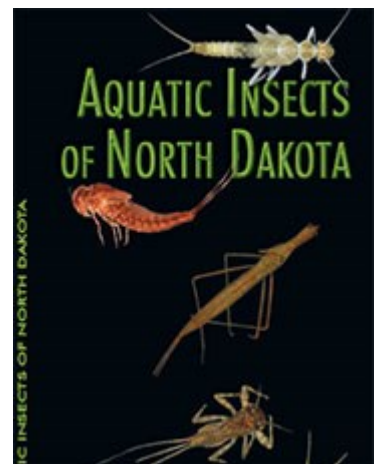
The simplest method of collecting insects from a stream or lake bottom is to just pick up some moderately sized rocks from a medium to fast riffle, or chunks of wood or small logs submerged near the lakeshore. If no rocks or wood are present then look for aquatic plants or plant debris, like decomposing leaves. Lift the pieces of substrate carefully as many insect nymphs or larvae will let go when they sense their home is rising out of the water. Once you have a rock or log in hand you can check it carefully for different types of insect larvae and even see if pupae are attached.

To collect your insects, use a D-frame aquatic sampling net. These are commercially available nets made with a D-shaped metal hoop with fine-meshed net bag attached to a five-foot wooden or metal handle.

Once insects are collected, place them in a kill jar for sorting and identification in the lab or classroom. Aquatic insects must be stored in a liquid preservative. The best preservative is 85 to 90% (percent, not proof) ethyl alcohol. Yes, that's good old grain alcohol, so you can imagine just how pickled these critters end up. But you don't have to use drinkable alcohol. I usually buy 90% denatured ethanol at a drug store or chemical supply company. Denatured ethanol is treated with other chemicals that make it quite undrinkable. If you can't get ethanol, you can use isopropyl or rubbing alcohol, as well. Your jar should have a sealable top so no alcohol evaporates.

Once you are back in the classroom or lab, sort the insects. You can use: https://gf.nd.gov/sites/default/files/publications/invertebrate_brochure.pdf or other available aquatic insect identification guide.

Once insects are sorted and identified, proceed to calculate the cumulative index value.

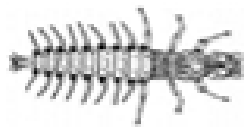


Student Page: Macroinvertebrate Taxa Groups

Group 1: These organisms are generally pollution intolerant. Their dominance signifies **GOOD WATER QUALITY**.



Caddisfly Larvae



Dobsonfly Larvae



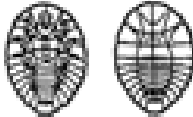
Adult Riffle Beetle



Stonefly Nymph



Mayfly Nymph



Water Penny Beetle Larvae

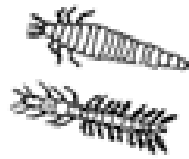
Group 2: These organisms can exist in a wide range of water quality conditions.



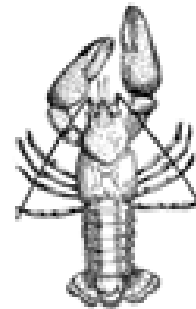
Dragonfly Nymph



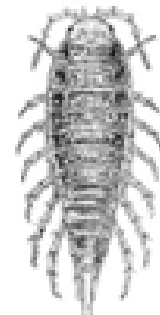
Damselfly Nymph



Beetle Larvae



Crawfish



Sow Bug



Crane Fly Larvae



Clams

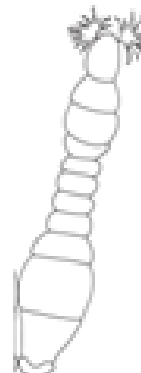
Group 3: These organisms are generally tolerant of pollution. Their dominance usually signifies **POOR WATER QUALITY**.



Pouch Snails



Leeches



Black Fly Larvae



Aquatic Worms



Midge Larvae



Scud

Student Page: Cumulative Index Value

Group 1

Number of Group 1 Members _____ x 3 = _____

Number of Group 2 Members _____ x 2 = _____

Number of Group 3 Members _____ x 1 = _____

Cumulative Index Value

Sum of: Group 1+ Group 2 + Group 3 _____

Cumulative Index Value

Stream Quality Assessment

23+	Excellent
17-22	Good
11-16	Fair
0-10	Poor

Background: Wetlands are sometimes called "nurseries of life." The water, the abundance of food, and the natural shelter make ideal habitats for countless numbers and different kinds of wildlife.

Questing for Wetlands

Objective: Students will identify species of wetland plants and animals.

Summary: Students will learn about wetlands by exploring them with a checklist.

Wetlands are classified into four major types: temporary, seasonal, semi-permanent and permanent. Each of the types is an important provider of habitat.

North Dakota is one of the most important waterfowl breeding areas on the continent of North America.

Several species of songbirds also depend on wetland habitats. Songbirds are small, perching birds that sing a variety of songs.

Wetlands provide habitat for millions of aquatic insects (insects that hatch or live in the water). Many waterfowl, shorebirds, amphibians, reptiles, fish, and other animals depend on aquatic insects as food for survival.

Wetlands are significant habitats for many species of amphibians and reptiles.

Mammals that make their homes in North Dakota's wetlands include beaver, muskrat, mink and raccoon.

Permanent wetlands are home to many species of fish. Three of the most important game fish in North Dakota are northern pike, perch and walleye.

The wetlands of North Dakota are so significant that they have been called a "national treasure." A large variety of plants, animals and insects depend on wetland environments for life itself. Wetlands are of great importance for other reasons as well. These include natural flood control, improving water quality, recharging groundwater, and public use.

Procedure:

Divide students into groups and have them ex-

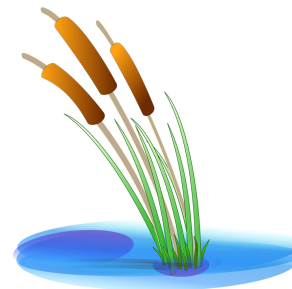
plore a designated wetland. Record their observations on the Student Page: Wetland Quest. Instruct students to observe plants and animals.

Assessment:

Students will identify one animal species.

Students will identify one wetland plant species.

Students will identify one insect species.



Grade: K-12

Subjects: Life Science

Habitats: Wetlands

Supplies: Paper, pencil, clipboard

Setting: outside

Vocabulary: Song bird, wetland, mammal, ground water, waterfowl, diversity

Student Pages: Wetlands Quest

Student Page: Wetland Quest

Find a flying insect.
Describe it.



Locate and identify a bird that wades in water



Locate a bird's nest.
Describe the location.



Locate and identify a bird in the water.



Find evidence of a mammal.



Find something YELLOW and identify it.

Locate a wild cucumber



Locate a plant with narrow leaves.
Identify the plant.



Find evidence of an amphibian or reptile.



Evidence that other people have visited this habitat.

Making Observations

Objectives: Students will use senses to make observations about the world around them and identify animals that eat plants or other animals for food.

Summary: Students exercise their observation skills by comparing leaves and take a walk in the neighborhood.

Background: Many kinds of insects lay their eggs on leaves. The tree reacts by growing over them, forming a little bump called a **gall**. The egg will hatch, and the tiny bug will emerge from the gall when it's ready. There are many kinds of galls - over 85 on oak trees alone. They are usually form in the fall armless to the trees and plants.

Leaves turn colors because they are not getting as much sun as autumn progresses.

Leaves fall from the trees because they are "pushed" by newly formed buds underneath them on the twig.

Procedure: Have students form a circle. Place leaves in a grocery bag. Walk around the circle, asking each student to reach in the bag without looking and select only one leaf.

Students can then return to their workspace

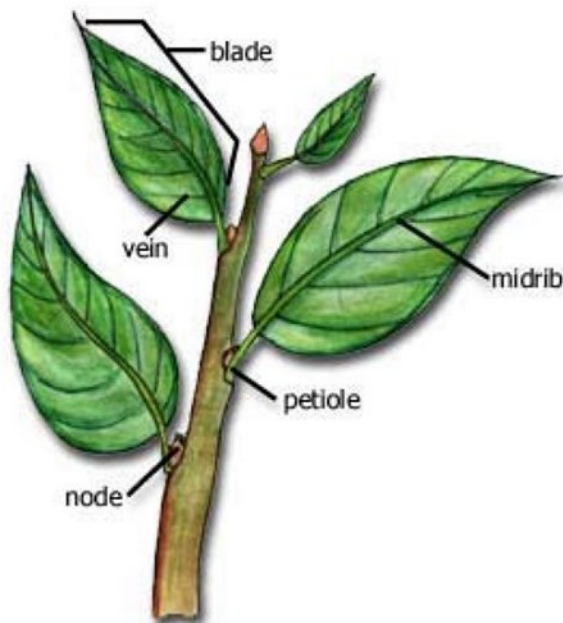
and study their leaf carefully for one minute. Have them look at the leaves, locating galls or evidence of other animals (insects). Discuss the parts of a leaf, what a gall is and the different leaf shapes.

Provide each student a piece of white paper. Have students place their leaf under the white paper (vein side up) and rub a crayon lightly across the paper to produce a leaf rubbing.

When Your Class is Outside: Before going outside, discuss with your students ways to really look and observe nature using their senses. This can be done by standing in one spot and listening quietly, looking carefully at the bark on a tree, the base of the tree or up into the top of the tree, smelling the air, listening for sounds of wildlife and touching the bark on a tree.

Provide each student a copy of the Student Page: Observations.

Parts of a Leaf



Grade: 5-12

Subjects: Life Science

Habitats: Wetlands, riparian, prairie, badlands and woodlands

Supplies: Paper, pencil

Setting: Inside and outside

Vocabulary: Gall, lobes, seedling, autumn, photosynthesis, bud, seed, seasons

Student Pages: Observations

Take your students outside for a walk in the neighborhood to observe for signs of nature. Students can take their observation sheet with them on a clipboard or leave it at their desk.

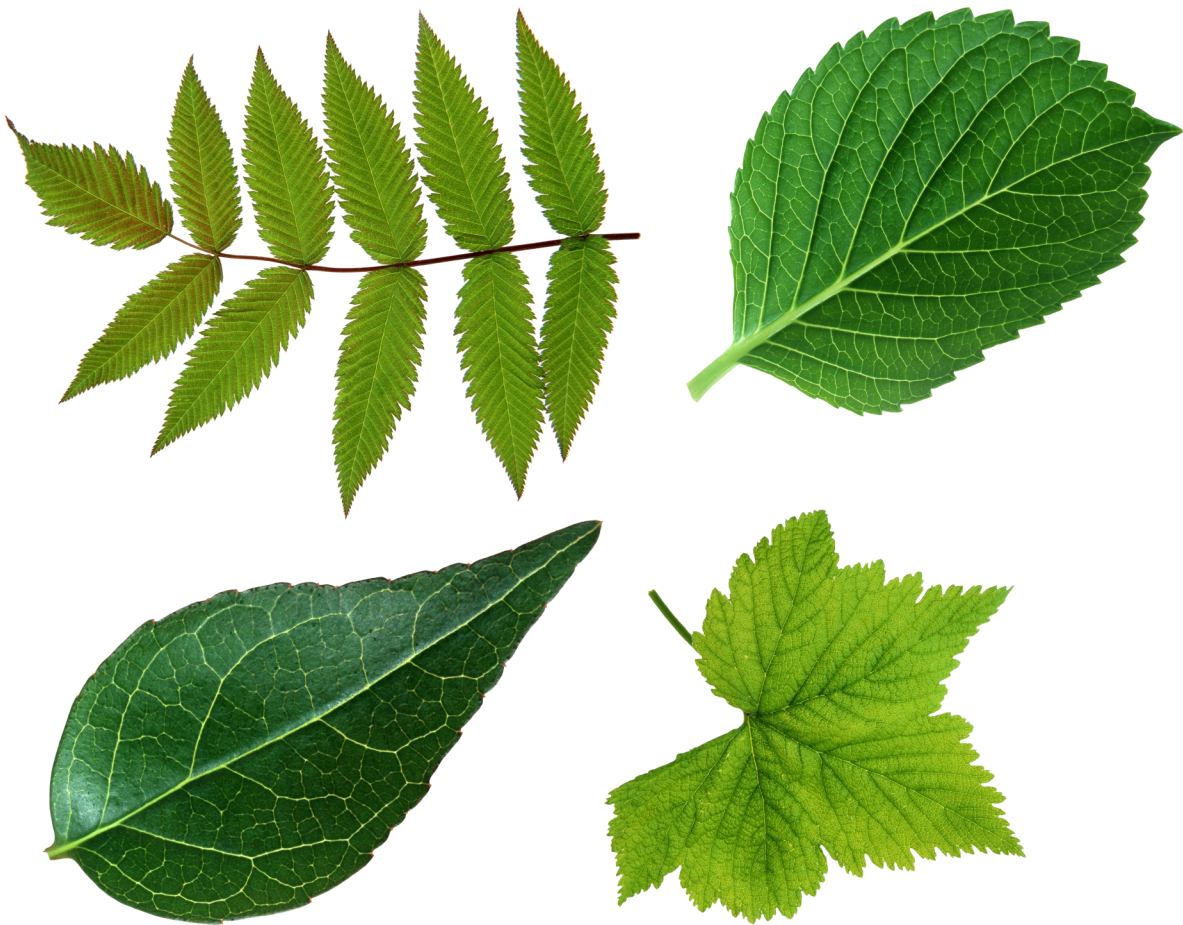
While on the walk, have students observe evidence of animals left on the leaves and on the trees in the neighborhood using their senses.

Return to the classroom and complete the observation sheet and share results.

Assessment:

What made your leaf special? Describe the characteristics of your leaf.

What were the most common type of wildlife evidence observed on the walking trip?



Student Page: Observations



What have I seen?



What do I hear?



What have I touched?
What does it feel like?



What do I smell?

Fish Printing

Objective Students will learn the differences in fish species and their habitats.

Summary: Students will print fish using fish replicas or real fish and paint on paper or fabric.

Background: **Gyotaku** (Japanese 魚拓, from gyo "fish" + taku "rubbing") is a traditional form of Japanese fish printing, dating from the mid-19th century, a form of nature printing used by fishermen to record their catches. Fish printing is a perfect way to combine science (fish diversity, anatomy, ecology) art (create colorful displays), reading (combine with fish stories) and writing (write fact or fiction about the fish) while practicing the ageless art of Gyotaku or fish printing.

Procedure: If using real fish, clean slimy substance from scales with salt and vinegar, alcohol or squeeze a lemon over it and gently wipe. Be very careful not to remove any scales.

Place newspaper or table covering under fish to keep table clean. Lay fish on dry surface making sure that fins and tail are fanned out. Apply any type of water-based ink or paint to the fish with soft brush. Apply gently but in all directions. When applying paint or ink, work quickly so that it doesn't dry and apply only a thin layer. You may need to experiment to get just the right amount on the fish. You can also color the scales with different colors of ink for dramatic effects.

Place the paper over the painted fish with one hand so it does not move and gently press the paper down over the entire fish making sure all areas of the fish are transferred to the paper with the other hand.

Gently lift your paper off the fish and place it on a clean surface to dry. Drying time varies depending on weather and room conditions.

When you look at the print a smudge means

the paper, or the fish slipped. A blank spot means that there was not enough paint, or you did not press the paper down in that spot.

If paint remains on the fish, you can quickly press the same paper down on the fish in a different spot from the first print and make a "ghost print."

To clean, simply wash the fish or replica off with warm soapy water and dry with a paper towel.



Grade: PreK - 12

Subjects: Art, life science, social science

Habitats: Wetlands, riparian

Supplies: Fish forms, tempera paint, ink, newsprint paper, rice paper and/or fabric, rollers or foam brushes, paint pallet

Setting: Indoors

Vocabulary: Adaptation, camouflage

Assessment:

What is another word for Fish Printing?

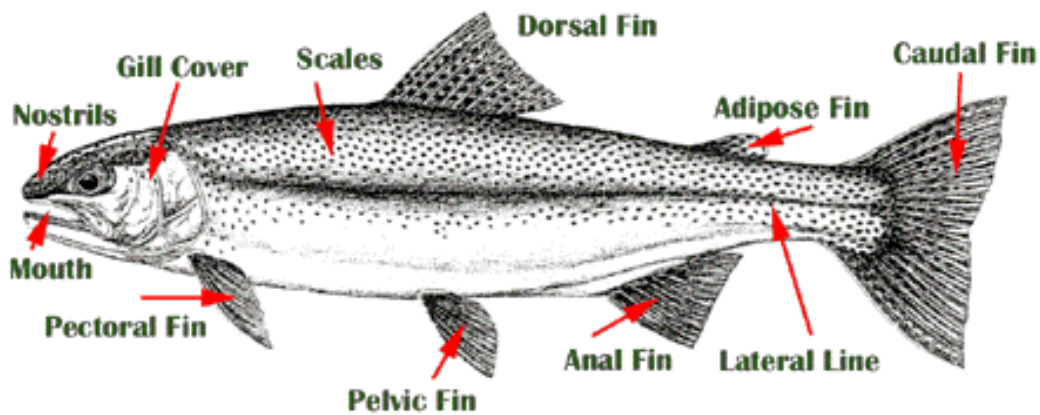
Why did people begin to fish print?

Name five different species of fish species found in North Dakota.

Extensions:

Have students diagram the fish they have printed with the items listed on the diagram below. Note: Only fish in the salmon family have an adipose fin.

Anatomy of a Fish



Have students research the species of fish they have printed. The research can then be presented orally, in a PowerPoint presentation or a report. Their research should include:

What type of aquatic habitat it is found in (for example, river or pond).

What the fish eats.

Information about reproduction.

Fish Printing Supplies:

Nasco <http://www.enasco.com/> 1-800-558-959 5

Dick Blick Art Supplies <http://www.dickblick.com/> 1-800-828-4548



Adaptations

In this section you will find activities that explore animal adaptations.



Birds of a Feather

Objective: Students learn the special functions of different bird beaks.

Summary: Students will learn about different species of birds and how they eat. Students will construct a simple bird feeder for observation.

Background: Every animal has special features that allow it to survive in the wild. These special features are called adaptations. Birds have hollow light bones and are covered with feathers which are warm, strong and light weight. Feathers help birds fly, keep them warm and dry and attract mates or camouflage. Males usually have brightly colored feathers to attract mates and females usually have dull colored feathers to camouflage themselves and their young.

Most birds have very sharp eyesight. Birds have specially adapted beaks, feet, legs, eyes and wings to help them stay warm in cold weather and find food to give them energy. A variety of beaks are found on birds. They are used to eat different kinds of food.

Procedure: Talk with your students about birds. Ask them what they know about birds and what types of birds that live in North Dakota. Ask students if they know what foods birds eat. List the students' responses on the board.

Use books and pictures to continue the discussion about birds. Discuss bird characteristics or adaptations. For example, most birds have hollow bones, all have feathers, they have specialized beaks for eating different foods and their feet are different depending on their habitat. Ducks have webbed feet; birds of prey have talons for perching and grasping their prey.

Birds' beaks are uniquely adapted to their diet. For example, woodpecker beaks are pointy for getting bugs out of cracks in trees, duck beaks strain out small animals of the water, shore-

birds are long for grabbing out insects and worms from the mud. See the list of North Dakota Birds and the food they eat.



Grade: k-8

Subjects: Life Science, industrial Arts

Habitats: Prairie, badlands, wetlands, woodlands and rRiparian

Supplies: Bird seed, paper plates

Setting: Indoors

Vocabulary: Adaptations, beak, camouflage, webbed feet, talons, feathers

Chart 1: Common North Dakota Birds and their Foods

Bird	Food
Bald Eagle	Fish, Ducks
Canada Goose	Grass sprouts
Chickadee	Seeds, Insects, Berries
Crow	Most anything
Great Blue Heron	Fish, Aquatic life
Junco	Seeds
Magpie	Carrion
Red tailed hawk	Mice, Rodents, Partridge

Figure 1: Use these images to explore different beak types and feet and how they help the birds to survive.



Assessment

What adaptations do birds have that other animals don't?

Why do birds have different kinds of beaks and feet?

Draw a piece of food and the bird bill that would work best for eating.

Extensions

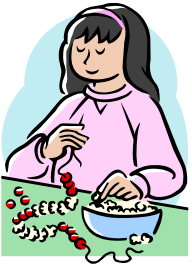
Pinecone Bird Feeder

Tie a long string to the top of the pinecone. Cover a pinecone with peanut butter. Roll pinecone in bird seed. Hang it from a tree in your yard.



Rice Krispy Feeder

Add a string to the top of a toilet paper tube. Cover the tube with peanut butter and roll in Rice Krispies. Hang it from a tree!

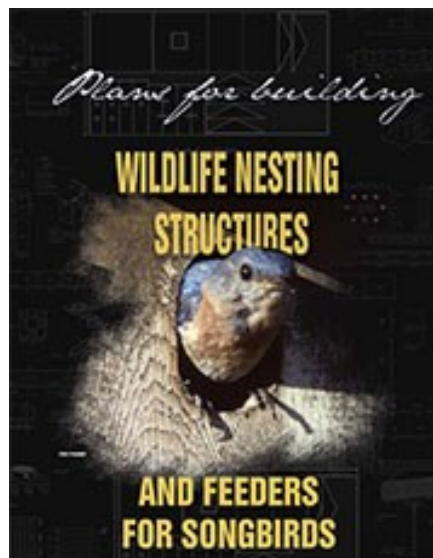


Garland Feeder

Thread different kinds of berries and freshly popped popcorn on a string and decorate a tree outdoors for the birds.

For older students, have them build bird feeders using this document: Plans for building wild-life nesting structures and feeders:

https://gf.nd.gov/sites/default/files/publications/nest_structure_plans-1.pdf



Striking Distance

Objectives: Students will understand the predator/prey relationships of prairie rattlesnakes.

Summary: Students play a game of tag that simulates a rattlesnake's striking distance.

Background: The prairie rattlesnake or (*Crotalus viridis*) is North Dakota's only venomous snake. Their color varies from greenish-gray, brown or red, to all brown. They have dark, oval blotches surrounded by white markings. Rattlesnakes are found in grasslands and sagebrush areas, as well as high rocky ledges of buttes. They are primarily found in southwestern North Dakota but have been observed in counties bordering the Missouri River to the east.

In early spring and late fall, prairie rattlesnakes hunt for food during the day. In summer months, they take shelter from the heat by finding a shaded area or rocky outcrops. There they stay until evening when they begin their nightly wait to ambush small mammals. Their diet includes small mammals, amphibians, other reptiles and birds. In winter, these snakes hibernate together in prairie dog burrows or rocky crevices.

Females mate in March to May, and in the early fall give birth to live young. An average litter contains about 12 young, but this can vary from 4-25. Young are able to fend for themselves and no parental care is given by the mother.

The unique feature that gives rattlesnakes their name is the rattle. These rattles are shaken by snakes to scare and warn potential predators. The number of rattle segments increases each time snakes shed their skin, about one to two times per year. Because of this you can only approximate the age of rattlesnakes by the number of segments on the rattle. Rattlesnakes are pit vipers. They use specialized organs to detect heat. These pits,

found below and in front of the eye, are placed at different positions on either side of the snake's head. This makes it possible for snakes to line up prey in total darkness. They can sense warm-blooded prey in complete darkness up to 2 feet away. These thermoreceptor organs contain nerves that are sensitive to heat or warmth and can detect temperature differences within several thousandths of a degree. All snakes are predators and must locate their prey before they seize it. A snake's vision can detect movement out to about 40 feet; closer objects are seen more sharply.

Fangs are covered by a protective sheath of tissue and are normally folded back against the roof of the mouth. Rattlesnake fangs are hollow and connected to a venom gland, which lies behind the eye. Fangs are replaced at regular intervals.

Most snakes are normally timid and secretive. When approached, they usually remain quiet to avoid detection. They may try to escape if given an opportunity. When frightened, cornered, or attacked, snakes will stand their ground and may attempt to strike at or even bite their intruder.

As a rule of thumb, rattlesnakes can, at best, strike at a distance of two-thirds their total

Grade: 6-7

Subjects: Life Science, Physical Education

Habitats: Badlands

Supplies: Small bean bags

Setting: inside or outside

Vocabulary: Predator, Prey, Striking distance, Short grass prairie, Pit viper

body length. For example, a 3-foot-long snake may be able to strike at a distance of 2 feet. body length. For example, a three foot long snake may be able to strike a distance of two feet.

Always keep a safe distance from any snake.

Procedure: Provide the background information to your students. Make sure they have an understanding of rattlesnake striking distance.

To play the game, **Striking Distance**, you will need an area free of obstacles. Designate a safe area for prey. Have one student become the rattlesnake. Everyone else is prey. Remember, rattlesnakes can strike at about two-thirds their total body length away, so if the snake is 3 feet long, the snake can "strike" when prey is 2 feet away. The teacher will tell the students the length of the rattlesnake for this game so they can determine their "striking distance."



For the snake to strike it will need a soft object (foam blocks or bean bags work well).

The snake will strike at the prey by hitting them on the legs with the soft object.

When prey has been struck, it must stop where it is and freeze.

For a prey animal to heal, two untagged prey link arms around the bitten prey and escort them to a designated safe area where the snake cannot go. The injured prey will count out loud to five and then can get back into the game.

The game ends when all the prey have been bitten.

A few things to note:

*Prey escorting another prey animal cannot be tagged.

*No prey animal can hide out in the safe area.

Assessment:

1. Students will list the foods that rattlesnakes eat.
2. Students will explain how rattlesnakes determine if prey is nearby.
3. Given different snake lengths, students will be able to determine striking distance.

Extensions:

Add more rattlesnakes to the game.

*Have students decide what type of prey animal they are and have them move like the prey animal.

*Play three rounds of **Striking Distance**. At the beginning of each round, decrease the size of the game area.

Whose Poop is This & Other Animal Signs

Objective Students will characterize and identify animal signs including scat, fur, tracks and other signs.

Summary: Students will take a walk to identify animals signs.

Background: Taking a walk in your town or in a natural area can reveal secrets on who lives in the habitat even without you observing wildlife. Animals leave behind lots of clues in their habitat. These clues include nests, tracks, fur, scats (animal waste), owl pellets, chew or bite marks on trees or bushes, houses like lodges or dens, feathers, and other signs.

Wildlife diversity is the number of different species of animals that are found in a defined area. Biologists use these clues to study the wildlife diversity in different habitats. Tracks can be used to estimate populations in areas of sand or snow where tracks are evident.

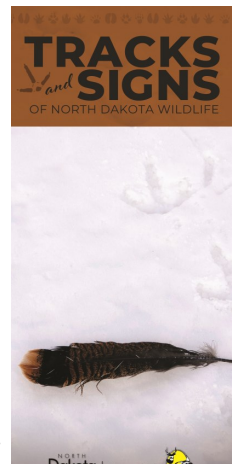
A high diversity number indicates the quality of habitat. With many different types of plants in an area, different wildlife species may be better supported. Areas that are impacted by man through pesticide application, development, or other man-made impacts.

Procedure: Select an area where wildlife signs can be observed. Distribute the Tracks publication and review the different types of animal signs. It can be found online at: https://gf.nd.gov/sites/default/files/publications/tracks_signs_of_nd_wildlife.pdf

Younger students: Gather students and brainstorm the types of animals that might be observed on the walk. Write this information on the board or make a master list of animal signs for students.

Go on your walk and record the different animal signs and type of animal that left the sign behind on student page. Living animals observed should also be recorded.

Once back in the classroom, compile the list of animal signs and types of animals identified on walk.



Grade: K-12

Subjects: Life Science

Habitats: Wetlands, riparian, prairie, woodlands, and badlands

Supplies: Paper, pencil, clipboard

Setting: Outside

Vocabulary: Diversity, tracks, scat, habitat

Student Pages: Whose Poop is This & Other Animal Signs

Older students: Designate a study area that can be followed throughout the school year. The study area should be marked off by stakes. An example of a study area size is 1m x 1m. Larger study plot size may reveal more species diversity in the area.

Have students identify all animal signs and living wildlife on the study plot and record them on student sheet. Once back in the classroom tally all the results.

Observe study plot throughout the year and compare changes in diversity.

Assessment:

Older students: Designate a study area that can be followed throughout the school year. The study area should be marked off by stakes. An example of a study area size is 1m x 1m. Larger study plot size may reveal more species diversity in the area.

Have students identify all animal signs and living wildlife on the study plot and record them on the student sheet. Once back in the classroom tally all the results.

Observe study plot throughout the year and compare changes in diversity.

Assessment

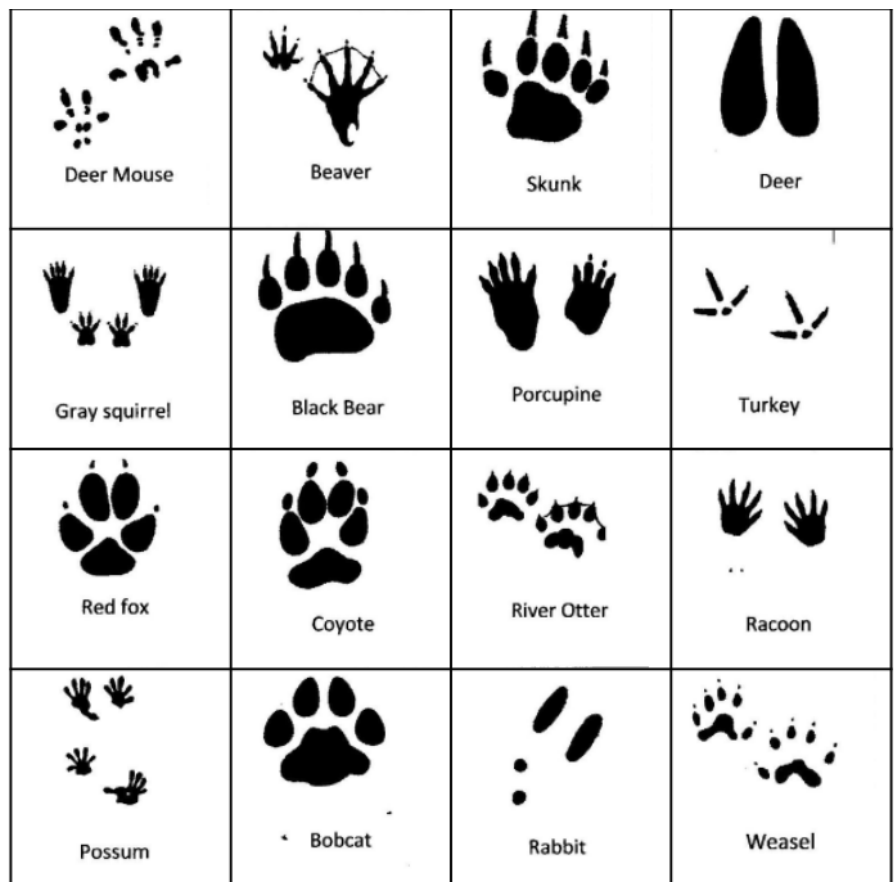
Define animal diversity?

Explain how to determine if an area had a high animal diversity?

Extensions

Have students monitor an area throughout the school year and record the differences. Explain why there is a change.

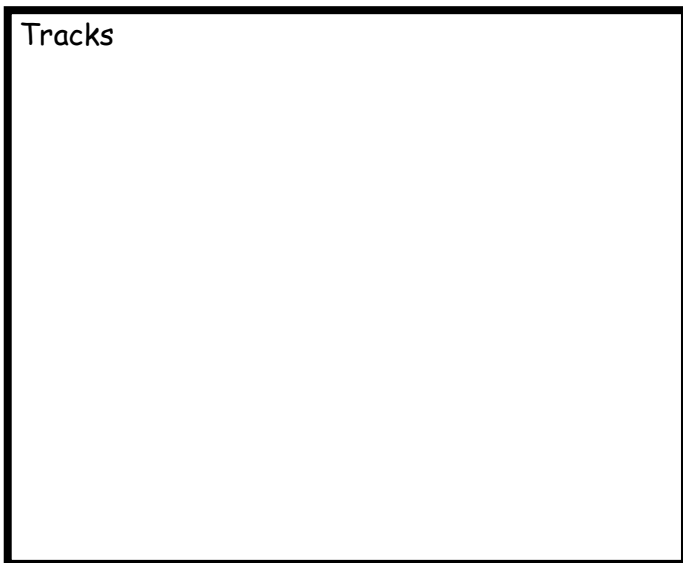
Have students compare two different locations or study plots. Explain why the diversity levels are the same or different.



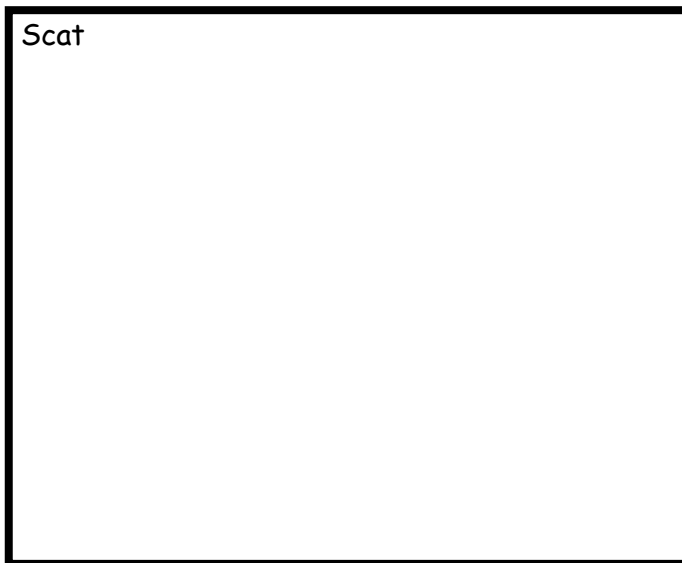
Student Page: Whose Poop is This & Other Animal Signs

Record your findings by drawings or describing your observations.

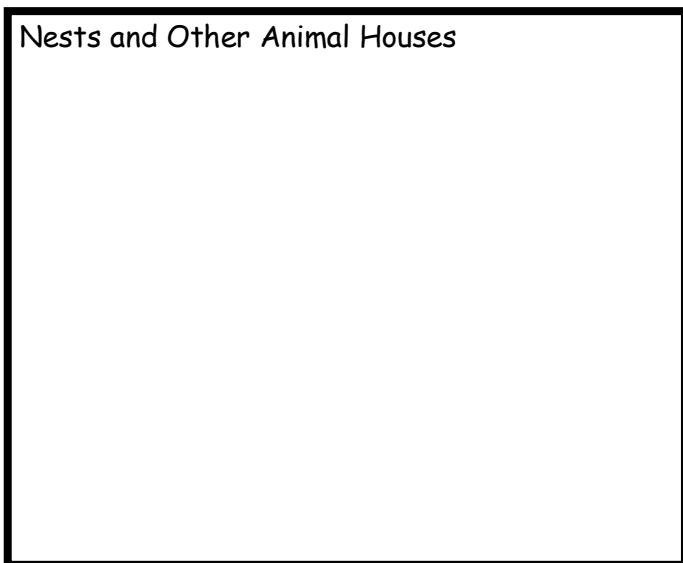
Tracks



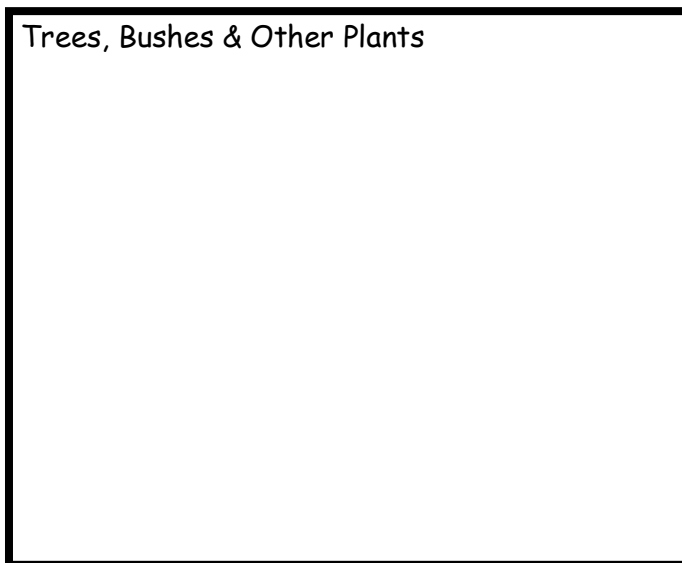
Scat



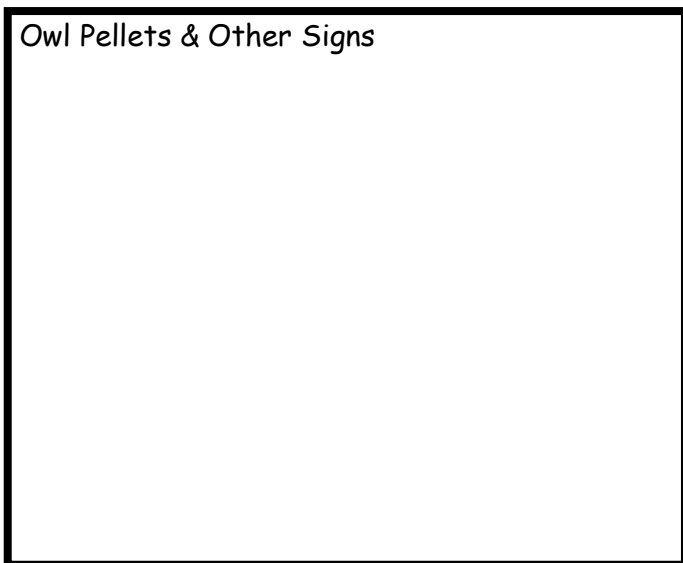
Nests and Other Animal Houses



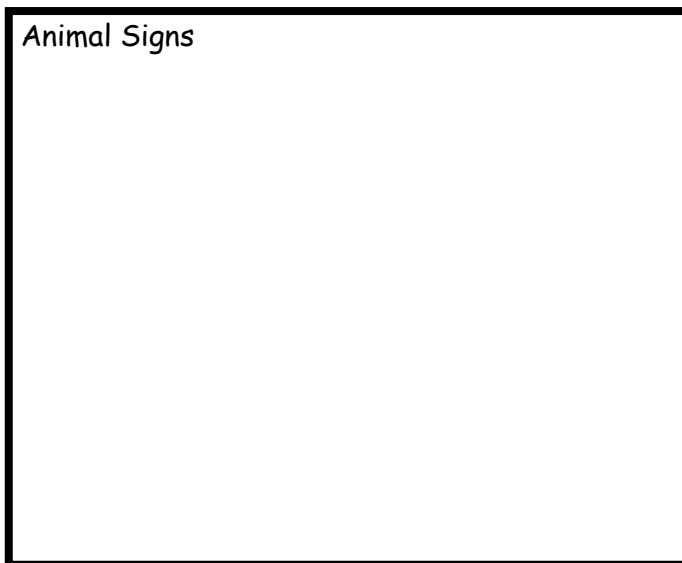
Trees, Bushes & Other Plants



Owl Pellets & Other Signs



Animal Signs



Using Shapes for Texture or Illustration

Objective: Students will become more proficient at identifying shapes or numbers by using them in art projects to draw and illustrate an object, animal or landscape.

Method: Students will draw a picture of a habitat or wildlife species using shapes as texture.

Artists like Doug Boyd of Nebraska use shapes to illustrate texture in their drawings. Just like three-dimensional forms, texture can be real or implied. Real, tangible texture can be created through endless tactile possibilities: cutting, building, tearing or layering of materials, for example. Texture is created using other elements of art, including form, line, shape and color.

Take a look at Boyd's art for inspiration.

Procedure

Introduce the shapes or numbers that you wish the student to become more familiar with. Once students can identify shapes or numbers, have them use the items to show texture or detail in their drawing of a wildlife species or habitat found in North Dakota. Have them use color if available.



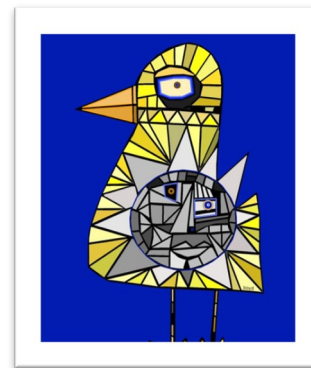
Assessment

Students will identify geometric shapes used in drawings.

Students will identify numbers used in drawings.

Extension

For older students, have them use only numbers or shapes to illustrate texture in their drawing.



Grade: k-12

Subjects: Visual Arts

Habitats: Prairie, woodlands, wetlands, badlands, and riparian

Supplies: Drawing paper, markers, pencil, colored pencils

Setting: Indoors or outside

Vocabulary: Prairie, woodlands, wetlands, badlands, and riparian

Anatomy of a Butterfly

Objective: Provide students with the means to learn the different parts of a butterfly.

Summary: Students will construct a model of a butterfly.

Background: The butterfly anatomy is made of distinct parts, with each serving a unique purpose to the organism.

Antennae: They have many functions including pheromone detection, which is used for mate location and recognition. Think of them as butterfly radar.

Front Wing & Back Wing: Students should be able to mark location on a diagram

Wing Veins: The pattern of veins is different for every genus of butterfly, and is one of the main criteria used by taxonomists when classifying butterflies.

Abdomen: abdomen contains the digestive system, breathing apparatus, a long tubular heart, and the sexual organs.

Spiracles: On the sides of each segment are microscopic holes called spiracles, through which air enters and leaves the body. Slight rhythmic movements of the body, coordinated with the opening and closing of the spiracles, causes air to be drawn into tiny lung-like sacs, and later expelled.

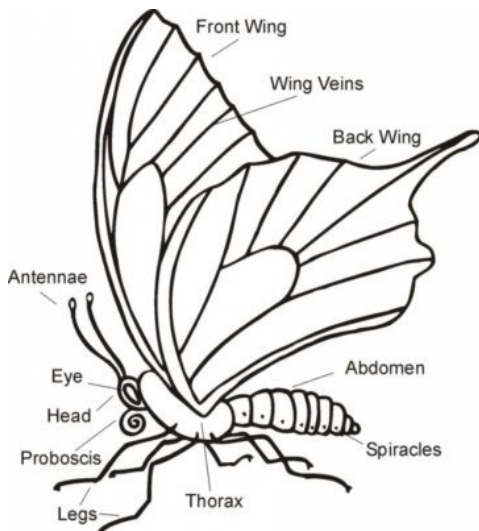
Thorax: consists of 3 body segments which are fused together, forming a chitinous cage which contains the flight muscles, and acts as an anchor point for the legs.

Legs: butterflies have 3 pairs of legs

Proboscis: a tube, much like a drinking straw. This tube can be coiled up like a spring for storage, or extended to enable the butterfly to reach deep into flowers to suck up nectar.

Head: Contains the eyes, antennae and proboscis

Eye: Butterflies have compound eyes that produce an image that looks like a mosaic.



Grade: 2-7

Subjects: Life science, visual art

Habitats: Wetlands, woodlands, prairie, badlands, and riparian

Supplies: Construction materials (candy parts or craft supplies)

Setting: Indoors

Vocabulary: Antennae, wing veins, abdomen, spiracle, thorax, proboscis, compound eye

Procedure:

Students will build butterfly models out of the following items using the image below as a guide.

Gum drops (head)

Orange candy slices (thorax)

Small marshmallows (abdomen)

Black shoelace licorice (legs)

Red shoelace licorice (proboscis)

Mini M&M's (compound eyes)

Large pretzel twists (wings)

White frosting (glue for candy)

Toothpicks (holds head, thorax and abdomen together)

**Assessment:**

Students will name all body parts of a butterfly and their location on the butterfly's body.

Extensions:

Students will build models out of craft items such as foam shapes and pipe cleaners.

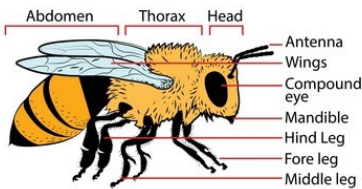
Building Pollinators

Objectives: 1) Students will learn the anatomy of pollinators.
2) Students will learn about adaptations of pollinator insects.

Summary: Students will use knowledge of pollinators to build a fictional pollinator.

Background: Animals or insects that transfer pollen from plant to plant are called pollinators. Pollinators visit flowers for many reasons, including food and shelter. Although some plant species rely on wind or water to transfer pollen from one flower to the next, the vast majority, almost 90% of all plant species, need the help of animals to accomplish this task. Of the approximately 200,000 different species of animals around the world that act as pollinators, the vast majority are invertebrates, including bees, butterflies, wasps and flies.

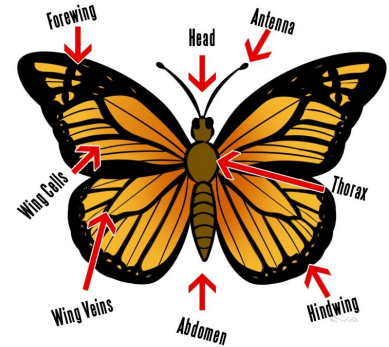
Among pollinators, bees are the superstars, they are the only group of insects that actively collect pollen and, in the process, transfer large amounts



of pollen from flower to flower. Bees also exhibit a behavior called floral constancy, which means that they visit flowers of one species repeatedly over a period of time. North America alone boasts more than 5,000 species of native bees, 90% of which lead solitary lives. The remaining 10 % are social bees, live in colonies and share the work of preparing and provisioning the same nest. Whether solitary or social, many species of bees pollinate effectively, with the European honeybee, the bumble bee, and the sweat bee among the most prolific.

Butterflies have excellent vision and are thus drawn to bright colors, including reds and oranges like sunflower, coneflower, artichoke, thistles, and dandelions, and mint and other

herbs naturally appeal to these fluttering insects. Attracting butterflies, however, involves incorporating plants that serve the needs of all their life stages,



places to lay eggs and form chrysalides, as well as food plants for larvae (caterpillars) and nectar sources for adults. The wing colors and patterns of butterflies are one of their most visible adaptations. Some butterflies have wing patterns that allow them to blend into their surroundings, while others have colorings that make predators believe they are poisonous. Still other butterflies have wing patterns that look like eyes, making them appear larger and scarier to enemies.

Flies can transport large amounts of pollen, which they often pick up from nectar-producing flowers. They prefer shallow, open flowers with readily accessible nectar drop-

Grade: 3-12

Subjects: Life sciences, visual art, language arts

Habitats: Wetlands, prairie, riparian, woodlands and badlands

Supplies: Paper, drawing materials, clay for sculpting, building materials such as foam, yard, pipe cleaners, etc.

Setting: Indoors

Vocabulary: Pollinator, adaptation, antennae, proboscis

Student Pages: My Pollinator

lets. Flies generally have tubular, sucking mouthparts, which vary in length and limit which flowers different species will visit. They are drawn to celery/celeriac, parsnip, and parsley, mustards, greens, strawberry, raspberry, and blackberry, many of which also happen to be unattractive to bees.

Procedure: Before students begin, review what students have learned about pollinators and their role in a healthy garden. Take a look at the physical attributes of actual pollinators. Include images of body types, wings, legs and mouthparts. After students have background information on pollinators, introduce the concept of building or drawing a fictional pollinator. Explain to the students that their pollinator can be a bee, fly or butterfly.

Students may use any medium to create their pollinator. This includes crayons, paint, colored pencil, markers, clay or sculpting using other objects such as foam, yarn, or pipe cleaners.

Pass out one of each type of Pollinator Building Card to students. Each student should receive a card for Mouth Type, Wing Type and Antennae Type. Combining the attributes of each card, students will develop a "New Species" of pollinator. When students are building their pollinator, students must explain the reasoning behind the coloration (what function does it serve, protection, mating, etc.) the mouth parts, legs, and other body parts.

Once students create their pollinator, have them complete the student page or use the writing prompts below.

What does your pollinator eat?

How does it eat?

What colors is it attracted to?

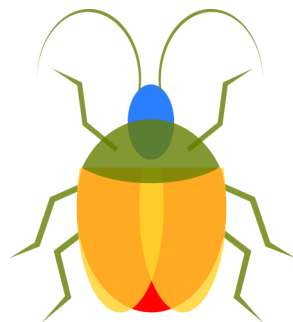
How large is your pollinator?

Where does it Live? Describe the habitat.

What are its predators?

Assessment: Students will identify pollinator differences and adaptations.

Extension: Older students create a virtual pollinator collection. Using cell phone or tablets, students collect pictures of pollinators in their region. Identify pollinators using field guides or iNaturalist. Each pollinator "collected" will have a profile indicating preferred habitat, food sources and predators. Students can share their "collections" through PowerPoint, or other digital media app.



Student Page: My Pollinator

The name of my pollinator is:

What does your pollinator eat?

How does it eat?











What colors is it attracted to?

How large is your pollinator?

Where does it Live? Describe the habitat?

What are its predators?

Pollinator Building Cards

<p>Antennae Type</p> <p>Conspicuous antennae (fly, wasp, bee or ant)</p> 	<p>Antennae Type</p> <p>Plum-like antennae (moth)</p> 
<p>Wing Type</p> <p>Two Pair of wings with powdery scales (Butterfly or moth)</p> 	<p>Antennae Type</p> <p>Knobbed antennae (butterfly)</p> 
<p>Wing Type</p> <p>One pair of wings (fly)</p> 	<p>Wing Type</p> <p>Two pair of transparent wings (wasp, bee or ant)</p> 
<p>Wing Type</p> <p>Wings with covers meeting straight down the back (beetle)</p> 	<p>Mouth Type</p> <p>Chewing mouth parts (beetle)</p> 
<p>Mouth Type</p> <p>Sucking mouth parts (fly)</p> 	<p>Mouth Type</p> <p>Sucking mouth parts that at long and coiled (butterfly or moth)</p> 

A Coat for all Season

Objectives: Students will describe characteristics and benefits of coat color change.

Summary: Students will make a model using paper plates to demonstrate the change in coat color for some mammals from summer to winter.

Background: In North Dakota, the long-tailed weasel is found on the prairie and usually lives near a water source. It is the largest and most common of three weasel species found in North Dakota. The other two are the ermine, or short-tailed weasel (*Mustela erminea*), and the least weasel (*Mustela nivalis*).

The long-tailed weasel is a carnivore. It has a very high rate of metabolism and eats about 40% of its body weight every day! Most of its diet is made up of small mammals like mice, voles, rabbits, gophers and chipmunks. It will occasionally eat birds and insects. It crushes its prey's skull with its canines. It uses scent and sound to track its prey. Its long, thin body makes it easy for it to follow prey into burrows.

The weasel is a solitary animal, except during mating season. It lives in the abandoned burrows of other mammals, in rotting logs or under tree roots or rocks. Its nest is made of grass and leaves and lined with fur. The long-tailed weasel is most active in the night, but it also comes out in the day. It does not hibernate. The long-tailed weasel can climb trees and it is a good swimmer. It uses lots of different vocalizations including squeals, squeaks, trills and purrs. It also releases a strong-smelling musk during mating season and when it is frightened. It is very aggressive when its territory is invaded.

The most basic form of camouflage is a coloration that matches an animal's surroundings. Of course, an animal's surroundings may change from time to time. Many animals have developed special adaptations that let them change their coloration as their surroundings change. In regions of snow, both species change their coat from summer brown to winter white. The white hair, which is longer and denser, replaces the brown over a period of three to five weeks. The color change starts from the belly and spreads upward. In spring, the process is

reversed. Only the tip of the tail, which is black, remains unchanged. Interestingly, the ability to change color is genetically programmed. Weasels from the south do not change color even when they are transplanted to the snowy north. Likewise, northern weasels still turn white when moved to a southern climate.

The change in color is triggered by length of daylight, not by temperature. That means weasels face special risks during any winter of on-again, off-again snow. Northern weasels can't help but turn white even when the earth remains brown, which makes them easy targets for predators.

Historically, the skins of weasels in winter. Historically, the skins of weasels in winter pelage were highly prized. Their fur is known as ermine (as is the animal itself in its winter whites), and in ages past it symbolized purity and innocence. According to medieval lore, the weasel would risk death to avoid soiling this beautiful coat. All a hunter needed to do was smear a weasel's lair with mud while the animal was out. According to the theory, the exhausted weasel would surrender before running through mud. The weasel in white thus came to symbolize noble notions of "death before dishonor," and its fur began adorning the

Grade: K-5

Subjects: Life science, visual arts, environmental science

Habitats: Prairie

Supplies: White paper plates, pencil, markers, paint, metal brad

Setting: Indoors

Vocabulary: Prairie, camouflage, adaptations

Student Pages: A Coat for all Seasons

ceremonial attire of monarchs. As recently as 1937, a total of 50,000 ermine pelts were sent from Canada to England to make robes for the coronation of King George VI.

Procedure: Cut out the long-tailed weasel on the student page. Trace an outline onto white paper plate and cut out the weasel on the paper plate. On a second paper plate, color half the plate brown. Once the brown paint is dry, draw a black ring around the edge of plate. This will be the tip of tail that remains black regardless of season. Attach the plate with the cut out weasel onto the front of the colored plate with brad through center. Spin the front plate and watch as your weasel changes color.

Assessment:

What triggers the weasel's fur to change color?

How does the winter fur differ from summer fur in texture and color?

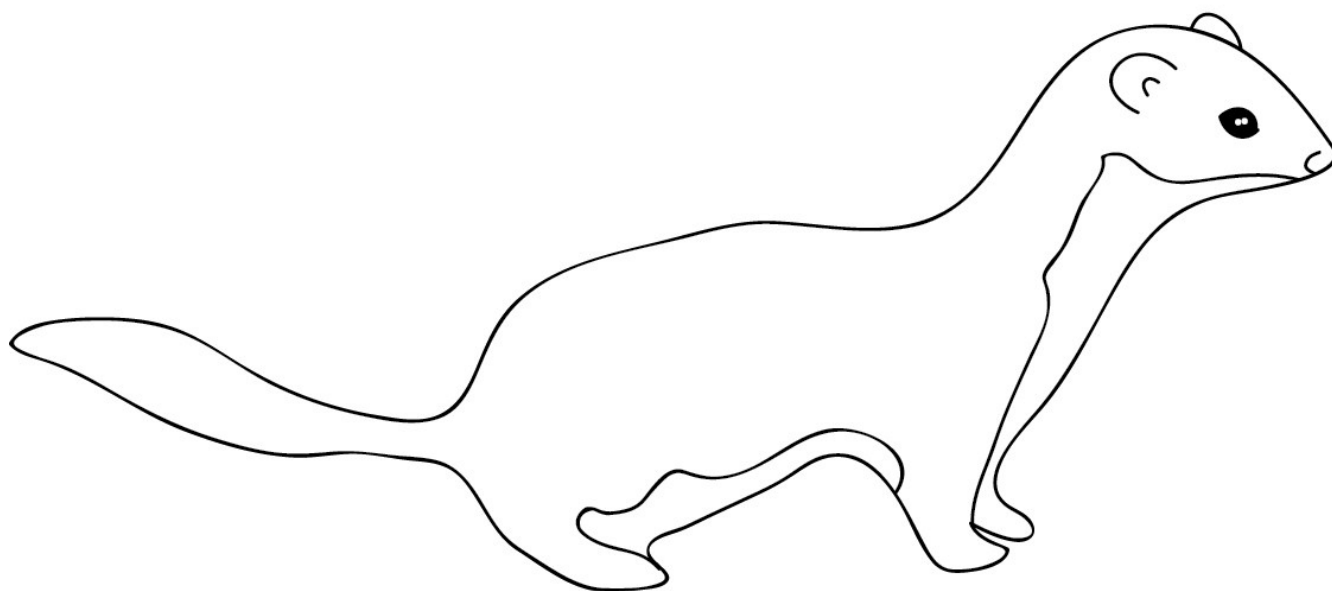
Explain how camouflage helps a wild animal.

Extensions

Instead of a weasel, use the jack rabbit outline instead. The jack rabbit also changes to white in the winter. Other animals that change from brown to white are the snow-shoed hare, and ptarmigan. Find outlines of these animals and put them in your collection.



Student Page: A Coat for all Seasons



Humans, Habitats and Wildlife

In this section you will find activities that explore the relationship between humans, wildlife and habitat.



Making Maps

Objectives: Students will learn the parts of a map, rivers, types of prairies, major cities, and landmarks of North Dakota.

Summary: Students will label maps with rivers, landmarks and cities in North Dakota.

Background: Maps are representations in miniature of larger areas. They shrink large areas onto a sheet of paper. Symbols represent features like rivers, roads, cities or even populations.

Maps fall into two different categories:

Reference maps use symbols to represent features of physical and man-made environments like rivers, lakes, roads and cities. Road maps and other maps that show political boundaries are examples of reference maps.

Thematic maps focus on a specific topic to show spatial distributions or patterns, like rainfall or other environmental issues. Thematic maps use shading, dots, or different sized symbols to represent the differences. They use shapes or colors to represent differences in type, like an ecoregion.

The title of a map communicates the main purpose of the map and specifies:

What - the main topic.

Where - the part of the world that it shows.

When - what time period the map covers.

An example of a map title is *Population Density of North Dakota (2022)*.

The legend explains the meaning of map symbols. The legend reveals different symbols and their meaning.

Direction is indicated by a compass rose that points to the four cardinal directions.

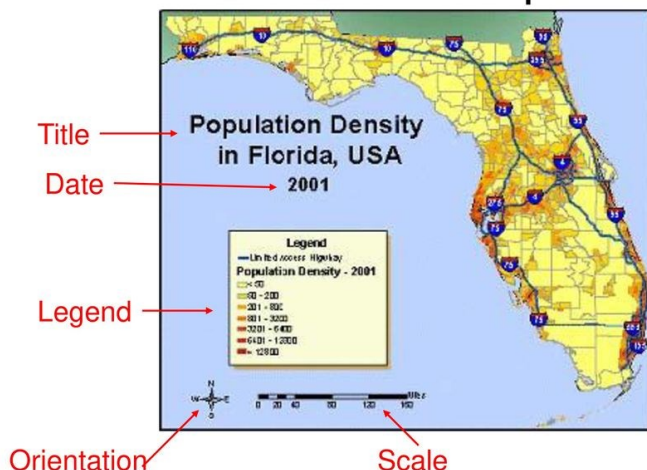
The grid system makes it possible to describe the location of places and talk about time at different locations. Latitudinal lines run horizontally and are measured in degrees.

Longitudinal lines run vertically and are measured in degrees.

A scale allows the reader to relate distances on the map to actual distances on the Earth.

In addition to the above listed map types, there are also Pictorial Maps that can depict the same types of information but have been used by historians. You will see pictorial maps both as historical documents and as works of art.

Parts of a Map



Grade: 3-12

Subjects: Life science, social science, geography

Habitats: Wetlands, riparian, prairie, badlands, and woodlands

Supplies: Paper, pencil, colored pencils

Setting: inside

Vocabulary: Map, legend, compass rose, grid system, scale

Student Pages: Map of North Dakota, Rivers of North Dakota, Map Symbols

Procedure: Using the maps and map symbols Student Pages, diagram the maps to indicate rivers, prairie types, state capital and other items that are important to your class. They may be the school locations, area parks, historical sites, etc. Students may need to make up their own symbols for special locations. Remember to have students use colored pencil to complete their map. Also, have them include a compass rose, legend, and a title for their map.

Assessment:

Describe the differences between Reference and Thematic Maps.

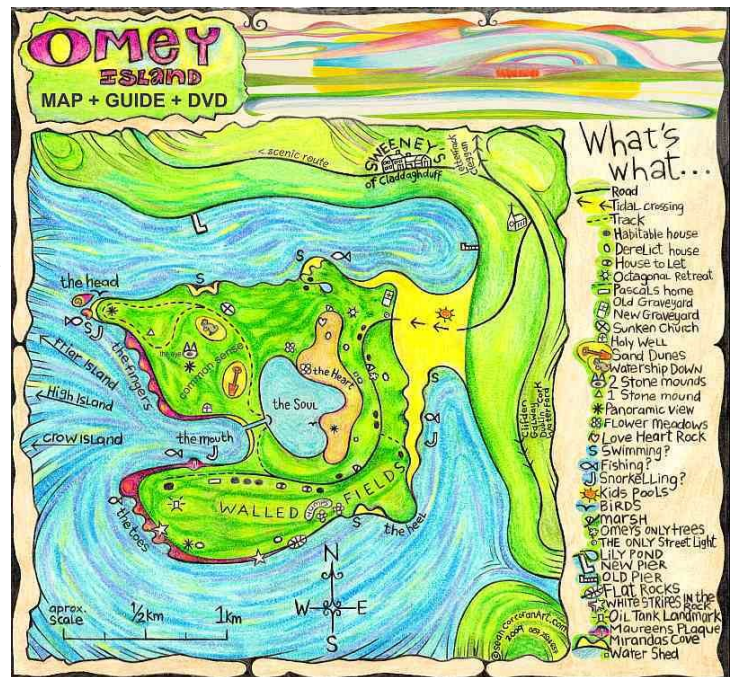
Define the following terms:

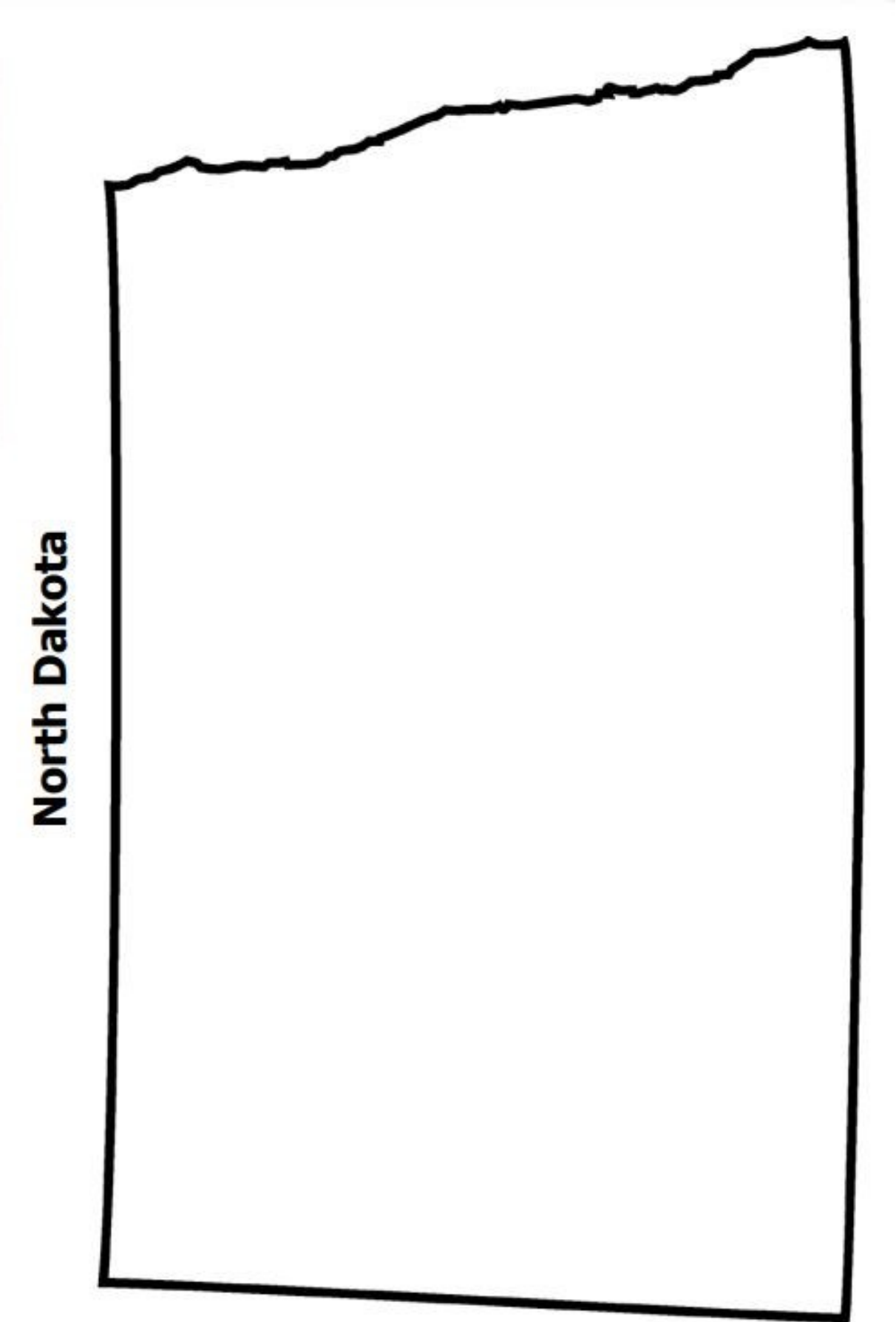
- Map title
- Map legend
- Compass Rose
- Scale

Extensions:

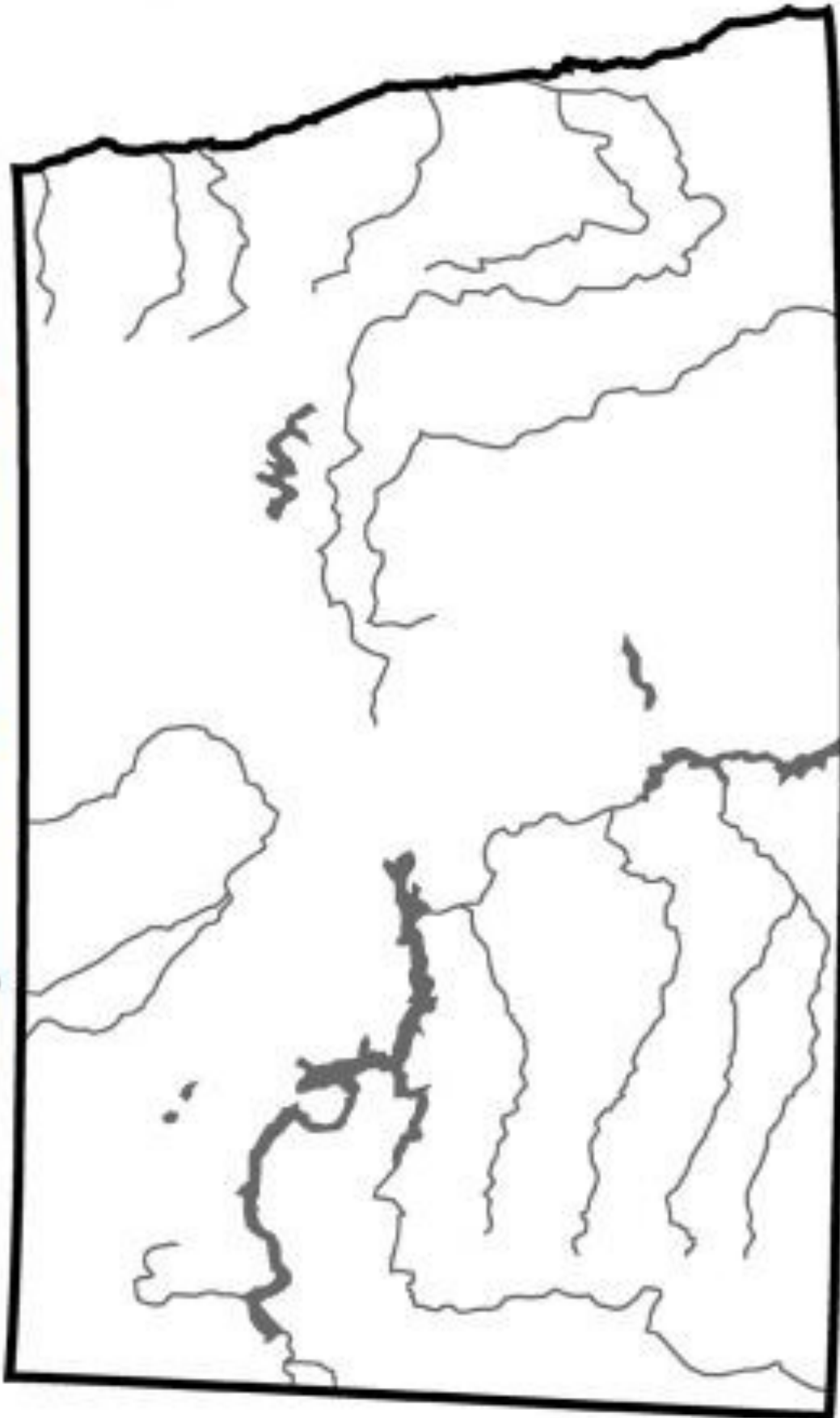
Have students create a pictorial map of your community, county, or state.

Using a mobile map app like google maps, apple maps or Onx, have them take a screen shot of the map image and have them identify all the components of a paper map. Explain the differences and similarities of paper maps and electronic maps.





Major Rivers of North Dakota



Student Page: Map Legends

Generic Road Map Legend

	Highway
	U.S. route
	State route
	Major street
	Street or road
	Railroad
	Ferry
	Interstate route
	U.S. route
	State route
	State capital
	Cities over 1,500,001
	Cities 1,000,001 to 1,500,000
	Cities 700,000 to 1,000,000
	State boundary
	County boundary
	Public airport
	Commercial airport
	Military airport
	Point of interest
	Elevation point



Tell It Like It Was

Objectives: Students will identify wildlife and landforms in specific North Dakota habitats that were originally found on the prairie. Students will write an experience in the voice of an early settler.

Summary: Students will write a letter or journal entry in the voice of a homesteading settler.

Background: When European explorers first came to North America, they used the word "prairie" a French word for meadow, to describe the grasslands they encountered. The tallgrass prairie found in the eastern part of North Dakota could reach heights above a man's head. Bison grazed the prairies in large herds. Also present were elk, as well as white-tailed deer, mule deer, coyotes, antelope, grizzly bears and wolves. Lewis and Clark wrote in their journals about the different species of wildlife they encountered along their trip through North Dakota. In addition to the many different types of wildlife, they described the plants they also saw, including buffalo berry, cottonwood and elm trees. Probably one of the most frightening sights the early settlers encountered was a prairie wildfire. For an accurate account of life on the prairie, students can read the North Dakota Section of the Lewis & Clark Journals.

European settlers began to arrive on the North Dakota prairies in the 1870s and took possession of land through the Homestead Act of 1862.

Procedure: Have students make a list of all the plants, wildlife and other sights they might see as an early settler. From this list have them incorporate the species from their list into a short story or letter to someone back "home" from the perspective of a settler experiencing the North Dakota prairie for the first time. Also, have them take into account what season it is when the settler arrives in the state.

Students may read their stories aloud so everyone can share their first North Dakota experiences. Students can also add to their essay by illustrating some of the species that they would have seen.

Assessment:

Name animal species that were seen either by Lewis and Clark or by early settlers but not found in the wild in North Dakota today.

Explain why or why not it would not be practical for these animals to live in the wild in North Dakota today.

Additional Resources:

Along the Lewis and Clark Trail in North Dakota compiled by Sheila C. Robinson, 1993

North Dakota 100 years ago by Larry Aasen. Westport, CT: Ellery Press, 2008.

North Dakota history: Readings about the Northern Plains State / edited by Kathleen Davison, Bonnie T. Johnson, Neil D. Howe; with unit introductions by Barbara Handy-Marchello. Fargo, N.D.: North Dakota Center for Distance Education, c2008.

Dakotas: Where the West Begins / photographs by Phil Schermeister ; written by John Thompson. Washington, D.C.: National Geographic, 2008.

Grade: 3-8

Subjects: Life science, geography, language arts, visual arts

Habitats: Prairie, wetlands, woodlands, riparian, badlands

Supplies: Paper, writing utensil, markers, colored pencils

Setting: Indoors

Vocabulary: Wildlife, prairie, tall grass prairie, mixed grass prairie, short grassed prairie

Student Pages: Tell It Like It Was - Observation, Tell It Like It Was - The Letter

From the Banat to North Dakota: A History of the German-Hungarian Pioneers in Western North Dakota / by David Dreyer and Josette S. Hatter. Fargo: Institute for Regional Studies, North Dakota State University, 2006.

Women of the Northern Plains: Gender and Settlement on the Homestead Frontier, 1870-1930 / Barbara Handy-Marchello. St. Paul: Minnesota Historical Society Press, 2005.

The Story of North Dakota. by Rolfsrud, Erling Nicolai, Alexandria, Minn., Lantern Books, 1963

From the Banat to North Dakota : a history of the German-Hungarian pioneers in western North Dakota / by David Dreyer and Josette S. Hatter. Fargo : Institute for Regional Studies, North Dakota State University, 2006.

Women of the Northern Plains : gender and settlement on the homestead frontier, 1870-1930 / Barbara Handy-Marchello. St. Paul : Minnesota Historical Society Press, 2005.

The story of North Dakota. by Rolfsrud, Erling Nicolai, Alexandria, Minn., Lantern Books, 1963

Student Page:
Observations

Habitats (Select one habitat)		Landform Changes and Observations:	
Riparian—Rivers Badlands—Southwest Woodlands—2-3% Prairie—Statewide (Tall grass, mixed grass & short grass) Wetlands—Temporary, permanent, lakes, dams			
Wildlife			
Birds	Mammals	Reptiles/ Amphibians	Fish

Student Page: Tell It Like It Was - The Letter



A writing template for a letter. It features a central area with 18 horizontal lines. The top two lines are indented from the left margin. The bottom two lines are also indented from the left margin. The page is decorated with intricate scrollwork in the four corners.

Questing for Wildlife

Objectives: Students will identify signs of wildlife.

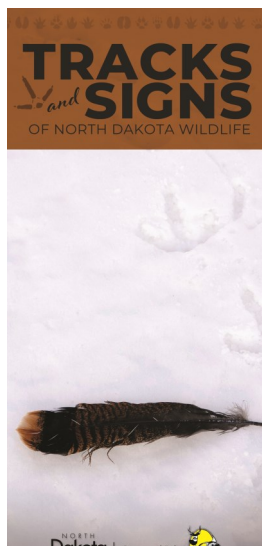
Summary: Students will learn about wildlife signs by exploring them with a checklist.

Background: Identifying wildlife tracks is a learned art that takes practice in the field. Tracking is a great way to understand which species are present, as well as understand the relationships between animals, their food sources and favored habitats throughout the year.

Track identification can be a bit easier by knowing what species are more likely to be found in a given area or habitat. The foot patterns presented on the ground may vary, depending on whether the creature is walking, running, galloping or trotting. An impression will be easier to identify in soft earth found around the edge of a wetland. Sand and snow may be more challenging.

Use other animal markings such as scat, home building or other behavioral signs nearby to assist in narrowing down your best guess. Also, think what would make more sense given the location. For example, a cottontail rabbit in a sitting position underneath a back yard deck may leave an impression of overlapping tracks that at first could appear as a large predator track. A large dog would also leave a print looking a lot like a wolf.

To learn more, acquire a comprehensive guide containing much more information on the subject. You might want to use Tracks and Signs of North Dakota Wildlife found at https://gf.nd.gov/sites/default/files/publications/tracks_signs_of_nd_wildlife.pdf.



Mostly, have fun and learn what you can by simply being outside!

Procedure:

Divide students into groups and have them explore a designated natural habitat. Record their observations on the Student Page: Wildlife Quest. Instruct students to observe plants and animals.

Assessment:

Students will identify one animal species.

Students will describe how animals and humans share habitats.



Grade: K-12

Subjects: Life Science

Habitats: Wetlands, riparian, prairie, woodlands, badlands

Supplies: Paper, pencil, clipboard

Setting: outside

Vocabulary: Animal track, scat, diversity, herbivore

Student Pages: Wildlife Quest

Student Page: Wildlife Quest

Find traces of an animal running



Find scat on a hard surface like a rock.



Find pellet like scat. What type of animal left it behind?

What animals leave tracks with claw marks?



Find evidence of an animal that is not a track or scat

Find a place where a plant eating animal ate.

Find bird tracks or droppings



Find evidence that a deer was in the area.



Locate a place where an animal rested. How can you tell?



Evidence that other people and animals share the same habitat.



Soil Painting

Objectives: To discover the beauty in the variety of colored soils found in the world and understand the different characteristics of soil.

Summary: Students will create a painting using paints made from different soils.

Background: Soil consists of minerals, water, air, organic matter and living organisms. Covering most of the Earth, soil forms the uppermost layer of the crust of our planet. By providing nutrients and water to plants, soil supports all life on Earth. Soil is essential not only for the plants that grow in it but also for the humans and other organisms that rely on plants for food and shelter.

Sandy, silt, clay, and loam are among the common terms to describe soil textures. Most of the solid structure of soil is made up of mineral particles. Differences in a particular soil's particle sizes and proportions help determine the type of soil texture.

The most familiar type of mineral particle is sand, which is visible to the naked eye. Silt particles, which are smaller than sand particles, are microscopic and smooth when wet, but they're not sticky. Clay, the smallest type of particle, is sticky when wet, forming hard clods when dry. Loam is soil that is made up of roughly equal amounts of sand, silt and clay. Loam may have organic matter humus, mixed in as well.

Soil structure is the way the sand, silt and clay particles are clumped together. Organic matter (decaying plants and animals) and soil organisms like earthworms, and soil structure. Clays, organic matter and materials excreted by soil organisms bind the soil particles together to form. Soil structure is important for plant growth, regulating the movement of air and water, influencing root development, and affecting.

Soil porosity is the pores within the soil. Porosity influences the movement of air and water. Healthy soils have many pores between



and within the aggregates. Poor quality soils have few visible pores, cracks, or holes.

Soils can be neutral. Soil nutrient absorption and plant growth. Some plants, like potatoes, grow best in a more acidic soil (pH of 5.0-6.0).

Soil colors range from black to red to white. Sometimes it can even be blue! Soil color mostly comes from organic matter and iron.

Grade: 3-12

Subjects: Life science, soil science, geology, visual arts

Habitats: Wetlands, riparian, woodlands, prairie, and badlands

Supplies: Different colored soil samples (air dried), mortar and pestle, watercolor paper, paper cups (4 oz.), sieve, pencils, paint brushes, artist medium or elmer's glue, sponges and rags, masking tape

Setting: inside

Vocabulary: Soil, sediments, geologic formations, soil texture, soil structure, porosity, soil pH,

Procedure:

For the Soil

Collect soil samples in a variety of colors. Soils can be found that are brown, black, red, orange, yellow, grey, even blue, or green. Air dry on aluminum foil or paper plates. Place some of the dried soil into a mortar. Use the pestle to further crush the soil into a fine powder. Repeat to crush all the different colored soils. Sieve the soils. Store the different soils in labeled jars.

For the Painting

Lightly sketch a drawing on watercolor paper with a pencil. Use masking tape to carefully tape the edges of the paper to the table or easel. This will allow the artwork to dry flat. Pour a small amount of artist acrylic or Elmer's glue in small paper cups. Add a small amount of finely powdered soil to the medium. Add a small amount of water to the soil mix for the desired consistency. Experiment with the depth of color by adding more soil and create new colors by mixing different soils. Use different sizes and kinds of paint brushes, sponges, or rags to apply the soil paint to your paper. When your artwork is dry, you may want to apply another layer of soil paint. You may use a black ink pen to make finishing touches on your artwork, either as an outline or as accents.



Assessment:

Describe the different soil characteristics.

Extensions:

Have students contact different Soil Services throughout the country to obtain different soil samples and compare to the soils found in your state.

Have an exhibit of students' soil artwork. Each art piece will have an explanation label of the different soil types, characteristics and where the soil type is found.

Resources:

Learn about Jan Lang, an artist that uses soil paint and view her soil paintings.

<https://access.onlinelibrary.wiley.com/doi/full/10.2136/sh2013-54-4-rc2>

Video instructions on how to paint soil: <https://youtu.be/1oLGdmyMcuQ>

Information on soil characteristics: <https://geopard.tech/blog/soil-types-how-to-make-the-most-of/>

Making a Difference

In this section you will find activities that provide more beneficial habitat for wildlife.



Building Habitat

Objectives: Students will understand the importance of land use planning as it affects people, wildlife and the environment. Students will observe butterflies in their natural environment. Students will discover the correlation between butterflies and plants as it relates to attracting wildlife.

Summary: Students will plan, plant and tend a habitat plot and monitor it's use by different species.

Background: Butterflies and other pollinator insects need gardens to survive. Planning and planting a pollinator garden is a positive action for pollinators. Students will work together on a long-term project, planning where and when to plant their garden, deciding on equipment and supplies they will need. Different species of butterflies have different preferences of nectar, in both color and taste. When trying to attract the greatest diversity of butterflies it is important to plant a wide variety of food plants. Select plants that bloom at different times of the season, providing a constant food source. Keep in mind that groups of the same plants are easier for butterflies to see. Consider a butterfly friendly site for your garden. Butterflies like sunny areas that are sheltered from high winds. These sights are most needed in the spring and fall. Be sure to provide rocks or bricks to give butterflies a place to soak up the warm sun. Butterfly gardens are a good way to expand student interest in nature. By providing an area with native inhabitants, students will have the opportunity to explore and observe the local environment around them. Pollinator gardens also play an important role in conserving butterfly habitats, which are diminished by urban development.

Procedure:

Step 1: Planning Discuss how butterflies and other insects use plants and how they need special plants at different times in their life cycles. Discuss the work involved in a garden, including the maintenance of the garden during summer months. Brainstorm the benefits of a

garden (decreased noise and air pollution from reduced mowing, reduced soil erosion, a beautiful garden, food and shelter for many organisms.) As a class, you should decide on the criteria you will use to judge a site. Important considerations include available sunlight, foot traffic, visibility to school and others, and vulnerability to vandalism. Choose the plants that you want in your garden. Encourage students to choose plants that bloom at different times. Perennials are good since they only have to be planted once. You can include an area for annual plants also. Plants should vary in height, color and length of blooming time. Using the chart, decide which butterflies you would like to attract, then choose the correlating plant. Once the class has decided which plants they want in the garden, consider printing pictures of the plants and using them to plan the garden. Use the graph paper to draw out a plan for planting. (Older students can work individually or in small groups with younger students with the teacher as a recorder.)

Grade: k-12

Subjects: Life science

Habitats: Wetlands, riparian, prairie, woodlands, and badlands

Supplies: Graph paper for planning, seed catalogues, seeds or seedlings, gardening supplies (soils, fertilizer, shovels, rake, hoe) and containers to start seeds.

Setting: outside

Vocabulary: Habitat, tracks, host plant, diversity

Student Pages: Habitat Observations

with the teacher as a recorder.)

Step 2: Start Seeds Buy seeds or plan where to purchase plants. Remember to purchase plants when it is time to plant your garden. Plant seeds: Fill trays with planting medium and plant seeds according to instructions on seed packets. Keep seedlings in a sunny window or under grow lights. Have students keep track of the seedling's growth in a journal, recording days to sprouting, height and leaf stage. After 6-12 weeks, seedlings will be ready to plant outside.

Step 3: Planting the Garden Prepare the soil by tilling and turning it over so it is loose for planting. This is also a good time to add fertilizer. When planting the seedlings, make sure the chance of frost is past. Apply mulch to prevent soil erosion, maintain soil moisture and slow weed growth. Once the garden is planted, set a class schedule for garden maintenance. This includes watering, weeding and replacing mulch. Make sure to leave time to observe the garden at least once a week. Keep track of the blooming plants and insects seen in the garden.

Step 4: Summer Care Make a plan for caring for the garden over the summer months. Involve parents, local garden clubs or other school staff and faculty. You can add a number of butterfly accessories to your garden. Students can build butterfly houses with small slots. You can also consider providing additional nectar source to supplement your flowers.

Assessment:

Students will describe the components of habitat.

Students will name common butterfly species and their host plants.

Extensions:

Students will develop habitat that is suitable for pollinators, mammals and/or birds.

Student Page: Habitat Observations

Date _____	Name _____				
Time _____					
Weather Conditions: Sunny	Cloudy	Raining	Windy	Calm	Other _____
Temperature _____					
Species of Insect/Butterfly _____					
Life Cycle State _____	Caterpillar size _____	Inches/Centimeters			
Type of plant observed on _____					

Common Butterflies in North Dakota and their host and nectar plants:

Butterfly	Host Plants	Nectar Plants
Spreadwing skippers	False indigo	<p>The following nectar plants are a good start for a pollinator garden. Using a combination of annuals and perennials will allow you to provide flowers in bloom throughout the season.</p> <ul style="list-style-type: none"> • Sedum • Asters • Bee balm • Blackeyed Susan • Blanket flower • Butterfly bush • Butterfly weed • Clover • Coneflower • Cosmos • Daisy fleabane • Dame’s rocket • Dandelion • Day lily • Gayfeather • Goldenrod • Lavender • Liatris • Lilac • Marigold • Petunia • Phlox • Verbena • Yarrow • Zinnia
Grass skippers	Little bluestem, switch grass	
Yellow swallowtail	Willow	
Black swallowtail	Dill ,fennel, parsley, celery, carrot, Queen Anne’s Lace, prairie parsley, water parsnip, water hemlock, wild chervil, water parsnip	
White or cabbage butterfly	Spider flower , radish, mustards, cabbage, broccoli	
Yellow or sulphur butterfly	Alfalfa, clover, vetch, legumes	
Bronze copper butterfly	Docks and smartweed	
Hairstreak butterfly	Mallow, legumes	
Melissa blue butterfly	Wild licorice and alfalfa	
Mormon metalmark butterfly	Rabbit brush	
Fritillaries	Violets	
Crescents and checkspots	Asters	
Angelwings and tortoiseshells	Currents, gooseberry, stinging nettle	
Monarch	Milkweeds	
Painted lady	Thistle, mallow	



Seed Bombs

Objectives: Students will identify native seed and create a native seed planting.

Summary: Students will assemble self-contained seed and soil mixtures to plant.

Background: Seed bombs are the main weapon guerrilla gardeners can use to spread flowers in bare spots, creating pockets of beauty and habitats for pollinators.

Many guerrilla gardeners arm themselves with trowels and work nocturnally. But with seed bombs it is possible to make a difference without that considerable commitment; lob a bomb from a bicycle, a car window, or when passing on foot. Seed bombing is best done in spring and autumn. Time your attack to coincide with heavy rainfall.

Before seed bombing, assess a site for sunniness and choose your seeds accordingly. They do not need to be sun-loving annuals: foxgloves would suit a shadier site. Cosmos, a classic annual, is a perfect candidate for guerrilla gardening.

Native seeds are the best alternatives for your seed bombs because pollinator insects are best adapted to use them for pollen, nectar and as food sources for all stages of life. For example, the monarch butterfly must have access to the milkweed plant to complete its life cycle.

Procedure: Mix the seed, clay, and compost together in a bowl to a ratio of three handfuls of clay, five handfuls of compost, and one handful of seed. Then carefully add water slowly and gradually (you don't want it too gloopy), mixing it all together until you get a consistency that you can form into truffle-sized balls. Lay them out to bake dry on a sunny windowsill for at least three hours.

Assessment:

Students will describe why native plants are a better option for pollinator insects.

Extensions:

Have students research native plants for your area.

Have students determine what plants are the best food source and/or host plants for pollinator insects.



Grade: k-12

Subjects: Life science, agriculture

Habitats: Prairie

Supplies: Soil, plastic tub for mixing, native seed, water, paper plates, powdered potters clay

Setting: indoors or outdoors

Vocabulary: Native plants, pollinator insects

Appendices

In this section you will find glossary of terms and lesson cross referenced by subject and grade.

Subject & Grade Index to Activities

Activity

Subjects

Activity	Grade Level	Page	Life Science	Earth Science	Language Arts	Social Studies	Art	Environmental Science	Industrial Arts	Physical Education
Exploring Habitats	3 - 8 Gr.	7	x		x	x				
What Type of Wetland	3 - 12 Gr.	10	x					x		
Parts of a Forest	K - 6 Gr.	12	x				x			
Exploring Badlands	3 - 8 Gr.	16	x	x	x	x	x	x		
Habitat Inventory	3 - 12 Gr.	18	x				x	x		
Modeling Habitat	3 - 7 Gr.	22	x		x	x				
Aquatic Insects & Water	6 - 12 Gr.	25	x					x		
Questing for Wetlands	K - 12 Gr.	29	x					x		
Making Observations	5 - 12 Gr.	31	x							
Fish Printing	PreK - 12 Gr.	34	x				x			
Birds of a Feather	K - 8 Gr.	37	x						x	
Striking Distance	3 - 8 Gr.	40	x							x
Whose Poop is This & Other Animal Signs	K - 12 Gr.	42	x							
Using Shapes for Texture or Illustration	K - 12 Gr.	45					x			
Anatomy of a Butterfly	2 - 7 Gr.	46	x				x			
Building Pollinators	3 - 12 Gr.	48	x		x		x			
Owl Pellets	3 - 12 Gr.	52	x				x			
A Coat for All Seasons	K - 5 Gr.	55	x				x	x		
Making Maps	3 - 12 Gr.	59	x			x	x			
Tell It Like It Was	3 - 8 Gr.	64	x		x	x	x			
Questing for Wildlife	K - 12 Gr.	67	x							
Soil Painting	3 - 12 Gr.	69	x	x			x			
Building Habitat	K - 12 Gr.	72	x							
Seed Bombs	K - 12 Gr.	75	x					x		

Glossary

Adaptation - it is the dynamic evolutionary process of natural selection that fits organisms to their environment, enhancing their evolutionary fitness

Antennae - they function as insect radar

Autumn - one of the four temperate seasons on Earth. Autumn marks the transition from summer to winter

Badlands - dry terrain where softer sedimentary rocks and clay-rich soils have been extensively eroded found in western North Dakota

Beak - external anatomical structure found mostly in birds, but also in turtles, non-avian dinosaurs and a few mammals used for eating, preening and fighting for prey

Bioaccumulation - gradual accumulation of substances, such as pesticides or other chemicals, in an organism

Biological integrity - associated with how "pristine" an environment is and its function relative to the potential or original state of an ecosystem before human alterations were imposed

Butterfly abdomen - abdomen contains the digestive system, breathing apparatus, a long tubular heart, and the sexual organs

Canopy - aboveground portion of plant community

Camouflage - the use of any combination of materials, coloration, or illumination for concealment, either by making animals or objects hard to see, or by disguising them as something else

Compass rose - figure on a map used to display the orientation of the cardinal directions (north, east, south, and west) and their intermediate points

Compound eye - visual organ that consists of thousands tiny independent photoreception units that consist of a cornea, lens, and photoreceptor cells which distinguish brightness and color

Conservation - the preservation or efficient use of natural resources

Deciduous - trees that have leaves

Diversity - the number of different types of life forms within an ecosystem

Evergreen - trees that have needles or scales that remain attached all year

Feathers - growths that form a distinctive outer covering, or plumage, on birds

Gall - abnormal outgrowths of plant tissues

Geologic formation - layer of rock having a consistent set of physical characteristics (lithology) that distinguishes it from adjacent layers of rock

Glacier - a persistent body of dense ice that is constantly moving under its own weight

Grid system - latitudinal and longitudinal lines that make it possible to describe the location of places and talk about time at different locations

Groundwater - the water present beneath Earth's surface in rock and soil pore spaces and in the fractures of rock formations

Habitat - the array of resources, physical and biotic factors that are present in an area, such as to support the survival and reproduction of a particular species

Host plant - supplies food resources

Leaf - principal appendage of the stem of a vascular plant,^[1] usually borne laterally above-ground and specialized for photosynthesis

Legend - explains the meaning of map symbols

Macroinvertebrate - group of animals that do not have a backbone

Mammal - animals characterized by the presence of milk-producing mammary glands for feeding their young, a neocortex region of the brain, fur or hair, and three middle ear bones

Map - a symbolic depiction emphasizing relationships between elements of some space, such as objects, regions, or themes

Mixed grass prairie - prairie composed of vegetation of varied heights

Native plant - a plant that originated in the area is grows

Niche - the match of a species to a specific environmental condition

Photosynthesis - a biological process used by many cellular organisms to convert light energy into chemical energy, which is stored in organic compounds that can later be metabolized through cellular respiration

Pit viper - a family of snakes that have of a heat-sensing pit organ located between the eye and the nostril on both sides of the head

Pollution - the introduction of contaminants into the natural environment that cause adverse change

Pollinator - any animal that transfers pollen from one flower to another. Usually an insect, but can be a bird, reptile or mammal

Porosity - the space between the mineral components in soil

Prairie - areas of land that are characterized by of grasses, herbs, and shrubs

Prairie pothole - depression in the ground formed by melting glacial ice

Predator - an animal whose diet consists of other animals

Prey - an animal that is consumed by other animals

Proboscis - a tube, much like a drinking straw. This tube can be coiled up like a spring for storage, or extended to enable the butterfly to reach deep into flowers to suck up nectar or straight as in other insects

Riparian - the habitat that is comprised of the land adjacent to rivers and the river itself

Scale - determines distance between two points on a map

Season - changes in weather, ecology, and the number of daylight hours in a region

Sediment - naturally occurring material that is broken down by process of weathering and erosion

Seed - a plant embryo and food reserve enclosed in a protective outer covering

Seedling - the beginning of plant growth once the seed sprouts

Short grass prairie - prairie that is comprised of vegetation generally shorter than 12 inches

Soil - the uppermost layer of the earth and consists of minerals, water, air, organic matter and living organisms

Soil pH - a measure of the acidity or basicity (alkalinity) of a soil

Soil Structure - the way the sand, silt and clay particles are clumped together

Soil Texture - Differences in a particular soil's particle sizes and proportions

Songbird - bird classified as a perching bird that is known for its vocalizations or song

Spiracle - holes through which air enters and leaves the body. Slight rhythmic movements of the body, coordinated with the opening and closing of the spiracles, causes air to be drawn into tiny lung-like sacs, and later expelled

Striking distance - the distance required for a snake to bite its prey

Tall grass prairie - prairie with vegetation at least three feet or more in height

Talon - the claw of a bird of prey

Thorax - consists of 3 insect body segments which are fused together, forming a chitinous cage which contains the flight muscles, and acts as an anchor point for the legs

Track - a footprint left behind by an animal

Tree trunk - the main stem of the tree

Water cycle - continuous movement of water on, above and below the surface of the Earth

Waterfowl - birds that use water in one or more parts of their life cycle. Only ducks, geese and swans are considered waterfowl

Webbed feet - feet with webbing between their toes belonging to waterfowl, beavers, otters and other wildlife species

Wetland - an area of land that is flooded with water, has wetland plants and has distinct wetland type soil

Wing vein - The pattern of veins is different for every genus of butterfly and is one of the main criteria used by taxonomists when classifying butterflies

Woodlands - habitat that is characterized by trees and shrubs and lacks open areas

