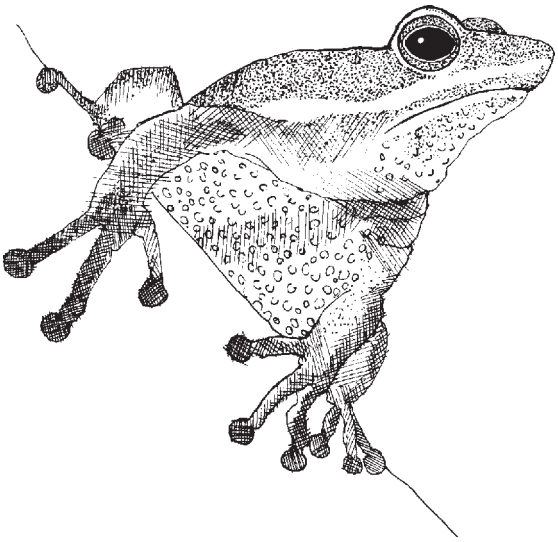
TUALATIN RIVER

National Wildlife Refuge

Indoor Classroom Activities



Section E

Section E

Guidelines for Indoor Classroom Use

Teachers and Chaperones: Please read and abide by the following guidelines when planning and using the Refuge classroom for student field trips.

Classroom Use

• The classroom is designed to extend students' outdoor experiences on the Refuge. Please plan to use the classroom as a springboard for outdoor activities, as a stop in a field trip rotation, and/or as a place to analyze and wrap-up a field trip.
• Please refer to the curriculum chapter called "Indoor Classroom Activities" to choose from an assortment of activities that available.
• A Refuge staff member or volunteer must be present when classroom is in use. Enter classroom double doors to the left of the Wildlife Center main entrance. Please do not use front entrance.
• The maximum occupancy of the classroom is 49 individuals, including adults. No exceptions.
• When using classroom, students may use the restrooms inside, but are not allowed to wander the exhibits or the sales area. They must return to classroom. Please manage appropriately. For visiting the information and sales area, see below.
• Use the classroom patio and outdoor paved areas for viewing, but please do not congregate in the area between the building.
• The classroom is not to be used as a lunchroom. Short snack times are ok. The classroom may be used for lunch in only the most inclement weather. Otherwise, students may eat in the plaza areas closest to the parking lot, on the classroom back patio, or on the bus. Again, the space between the buildings is not for eating lunches.
• All lunch trash must be taken away when the field trip is over. The Refuge does not have the capacity to manage this much waste. See the activity "No Trash Lunch" for ideas.
• When starting field trips outdoors, direct students to use the vault toilet instead of bringing them indoors. This avoids the tendency for large groups of students to use the bathroom because all of their friends are too.

Field Trips and the "Rest" of the Wildlife Center

• Field trips are **NOT** allowed to explore exhibit area. The exhibits are not designed for the type of use that would occur with groups of students. They are designed for casual visitors and families.
• In a controlled manner, students may visit the information desk and sales areas. To avoid overwhelming this small space, use the following guidelines:

    • As much as possible, field trip visits to the sales/information area should happen after the education activities are complete, or during lunch breaks. We do not want to hinder students' educational experiences.
    • All students must be accompanied by a chaperone. No more than 5 students per chaperone, regardless of age. No more than 2 supervised groups of 5 at a time.
    • While waiting their turn, teachers may choose to have students read the outdoor signs, view the refuge from the classroom patio, use the restroom, have a snack etc.
    • If the field trip is already using the classroom, they may access the information area from the interior hallway per the previous guidelines.

Naturalist-led activities

- Refuge staff or volunteer naturalists will lead all indoor classroom activities.
- Teachers and chaperones are welcome to stay in the classroom or use the time to train parent volunteers for other field trip activities. For students grade K-3, we require at least 3-5 parents remain in the classroom for supervision purposes. For older students, we require 1-3 parents stay.
- While students are participating indoors, teachers should/can take this 30 minutes to train, prepare and orient parent volunteers to the Refuge's rules, regulations, and trail system, as well as the day's lesson plan, activities and time schedule. A staff member or Refuge volunteer will accompany you if you need of additional information or to provide you with any requested field trip equipment.
- Teachers and parent volunteers should be ready outside the classroom five minutes before an activity ends. Once staff has assembled students into their color groups, teachers and parents should find their student group (red, green, blue, yellow, purple) and begin the day's outdoor field trip activities.

Be Aware of Your Trash

Bring trash bags with you, avoid littering on the trails and please pick up any trash that you see.

Classroom Supplies

All classroom supplies specific to classroom activities will be made available by Refuge staff or volunteers. No additional supplies are provided.

After School Extra Credit

Teachers that attend the teacher workshop will be encouraged to have their students return to the exhibit area with their families to earn extra credit. Refer to the "Extra Credit" section under "Resources" for activity worksheets that teachers may photocopy and provide to their students.

Refuge Introduction

INDOOR LAB ACTIVITY

Overview
Students will learn specific information about the U.S. Fish & Wildlife Service, the National Wildlife Refuge System, and how the Tualatin River Refuge is part of this vast system.

Classroom Capacity
45 maximum

Activity Capacity
60 students

Duration
15-20 minutes
30-35 min. 2 group rotation
(less time for K-3)

Grades
4-12
Variable K-3

Benchmarks
- Organisms
- Diversity/Interdependence
- Science & Social Perspectives
- State & Local History

Key Concepts
The Tualatin River National Wildlife Refuge is managed to provide safe habitat for many different plants, birds and animals. "Wildlife First" is the motto of the National Wildlife Refuge System.

Objectives
Students will be able to:
- understand importance of the Tualatin River Refuge and how it preserves habitat important to wildlife.
- understand the difference between a Refuge and a local park or playground.
- learn 2-3 plants, birds or animals on the Refuge.

Materials
Refuge Video
Student handout
Pencil

Background Information

At the beginning of the field trip, a brief introduction is offered to students, grades 4-12, by staff about the Tualatin River National Wildlife Refuge, followed by the 12 minute video "A Place For Wildlife & People." This video introduces students to the history of the National Wildlife Refuge System and the U.S. Fish & Wildlife Service which is responsible for caring for our nation's wildlife and habitat. Wildlife refuges give wildlife top priority, hence "Wildlife First" is the motto of the National Wildlife Refuge System. For younger students, an 8 minute video reviews through pictures the plants, animals and habitats of the Tualatin River Refuge.

With their new found knowledge, students will be able to understand why all National Wildlife Refuges, including the Tualatin River National Wildlife Refuge, are different from local parks or nature areas. They will understand how all Refuges are managed to support many different populations of plants and animals such as geese, ducks, oak trees, maple trees, bald eagles, etc.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) will lead all indoor lab activities.

The Refuge Introduction is recommended by staff as the first activity of the field trip or it can be added as one activity in the days rotation.

If student numbers are less than 35, students will stay as one group for this activity. If student numbers are more than 35, then they will be divided into two groups.

As one student group (less than 35), they will be given a short outside introduction about the Tualatin River Refuge by staff or a volunteer naturalist, and then be ushered into the classroom for the video viewing.

As two student groups (more than 60), they will rotate between an outside introduction about the Tualatin River Refuge presented by staff or a volunteer naturalist, and then rotate into the classroom for a video viewing about the National Wildlife Refuge System.

Students are offered an outdoor welcome introduction about the Tualatin River Refuge National Wildlife Refuge, and then an indoor video viewing specifically about the National Wildlife Refuge System. A brief question and answer period follows the video. After every student has gone through the Refuge Introduction, teachers and parent

volunteers will then escort them from the classroom to begin their outdoor field trip activities.

While students are participating in Refuge Introduction Activity teachers should take this 15 to 35 minute time slot to train, prepare and orient parent volunteers to Refuge rules, regulations, and trail system, along with the day's lesson plan, activities, time schedule and any other information. A staff member or Refuge volunteer will hand out any requested field trip equipment. Teachers and parent volunteers should be ready outside the classroom five minutes before Refuge Introduction ends. Once staff has assembled students into their color groups, teachers and parents should find their student group (red, green, blue, yellow, purple) and begin the day's outdoor field trip activities.

Variable K-3:
Students are offered a welcome introduction outside about the Tualatin River National Wildlife Refuge, and then will view an 8 minute video introducing them to the unique animals, birds, plants and habitat of the Tualatin River National Wildlife Refuge.

Again if student numbers are less than 35, students will stay as one group for this activity. If student numbers are more than 35, they will be divided into two groups. As noted above, teachers should take this time to train those parent volunteers leading activities during the day's field trip. Please note for students grade K-3, we require that at least 3 parents remain in the classroom for supervision purposes.

Assessment Ideas

Ask students the following questions:

1. What makes the Tualatin River Refuge different from your local park or school yard?
2. What types of unique birds, plants and animals do you think you can find at the Refuge?
3. What is the National Refuge System motto?
4. How do seasons affect the Refuge's plants, animals and birds?
5. What year was the National Refuge System established? Which President established the System and what is the name of the first Wildlife Refuge?
6. Why was the Tualatin River Refuge established?
7. What are 4 things you can do to help protect the plants, birds, and animals of the refuge?

References

U.S. Fish & Wildlife Service, Pacific Region.
http://www.fws.gov/pacific/

Tualatin River National Wildlife Refuge.
http://www.fws.gov/tualatinriver/

Journal Creation

INDOOR LAB ACTIVITY

Overview
Students will create their own journals to use during their visit to the Refuge, for follow-up activities back in class, and as a keepsake.

Classroom Capacity
45 maximum

Activity Capacity
45 students

Duration
Recommended first field trip activity: 25-30 minutes

Grades
4-12

Key Concepts
Allow students creative art time to personalize and construct their own field trip journal. This activity allows students to take a direct role in their journal creation while allowing teachers time to train parent volunteers for the days field trip activities.

Objectives
Students will be able to:
- Creatively design their journal covers and inside pages.
- Organize their work into finished journals for use during their field trip.

Materials
Refuge Art Supplies
Optional Teacher Requests: Extra paper, worksheets, or specific supplies to be furnished by teacher

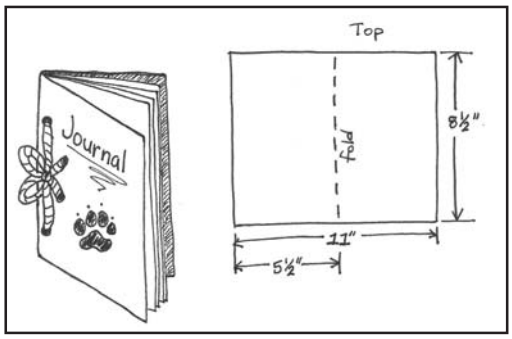
Background Information

What is "nature journaling"? Clare Walker Leslie writes, "Nature journaling is your path into the exploration of the natural world around you, and into your personal connection with it." It is the act of recording observations of the natural world around you and your feelings or perceptions of what you are observing. There are many combinations and techniques that can be used from poetry or prose, art or drawings, recordings or musical notations, stories or narratives - it is a flexible process dependent only on the individual. It is also interdisciplinary. Leslie notes ". . . it incorporates sciences, local social and natural history, math, languages, art, and physical education into one . . ." Creating a nature journal is a fun first step towards stirring curiosity about the natural world around us.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) will lead all indoor lab activities.

Standard format used for all journals:
A) 8.5" x 11" white paper folded in half for the inside pages, two folded sheets per journal.
B) 8.5" x 11" colored construction paper folded in half for covers, one folded sheet per journal.
C) All Refuge organized journals will include reflection pages, Refuge trail map and blank pages.
D) Final journals are 5.5" x 8.5", hole punched and threaded with yarn or other material. See sample below.
E) Teacher Requests: specific covers or additional pages already copied and completed at school can be furnished for inclusion into student journals.*



*Teachers can participate more fully in the journal creation by providing specific art supplies, teaching art styles, supplying specific covers or internal pages to be included, or offering hands-on assistance to students. Please inform Refuge staff during the reservation process concerning specific requests. To include specific pages into student journals, please follow the standard format noted above and bring the correct number of copies needed to accommodate each student's journal. Refuge staff and Refuge

volunteers will not copy extra quantities to finish journals.

Students will use the 30 minutes of indoor lab time to decorate their journal covers and some inside pages. They will also organize covers and pages into working journals by hole punching the spine and binding with yarn or twine. Depending upon the student's ages, art supplies will vary and could include rubber stamps and ink pads, markers, colored pencils, paints, cut paper, collage, glue and stencils.

While students are participating in the Journal Creation activity, teachers can use this 30 minute time slot to train, prepare and orient parent volunteers to Refuge rules, regulations, trail system, and the day's lesson plan, activities and time schedule. A staff member or Refuge volunteer will hand out any requested field trip equipment. Teachers and parent volunteers should be ready outside the classroom five minutes before Journal Creation ends. Once staff has assembled students into their color groups, teachers and parents should find their student group (red, green, blue, yellow, purple) and begin the day's outdoor field trip activities.

References

Leslie & Roth. *Keeping A Nature Journal. Discovering a Whole New Way of Seeing the World Around You.*

Be A Tree

Overview
Students will act as parts of a tree to help them learn about a tree's structure and how this structure helps trees survive and flourish.

Classroom Capacity
45 maximum

Activity Capacity
35 students

Duration
30-40 minutes

Grades
3-5
Variation K-2

Benchmarks
- Organisms
- Speaking & Listening
- Create, Present, Perform

Key Concepts
Students will learn the different components of tree physiology and their functions, and how they work together simultaneously to help the tree function.

Objectives
Students will be able to:
- identify the different parts of a tree.
- understand how the different parts of a tree work
- identify similarities in parts. of the human body and tree structure that are needed to survive.

Materials
Role cards
Props
Wood Cookies
Tree Poster

Background Information

From a tree's tiny root hairs buried in the ground, to the trunk, branches, and highest leaves found at the top of its crown, each part of a tree plays an important and vital part in helping it function. Students will learn about the various parts of a tree by acting out various parts and functions. Relating the parts of a tree to the human system gives students a better connection of what people and trees need to survive.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) will lead all indoor lab activities.

Using the wood cookie and tree diagram picture, students will be given a short introduction to understand the different parts of a tree and learn how they are going to act out the roles in a game. Students will learn that trees are similar to people in many ways and need the same things people need to survive (air, water, food). Ask which parts of the body provide those needs (nose to breathe, mouth to eat, hands to gather) and ask which parts of a tree might act like ours do (see descriptions below). But how does a tree get what it needs without moving around like a human?

Students will play the following roles:
Trunk and Branches- Includes the first 7 elements listed below:

Heartwood- (like skeletal system) Heartwood forms the central core of the tree, is made up of dense dead wood, and provides strength for the tree.

Xylem- (like veins) Also called sapwood, xylem carries water and nutrients up from the roots to the leaves, older xylem cells become part of the heartwood.

Cambium- (like veins) Cambium is a very thin layer of growing tissue. It makes cells that become new xylem, phloem, or cambium.

Phloem- (like veins) Also called the inner bark, phloem carries water and the sugar made in the leaves down to other parts of the tree such as roots, stems, buds, flowers, and fruits.

Bark- (like skin) Bark protects the tree from injury caused by insects, animals, plants, disease, or fire. Characteristics vary from species to species (thick, thin, spongy rough, smooth, covered with spines, etc.).

Roots- (like feet and toes) Roots help anchor the tree in the ground. They also absorb nutrients from the soil. There are different kinds of roots. The taproot is the main rootstem and grows straight into the ground. Lateral roots spread out from the tree and cover a broad area. They branch into smaller and smaller rootlets and then root hairs,

which absorb approximately 95 percent of the water and nutrients for the tree.

Leaves- (like hands) Leaves are the food factories of the tree. Using energy from the sun, which they capture with a pigment called chlorophyll, leaves convert carbon dioxide and water into oxygen and sugar (food!). This process is called photosynthesis. The gases needed for and generated by photosynthesis enter and exit through tiny holes called stomata, on the under surface of the leaves. Water vapor also exits through the stomata in the process of transpiration.

Students are going to "build" a tree by acting out the parts of it. Have students sit in a group on carpet squares. All students will have a role to play. Components that require more than one student may be added to or changed based on the number of students present. After the role cards are assigned, begin "building" your tree(s).

- Call for the roles listed, one at a time.
- As each student steps forth for their role, have them read aloud the function of their role (i.e. "Heartwood. I am strong, I support the tree!" or "Roots. We anchor the tree and absorb nutrients!") For roles that require multiple actors, have each student read aloud, even if it's repetitive. Roles with props can also hold up their prop for everyone to see or act out the function.
- After all roles have been read, ask students which role should be positioned first. Start positioning "tree parts" in the correct role noted while interacting with students about the function of each tree part and its overall role in the trees survival.
- Heartwood stands up in the middle. Roots lay on the floor around the "tree" or sit with their legs out in front of them. Cambium, xylem, and phloem stand around the heartwood as layers to form the "trunk". Bark can stand in front of bark with folded arms. Leaves should stand with their arms out and around the trunk, wiggling their hands and fingers like leaves.
- When all the pieces have been assembled, instruct the students to read their roles again, this time simultaneously, and repeat it several times while also trying to listen to what everyone else is saying. This allows students to realize how many functions are being performed at the same time by the tree, and how dynamic it is.
- When finished, get the students seated again and engage in a discussion using the assessment questions below.

K-2 Variation:
Use abbreviated role cards and follow the basic setup. After handing out a role card, have staff or volunteer say out loud their role (i.e. Your role is - Leaves!) and ask students to repeat Leaves! then read the role description (i.e. we make food!). Some roles make noises as their description, some do not but ask students to imitate their tree part (i.e. move hands like leaves in wind). Staff should lead the students into the correct role order, and repeat the roles with the students at the end.

Assessment Ideas

Ask students the following questions after they are seated again:

1. What roles stood out to them?
2. How many different things does the tree do at the same time?
3. What roles and functions are similar to their human bodies and functions? Compare and contrast.

For K-2 students ask:

1. Why was your role important to the tree?
2. How many different things does the tree do at the same time?
3. How is a human body (your body) similar to a tree?

Related Follow-up Outdoor Activity

Refuge staff recommends this activity be followed up outside on the Refuge with the "My Special Tree" activity from the Refuge's

curriculum book, On-Site Activities section. This activity allows students to observe trees hands-on by creating art of a tree and rubbings of tree bark, leaves and branches. Student handout is also available.

References

Project Learning Tree.
To Be a Tree; Tree Factory.

Tualatin River National Wildlife Refuge, EE Curriculum.
http://www.fws.gov/tualatinriver

Pelts & Tracks K-3

INDOOR LAB ACTIVITY

Overview
Students will identify and describe different physical adaptations of animals and birds native to the Refuge.

Classroom Capacity
45 maximum

Activity Capacity
30 students

Duration
30 minutes

Grades
K-3

Benchmarks
- Organisms
- Diversity/Interdependence

Key Concepts
Animals have specific features to help them survive. These adaptations vary from species to species.

Objectives
Students will be able to:
- understand how adaptations help animals survive.
- observe the physical differences between different animal species.
- learn about 2-3 animals native to the Refuge.

Materials
Animal Pelts
Animal Tracks
Animal Pictures

Background Information

Every species of animal or bird is different in its ability to adapt to its environment and to changes in its environment. Some animals and birds have special features that help them survive where they live. Looking closely at specific species, we can observe many physical characteristics that enable them to adapt and survive. Physical characteristics can include: fur color, shape of feet, type of teeth, or size of an animal. Behavioral characteristics are harder to observe. Behavioral characteristics can include: migration, hibernation, defensive, protective, or aggressive behavior.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) will lead all indoor lab activities.

Through visual and hands-on presentations at various tables, students will touch and view fur and tracks of animals native to the Refuge. They will discuss what is special and different about each animal and how these differences help each adapt and survive. Students will have 10 minutes to explore the props, with staff and volunteer naturalists encouraging them to be detectives and find clues about each animal by using adjectives to describe each animal's adaptations. The specific identity of the animal will not be given at this time.

They are encouraged to look, touch and ask about claws, paws, fur, shape or size of animal, whiskers, legs, eyes, ears, or tail. The adjectives they choose relate to the adaptations that help the animal survive, such as color, length or feel of fur, size of the animal, shape and size of tail, presence of whiskers, number of toes, length of the legs, size of ears, and so on.

After the 10 minutes, students will be seated in a group where they can view and discuss all the different animals they explored at the tables. The clues the students found will help them identify the animals. Pelts and pictures provided by the staff will help them name the animal and why its specific features are important to help it survive in the wild.

Teachers and parent volunteers are free to organize and train outside amongst themselves while students are in the indoor lab. For students grade K-3, we require at least 3 parents remain in the classroom for supervision purposes.

Assessment Ideas

Ask students the following questions:

1. Name some of the adaptations you noticed about the animals? Discuss the feet or paws, fur, shape or size of animal, whiskers, legs, eyes, ears, tail, claws, head, etc.
2. How are these adaptations useful?
3. What type of habitat does each animal use with its adaptations?
4. Which animals had the most interesting adaptations?

References

Positive Solutions USA.
Teacher's Guide to Discover Wild.

Project Wild.
Adaptation Artistry.

Pelts, Tracks & Skulls

INDOOR LAB CAPACITY

Overview
Students will identify and describe different physical adaptations of animals native to the Refuge.

Classroom Capacity
45 maximum

Activity Capacity
30 students

Duration
30 minutes

Grades
4-8

Benchmarks
- Organisms
- Diversity/Interdependence
- Forming Question/ Hypothesis

Key Concepts
Animals have specific features to help them survive. These adaptations vary from species to species.

Objectives
Students will be able to:
- understand how adaptations help animals survive.
- observe the physical differences between different animal species.
- learn 2-3 animals native to the Refuge.

Materials
Animal Pelts
Animal Tracks
Animal-Bird field guides
Animal Skulls
Student Handout

Background Information

Every species of animal or bird is different in its ability to adapt to its environment and to changes in its environment. Some animals and birds have special features that help them survive where they live. Looking closely at specific species, we can observe many physical characteristics that enable them to adapt and survive. Physical characteristics can include: fur color, shape of feet, type of teeth, or size of an animal. Behavioral characteristics are harder to observe. Behavioral characteristics can include: migration, hibernation, defensive, protective, or aggressive behavior.

Vocabulary

Adaptations—special features developed over time that help animals and plants cope with their environment.

Habitat—a place where an organism or population of organisms lives.

Hypotheses—a tentative, testable explanation of an observed. phenomenon

Niche—an organism's way of making a living that includes its habitat, food and behavior.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) will lead all indoor lab activities.

Through visual and hands-on props, students will discuss in small groups, the adaptations of a specific mammal found on the Refuge and form a hypotheses about its adaptations and how it relates to its environment. Students will have about 5-10 minutes in their groups to explore the props with staff and volunteer naturalists encouraging them to seek as many clues as possible, ask each other questions, and note observations about each animal's physical adaptations. Each group will then present its findings about its specific mammal to the other groups and give a hypothesis.

Students are encouraged to look at the feet or paws, fur, shape and size of animal, legs, eyes, ears, tail, head or skull, or claws to name a few. Asking questions in their group about their observations of the animal will help them discover the adaptations and organize a presentation. Pelts, rubber track molds, skulls, fact identification cards, photos and a student handout will be available to inform students about the animal and aid in group presentations.

If desired teachers and parent volunteers are free to organize and train outside amongst themselves while students are in the indoor lab.

Assessment Ideas

Ask students the following questions per group:

1. How do the following physical adaptations help your animal survive? Note specific characteristics about the feet or paws, fur, shape and size of animal, legs, eyes, ears, tail, head or skull, or claws to name a few.
2. What happens if an animal's environment changes and it can't adapt to the changes?
3. What changes can happen to an animal's habitat?
4. Can you name any animals that have adapted to such changes?

References

Positive Solutions USA.
Teacher's Guide to Discover Wild.

Project Wild.
Adaptation Artistry.

Bird Bill Adaptations

INDOOR LAB ACTIVITY

Overview
Students will learn about bird adaptations, specifically feeding techniques by using tools that simulate different types of beaks eating different foods.

Classroom Capacity
45 maximum

Activity Capacity
30 students

Duration
25-30 minutes

Grades
3-8

Benchmarks
- Diversity & Adaptations
- Make Observations
- Organisms

Key Concepts
Students will discover different bill adaptations of birds and how they are adapted to different types of food and their environment.

Objectives
Students will be able to:
- understand how birds use their beaks for eating.
- note how different adaptations are for different environments.
- name 2-3 different bird species and how their bills are adapted to their habitat.

Materials
Bird Bill Powerpoint
Bird Adaptation Game
Student Handout
Pencils

Background Information

Each bird species has different adaptations to the environment where it lives. Some birds are generalists and can survive on a variety of foods or environments, while others are more specialized and may only eat fish. All parts of a bird are specially adapted to their environment such as the bill for specific foods, the length of feathers for different flight, or the feet and talons for grasping, walking or swimming. Students will examine some of these adaptations then focus on the different feeding techniques of birds by rotating through six stations, using different tools to simulate bird bills.

Vocabulary

Adaptations—special features, both physical and behavioral characteristics, developed over time that help animals and plants survive within their environment.

Habitat—a place where an organism or population of organisms lives.

Generalist species—a species that can live in many different habitats, eat a variety of food and tolerate a wide range of environmental conditions.

Specialist—a species that can live in only one type of habitat, eat few varieties of food and tolerate a narrow range of climatic and other environmental conditions.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) will lead all indoor lab activities.

A brief bird video will be shown to discuss bird adaptations and view a variety of bills and feeding methods.

Six stations will be used to simulate six different types or species of birds: wren, hummingbird, finch, raptor, duck and swallow. Students will rotate through the stations trying to pick up different types of foods using available tools that simulate different bird species bills such as a strainer, small fishnet, straw, eyedropper, forceps, tweezers, chopsticks, pliers.

Students will break into six groups with one handout per group and rotate to each station, spending less than 1 minute at each station. Before the activity begins, the different student roles will be discussed. One student in each group is the “lookout”, one student records data and

the rest try the different bills. The "lookout" keeps students moving, relaying the concept that birds must eat quickly and efficiently to avoid predation.

Working as a group, students will fill in their handout at each station, noting which tool works best for which food choice and which bill belongs to which bird. After all rotations are complete, students will review with the other groups what they discovered about the differences in bird bills, what are the bill adaptations for each bird listed on their handout, did they answer correctly, and what does this tell them about birds native to the Refuge and its different habitats?

While students are participating in the Bird Adaptations activity, teachers can use this 30 minute time slot to train, prepare and orient parent volunteers to Refuge rules, regulations, trail system, and the day's lesson plan, activities and time schedule. A staff member or Refuge volunteer will hand out any requested field trip equipment. Teachers and parent volunteers should be ready outside the classroom five minutes before Bird Adaptations Activity ends. Once staff has assembled students into their color groups, teachers and parents should find their student group (red, green, blue, yellow, purple) and begin the day's outdoor field trip activities.

Assessment Ideas

Follow up by reviewing student handout.

References

Flying Wild. *Fill the Bill.*

Project Wild. *Adaptation Artistry.*

Stokes, & Stockes. *Stokes Beginner's Guide to Birds: Western Region.*

Raptor Adaptations

INDOOR LAB ACTIVITY

Overview
Students will learn about several specific physical adaptations for birds of prey including size and overall appearance, vision, hearing and feathers.

Classroom Capacity
45 maximum

Activity Capacity
30 students

Duration
30 minutes

Grades
6-8

Benchmarks
- Diversity & Adaptations
- Make Observations
- Organisms

Key Concepts
Students will discover different adaptations of birds of prey or raptors and how these adaptations help them survive in their environment.

Objectives
Students will be able to:
- note how different adaptations help specific bird species survive in different environments or habitats
- name 2-3 different bird of prey species and adaptations specific to them

Materials
Raptor Video/Presentation
Bird props
Student Handout
Pencils

Background Information

Each bird species has different adaptations to the environment where it lives. Some birds are generalist and can survive on a variety of foods or environments, while others are more specialized and may only eat fish. All parts of a bird are specially adapted to their environment such as the bill for specific foods, the length of feathers for different flight, or the feet and talons for grasping, walking or swimming. Students will examine different birds of prey found on the Refuge and some of their adaptations through a presentation and hands-on props.
The Raptor Habitat Walk is recommended by staff as a follow-up activity outside on the Refuge led by Refuge staff, teachers and parent volunteers. Please see next lesson for more details.

Vocabulary

Adaptations—special features, both physical and behavioral characteristics, developed over time that help animals and plants survive within their environment.

Habitat—a place where an organism or population of organisms lives.

Generalist species—a species that can live in many different habitats, eat a variety of food and tolerate a wide range of environmental conditions.

Specialist—a species that can live in only one type of habitat, eat few varieties of food and tolerate a narrow range of climatic and other environmental conditions.

Niche—the way of life or role of a species in an ecosystem.

Binocular vision—is vision in which both eyes are used together. Having two eyes confers at least four advantages over having one. First, it gives a creature a spare eye in case one is damaged. Second, it gives a wider field of view. Third, it gives binocular summation in which the ability to detect faint objects is enhanced.

Anisodactyly—arrangement of the toes typical of most perching birds: three toes pointing to the front and one pointing to the rear.

Mandible—lower portion of the bill.

Bird of Prey or Raptor—any of numerous carnivorous birds that hunt and kill other animals.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) leads all indoor lab activities.
A presentation about the most common raptors found on the Refuge

will discuss Coopers hawk, Northern Harrier, Bald Eagle, Red-tail hawk, Osprey, American Kestrel, and Great Horned owl. Hands-on props for students will provide more insight into the physical adaptations that allow raptors to survive within different habitats. These can include feet or talons, vision, overall size, coloring, feather shape, or bill.

Students will be provided handouts to fill in during the presentation and note key features about the raptors to aid them during their Raptor Habitat Walk on the Refuge (recommended by staff as follow-up). The handout's second side is for use during the walk.

References

Sholtz. *Birds of Prey.*

Sholtz. *Owls.*

National Audubon Society. *The Sibley Guide to Bird Life and Behavior.*

Video: *Raptor Force.*

Related Follow-up Outside Activity

Refuge staff recommends the "Raptor Habitat Walk" activity be followed outside on the Refuge once students have taken the indoor lesson. This lesson allows students to take what they have learned in the classroom out into the habitats of the raptors found on the Refuge. See next lesson.

This follow-up activity needs 1 adult for each of the 3 groups of students visiting 3 different habitats. Activity can be led by staff, Refuge volunteer naturalists, teachers or parent volunteers. Scripts are available for teachers and parent volunteers. Please note during reservation process if staff or refuge volunteer naturalists are needed to help lead any of the 3 groups, or if scripts are needed for parent volunteers.

Raptor Habitat Walk

Overview
In this activity students will observe specific habitats found on the Refuge used by the raptors discussed in the Raptor Adaptations activity.

Activity Capacity
3 groups: 10-15 students per group

Duration
45 min. (including walking time)

Grades
6-8

Benchmarks
- Diversity & Adaptations
- Make Observations
- Organisms

Key Concepts
Students will discover how birds of prey found on the refuge, use their adaptations to help them survive in their specific habitats.

Objectives
Students will be able to:
- name one reason each habitat is important to a specific raptor
- note how different adaptations are for different environments
- name 2-3 different bird species and their preferred habitat

Materials
- student handout "Raptor Adaptations" & "Raptor Habitat Walk"
- clipboard
- pencils
- raptor field guide
- habitat ID cards
- mammal field guide
- binoculars

Background information:

A **habitat** is a home for a plant or animal. It has four components: *food, water, shelter, and space* suitable to the plant or animal's needs. Each habitat has its own unique characteristics. On the Refuge there are a variety of habitats, each of which supports different plants and animals. Many birds of prey call the Refuge home and their special adaptations are well suited to the variety of different habitats found on the Refuge.

Oak savannas once covered much of the Willamette Valley foothills. This habitat of large, widely scattered oak trees with grass undergrowth, thrived because of frequent, low-intensity fires set by Native Americans. But these savannas and other oak woodlands are disappearing due to a variety of causes. As wildfire has been stopped, closed-canopy oak woodlands and dense Douglas fir or mixed-species forests have replaced the oak savannas. Oak savannas now tend to be small and isolated. A variety of animals and birds use this habitat type.

A **riparian zone** is the land and plants that surround the perimeter of a water body. Riparian zones play an important role in fish and wildlife habitat, water quality, and erosion control. They also contain a great diversity of plants and animals because the area provides water, food, and protection. Riparian zones help to keep streams and rivers clean as they filter out sediments and minerals entering from surface and ground water. Fish depend on the riparian zone for food, protection and regulated water temperatures. The riparian zone also provides the water necessary for many insects reproductive cycle. Birds can find locations for nests, safe roosting spots away from predators, and a place to hunt. A variety of mammals live here as well.

Wetlands are areas that are transitional between terrestrial (land) and aquatic (water) systems, where the water table is at or near the surface or the land is covered by shallow water. The main feature most wetlands have in common is that the soil is at least periodically covered by water. Wetlands can take on many shapes and sizes and are also known as marsh, bog, saltwater marsh, freshwater marsh, forested wetland or swamp. Wetlands perform important functions such as water filtration, flood control, groundwater recharge, shoreline stabilization, fish spawning nurseries, and provide recreational, cultural and aesthetic values. A large variety of insects, plants, birds, mammals, reptiles and amphibians call wetlands home during one season or another.

Vocabulary:

Riparian area—the strip of land (20 meters or more) and plants that borders each side of a pond, creek, river, or other aquatic area.

Oak savanna—a habitat containing widely scattered, older oak trees.

Wetland—lands where water saturation is the dominant factor in determining soil development and the types of plant and animal communities.

Biotic—pertaining to life or living organisms in a habitat.

Abiotic—nonliving elements that impact the growth, composition, and structure of a habitat (e.g., soil, weather, sunlight, oxygen and other gasses, etc.).

Habitat—a place where an organism or population of organisms lives.

Adaptations—special features, both physical and behavioral characteristics, developed over time that help animals and plants survive within their environment.

Generalist species—a species that can live in many different habitats, eat a variety of food and tolerate a wide range of environmental conditions.

Specialist—a species that can live in only one type of habitat, eat few varieties of food and tolerate a narrow range of climatic and other environmental conditions.

Bird of Prey or Raptor—any of numerous carnivorous birds that hunt and kill other animals.

Suggested Procedure:

All the raptors previously discussed are found at the Refuge, but which ones are found in which habitat and why? Each group (three groups total) will visit one of three habitats and determine which raptors utilize which habitat.

The raptor species include the Coopers hawk, Northern harrier, Bald Eagle, Red-tail hawk, Osprey, American kestrel, and Great horned owl. Not all the species are found in each habitat.

1. Divide students into 3 groups of 10-15 students per group or less. Each group will visit a specific habitat and then join back together at the end of the field trip or back at school to discuss and share their findings with the other groups.

2. One group will visit the wetland habitat (wetland observation deck), another will visit the oak savanna (study station #2), and the third group will visit the riparian forest (study station #5). Each student in each group will work on a student handout from the Refuge.

3. Ask at the habitat, "What kind of habitat is this?" Define each habitat using field guides.

4. Students will spend time observing the habitat and discussing the four parts unique to each habitat (food, water, shelter, space) and a specific raptor(s).

Where would raptors get their *water*, *shelter, and food* in the specific habitat?

Ask: "What animals or plants have we discovered live in this habitat?"

5. Observe for a few moments and list on the student handout the variety of plants and possible animals that use this habitat. Not all insects and animals are visible but there are signs of them to observe.

6. Recall from the notes taken during video presentation, which raptor(s) is probably suitable to this habitat and why. Write the adaptations down and decide which raptor would be found in the particular habitat.

7. How does the type of habitat affect which raptor species can survive here?

8. Finish by discussing which raptor(s) they chose for their particular habitat and why. Fill out handout before leaving habitat.

Back at class or after the three groups have visited the habitats, have them come together for discussion.

Compare the raptors found in each habitat, do any overlap? Are any missing? Why?

Ask: "Which raptor(s) do you think would benefit from the *differences* or *similarities* between the wetland, oak savanna and the riparian forest?" They can confirm their answer after sharing information with the other groups.

References

Salt Marsh Curriculum Manual. *Habitat Comparison Walk.*

Project Wild. *Adaptation Artistry.*

Sholtz. *Birds of Prey.*

Sholtz. *Owls.*

Wetland Plants of Oregon & Washington.

National Audubon Society: *The Sibley Bird Guide to Bird Life and Behavior.*

Wonderful Wetlands

INDOOR LAB ACTIVITY

Overview
Students are presented with a selection of objects for investigation as metaphors for the natural functions of wetlands.

Classroom Capacity
45 maximum

Activity Capacity
30 students

Duration
30 minutes

Grades
1-3

Benchmarks
- Diversity/interdependence
- Dynamic Earth
- Forming the question/ hypothesis
- Analyzing & interpreting results
- People & environment interrelated

Key Concepts
Wetlands are an integral part of the environment, and are important to the lives of humans and wildlife.

Objectives
Students will be able to:
- describe the characteristics of wetlands
- evaluate the importance of wetlands to wildlife and humans
- name 2-3 uses of wetland habitats by people & wildlife

Materials
Wetland Metaphors Bag
Wetland pictures
Wetland Soil Demo Boxes

Background Information

Wetlands are many different things to many different people. Some people have never heard or thought about wetlands. Others are working actively to protect wetlands because of their importance.

Wetlands include freshwater and saltwater marshes, wet meadows, swamps, lagoons, bogs and prairie potholes. All wetlands, whether coastal or inland, provide special habitats that serve areas far beyond their boundaries. Wetlands are uniquely important to plants, animals, humans, and the total environment. Because of the abundance of food, vegetative cover (shelter), and water found there, most wetlands are rich with diverse wildlife species.

Coastal and inland marshes, for example, provide breeding, resting and wintering habitats for thousands of migratory birds – including ducks, geese, swans, cranes and shorebirds. Many species of fish that are important for commercial and personal use by humans, reproduce and spend part, or all, of their life cycles in fertile wetlands adjacent to larger, more open bodies of water. A wide variety of reptiles, amphibians, insects, and crustaceans also breed and live in wetlands. Many mammals – from Muskrats and Beaver to Blacktail Deer – also depend on wetland areas.

Wetlands are often referred to as "nurseries" because they provide critical breeding and rearing habitats for countless numbers and kinds of wildlife.

Wetlands act as natural filtering systems and have shown to be extremely effective. For example, they can trap and neutralize sewage waste, allow silt to settle, and promote the decomposition of many toxic substances.

Vegetation associated with wetlands are important because plants absorb nutrients and help distribute them through food webs. Plants also keep nutrient concentrations from reaching toxic levels. Plants slow down water flow, causing silt to settle out. Through photosynthesis, plants add oxygen to the system and provide food to other life forms.

Of great importance to humans are the flood control characteristics of wetlands. When runoff from rains and spring thaws is high, wetland areas absorb excess water, thereby helping the runoff gradually drain down streams and rivers and through the soil. Acting as buffers, healthy wetlands reduce flooding and erosion. In drier periods, wetlands hold precious moisture after open bodies of water have disappeared. Wetlands are also an important area for human recreation such as fishing, hunting, photography, wildlife watching and boating.

The many activities that take place in wetlands put them among the most productive ecosystems in the world.

Vocabulary

Floodplain—land next to a river that becomes covered with water when the river overflows its banks.

Habitat—area that provides a plant or animal with adequate food, water, shelter, and space.

Wetland—area that is regularly wet or flooded and has a water table that stands at, or above, the land surface for at least part of the year.

Metaphor—represents a concept or idea through another concept or idea like "A tree is a home" or "A river is a highway".

Marsh—wetland without trees, and which often has standing water.

Shrub—woody plant less than 12 feet tall with more than one stem rising from the ground. Could also be known as a bush.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) leads all indoor lab activities.

Teachers and all parent volunteers are free to organize and train outside amongst themselves while students are in the indoor lab if needed. 2-3 adults are required to stay in the classroom with 1-3 grade students.

What is a wetland? Students will give their definition of a wetland and list the different names people use for wetlands like bog, marsh, swamp, etc. Using pictures, discussion will focus on the variety of freshwater wetlands habitats and those specifically found on the Refuge.

Through the use of metaphors, students will discover how useful and important wetlands are by drawing objects from the "Mystery Wetland Metaphor Bag". Everything in the bag has something to do with wetland habitats and why they are important to both humans and wildlife. One student will draw an object from the bag, and with the help of fellow students try to figure out how the object represents what a wetland is or does. Another student draws another object from the bag and so on, until all the objects have been discussed. They will be encouraged to understand how wetlands are important to us and the many kinds of wildlife that depend upon them. Helping them understand how humans are connected to wetlands will link them to uses such as recreation, aesthetics, utilitarian uses, environmental quality, and nature study.

Following the discussion, students will proceed outside and view the Refuge's wetlands just to the west of the indoor classroom. Students will participate in a hands-on demonstration of how wetland soils function and how this relates back to the metaphors they just discussed.

To conclude, students will be asked to summarize the major roles that wetlands perform in contributing to habitat for wildlife and important uses for people.

Assessment Ideas

Explain why wetlands are called one of the world's most productive ecosystems.

Wetlands are important to a range of organisms in the animal kingdom, from zooplankton to humans. Select five species of animals and describe how wetlands are important to each.

What actions do humans do to harm wetlands? What can humans do to help wetlands?

References

Project Wet.
Capture, Store and Release.

Groundwater Foundation.
Making Discoveries: Groundwater Activities for the Classroom & Community.

Salt Marsh Manual; *Don Edwards San Francisco Bay National Wildlife Center.*

Project Learning Tree.
Watch on Wetlands; Water Wonders.

"Mystery Wetland Metaphor Bag" contents

Object:	Metaphoric function:
Sponge	Absorbs excess water caused by runoff; retains moisture for a time even if standing water dries up
Duck	A resting place for migratory birds
Baby Carriage	Provides a nursery that protects and feeds young wildlife & fish
Strainer	Strains silt, debris, etc. from the water
Beaver/Newt	Habitat for variety of wildlife
Cereal box	Provides nutrient-rich food for animals
Soap	Helps cleanse the environment
Binoculars	Recreational uses for humans like bird watching, fishing, hiking

What is a Wetland?

INDOOR LAB ACTIVITY

Overview
Students are presented with a selection of objects for investigation as metaphors for the natural functions of wetlands.

Classroom Capacity
45 maximum

Activity Capacity
30 students

Duration
30 minutes

Grades
4-6

Benchmarks
- Diversity/interdependence
- Dynamic Earth
- Forming a question/ hypothesis
- Analyzing & interpreting results
- People & environment interrelated

Key Concepts
Wetlands are an integral part of the environment, and are important to the lives of humans and wildlife. They are also a key habitat on the Tualatin River NWR.

Objectives
Students will be able to:
- describe the characteristics of wetlands
- evaluate the importance of wetlands to wildlife and humans
- name 2-3 uses of wetland habitats by people & wildlife

Materials
Wetland Flow Chart
Wetland pictures
Wetland Soil Demo Box

Background Information

Wetlands are many different things to many different people. Some people have never heard or thought about wetlands. Others are working actively to protect wetlands because of their importance.

Wetlands include freshwater and saltwater marshes, wet meadows, swamps, lagoons, bogs and prairie potholes. All wetlands, whether coastal or inland, provide special habitats that serve areas far beyond their boundaries. Wetlands are uniquely important to plants, animals, humans, and the total environment. Because of the abundance of food, vegetative cover (shelter), and water found there, most wetlands are rich with diverse wildlife species.

Coastal and inland marshes, for example, provide breeding, resting and wintering habitats for thousands of migratory birds – including ducks, geese, swans, cranes and shorebirds. Many species of fish that are important for commercial and personal use by humans, reproduce and spend part, or all, of their life cycles in fertile wetlands adjacent to larger, more open bodies of water. A wide variety of reptiles, amphibians, insects, and crustaceans also breed and live in wetlands. Many mammals – from Muskrats and Beaver to Blacktail Deer – also depend on wetland areas.

Wetlands are often referred to as "nurseries" because they provide critical breeding and rearing habitats for countless numbers and kinds of wildlife.

Wetlands act as natural filtering systems and have shown to be extremely effective. For example, they can trap and neutralize sewage waste, allow silt to settle, and promote the decomposition of many toxic substances.

Vegetation associated with wetlands are important because plants absorb nutrients and help distribute them through food webs. Plants also keep nutrient concentrations from reaching toxic levels. Plants slow down water flow, causing silt to settle out. Through photosynthesis, plants add oxygen to the system and provide food to other life forms.

Of great importance to humans are the flood control characteristics of wetlands. When runoff from rains and spring thaws is high, wetland areas absorb excess water, thereby helping the runoff gradually drain down streams and rivers and through the soil. Acting as buffers, healthy wetlands reduce flooding and erosion. In drier periods, wetlands hold precious moisture after open bodies of water have disappeared. Wetlands are also an important area for human recreation such as fishing, hunting, photography, wildlife watching and boating.

The many activities that take place in wetlands put them among the most productive ecosystems in the world.

Vocabulary

Floodplain—land next to a river that becomes covered with water when the river overflows its banks.

Habitat—area that provides a plant or animal with adequate food, water, shelter, and space.

Wetland—area that is regularly wet or flooded and has a water table that stands at, or above, the land surface for at least part of the year.

Marsh—wetland without trees, and which often has standing water.

Shrub—woody plant less than 12 feet tall with more than one stem rising from the ground.

Percolation—movement of water through the subsurface soil layers, usually continuing downward to the groundwater.

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) leads all indoor lab activities.

Teachers and all parent volunteers are free to organize and train outside amongst themselves while students are in the indoor lab if needed.

Students will give their definition of a wetland and the different names used for a wetland like bog, marsh, swamp, etc. Upon compiling the list, they will discuss the true definition of a wetland, and learn the different varieties of freshwater wetlands habitats including those found specificially on the Refuge.

Working in groups, students will categorize the different characteristics of freshwater wetlands habitats by using a flow chart and comparing habitat pictures. Following the flow chart instructions, they will match the correct habitat type with its picture and description. The flow chart activity will provide students with background information to serve as an overview of the basic ecological activities that characterize the wetland habitat.

They will be encouraged to understand how wetlands are important to us and the many varieties of wildlife that depend upon them. Helping them understand how humans are connected to wetlands will link them to uses such as recreation, aesthetics, utilitarian uses, environmental quality, and nature study.

Following the discussion, students will proceed outside and view the Refuge's wetlands just to the west of the indoor classroom. Students will participate in a hands-on demonstration of how wetland soils function and how this relates back to the human and wildlife uses they just discussed.

To conclude, students will be asked to summarize the major roles that wetlands perform in contributing to habitat for wildlife and important uses for people.

Assessment Ideas

Explain why wetlands are called one of the world's most productive ecosystems.

Wetlands are important to a range of organisms in the animal kingdom, from zooplankton to humans. Select five species of animals and describe how wetlands are important to each.

What actions do humans do to harm wetlands? What can humans do to help wetlands?

References

Project Wet.
Capture, Store and Release.

Groundwater Foundation.
Making Discoveries: Groundwater Activities for the Classroom & Community.

Salt Marsh Manual; *Don Edwards San Francisco Bay National Wildlife Center.*

Project Learning Tree.
Watch on Wetlands; Water Wonders.

Animal Detective - Tracking Basics

INDOOR LAB CAPACITY

Overview
Students will describe different animal prints by what features they observe while measuring and drawing tracks.

Classroom Capacity
45 maximum

Activity Capacity
30 students

Duration
30 minutes

Grades
3-5

Benchmarks
- Organisms
- Direct & Indirect Measurements
- Forming Question/ Hypothesis

Key Concepts
All animals have specific features unique to their foot prints. Learning the basic features, measurements, and drawing prints can lead to insight into an animals life.

Objectives
Students will be able to:
- draw a print through direct observation.
- measure a print.
- learn the basic structure of an animal print.

Materials
Tracking boxes
Animal track templates
Student handout

Background Information

Seeing a wild animal is exciting and fun but because many animals are secretive, the closest we may ever come to seeing them is through their tracks. Tracking animals can be easy, difficult, fun and unpredictable - clear, perfect tracks shown in tracking books are not the norm. Tracks offer a view into their lives - by reading the stories they leave behind in their foot prints!

Tracking is a way to study the relationships between wildlife, plants and ecosystems. It is a meeting of science and storytelling. By gathering all the clues possible from a print or tracks, one can piece together the stories they tell and learn about animal behavior. It allows students to use other senses and expand into direct experiential learning outside the classroom. They can track outside in any weather, terrain or location, from backyard to school yard to wilderness area.

Learning the basics of animal foot prints can help one become an animal detective or animal tracker. It can lead to the eventual identification of the animal itself. It isn't always possible to positively identify every track but by combining all the clues, gaining experience and learning patience, one can be correct much of the time.

Vocabulary

Tracking—meeting place between science and storytelling; following prints, tracks, and signs left behind by animals and making critical observations and collecting data to learn about the relationship of animals and their world, and to become aware of the world around oneself.

Print—one mark left by an animal or person's foot, whether it is the front or back or left or right foot; multiple prints make a track.

Track—pattern left by a series of prints.

Claws—hardened material derived from hair; claws may or may not show in a print.

Toe pad—each toe has a pad directly below the tip. Like the tips of human fingers.

Intermediate pad(s) or heel pad—group of pads or one large pad behind the toe pad(s).

Suggested Procedure

Note: Refuge staff or Refuge volunteer naturalist(s) will lead all indoor lab activities.

Through visual and hands-on activities, students will learn the basics of animal tracking: what an animal print is, what it can tell about an animal, and what are the basic features of a print. As they look at animal prints they will learn to interpret its basic form, then measure and draw it through "Look, Measure, & Draw."

At the outdoor tracking boxes, students will observe tracks and determine the number of toes, claws, overall shape of the toes and heel pad, measure the width and length of the print, and draw the overall shape. They will record all these clues on a student handout.

Though the animal's identity is not the final goal of the activity, students will share what characteristics they observed about the tracks.

If desired teachers and parent volunteers are free to organize and train outside amongst themselves while students are in the indoor lab.

Assessment Ideas

Review handout with students.

References

James Halfpenny
A Field Guide to Mammal Tracking of North America.

Ian Sheldon
Animal Tracks of Washington & Oregon.

Mark Elbroch
Mammal Tracks & Sign: A Guide to North American Species.