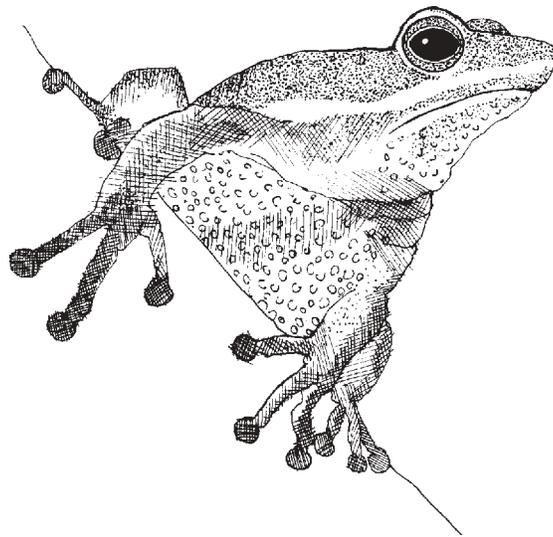




Indoor Classroom Activities



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

20 minutes

45 min. for 2 group rotation

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 found on the Refuge.

Materials

Refuge Video
Student handout
Pencil

Background Information

At the beginning of the field trip, a brief introduction is offered by staff about the Tualatin River National Wildlife Refuge, followed by the 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 System which is responsible for caring for our country's wildlife and their habitat. Wildlife refuges give wildlife top priority, hence "Wildlife First" is the motto of the National Wildlife Refuge System.

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 45, 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 outdoors 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 20 to 45 minute time slot to train, prepare and orient parent volunteers to the Refuge's rules, regulations, and trail system, along with the day's lesson plan, activities and time schedule. A staff member or Refuge volunteer will hand off 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 Refuge 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 45, 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 at least 3-5 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's motto?
4. How might seasons affect the Refuge's plants, birds and animals?

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?

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: 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

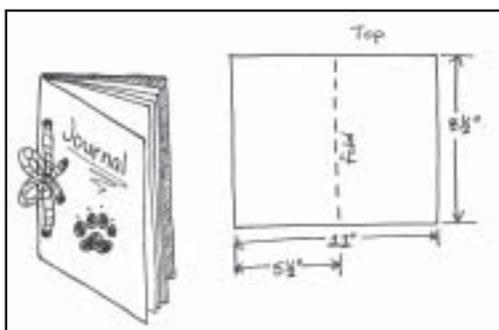
What is "nature journaling"? Clare Walker Leslie writes, "Nature journaling is your path into the exploration of the nature world around you, and into your personal connection with it." It is the act of recording observations of the natural world around you and your feelings or perceptions of what you 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 dependant 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 the Refuge's rules, regulations, trail system, and the day's lesson plan, activities and time schedule. A staff member or Refuge volunteer will hand off 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

45 students

Duration

30 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?

Roles are as follows:

Trunk and Branches- Includes the first 5 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. (Max. 1 student for this role)

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. (Max. 3 students)

Cambium- (like veins) Cambium is a very thin layer of growing tissue. It makes cells that become new xylem, phloem, or cambium. (Max. 5 students)

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. (Max. 6 students)

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.). (Max. 8 students)

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. (Max. 3 students, 1 taproot, 2 lateral roots)

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. (Max. 4 students)

Tell the students they are going to “build” a tree by acting out the parts of it. If there are more than 20 students, split them into two groups of 10-15 students each. Have students stand in a circle(s). Hand out role cards to each student. Components that require more than one student may be revised based on the number of students present. After the role cards are assigned, begin “building” your tree(s).

- Call for the roles in the order listed, one at a time. Or, ask the students what the order should be and guide them as they answer.

- As each student steps forth while still in their group, 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 (i.e. pretend to sip on straws to simulate transport of nutrients and sap).

- After the student has read their function, position them in the center of the circle. 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 with their hands up in front of them or fold their arms. Leaves should stand with their arms out and around the trunk, wiggling their 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.

- Disassemble the “tree” and if there is enough time, reassign students different roles and repeat the exercise.

- When finished, get the students seated again and engage in a discussion using the assessment questions below.

K-2 Variation:

Use abbreviated role cards. Follow the basic set-up and split students into 2 groups if necessary. After handing out the role cards, the staff or volunteer should read the role description and then ask the student to say out loud the shorter version on their card, or have staff or volunteer say the short version and ask students to repeat it. Students with props can hold them up at the same time. Staff can lead the students by asking them what order the roles should be called in, and should 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/>

Feathers, 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
Feathers
Animal Pictures
Animal Skulls

Background Information

Every species of animal or bird is different in its abilities 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 a 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.

Teachers and all 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 3-5 parents remain in the classroom for supervision purposes.

Through a visual and hands-on presentation at various tables, students will touch and view fur, feathers, 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 animals adaptations. The specific identity of the animal will not be given at this time.

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

After the 10 minutes, students are 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 answer what the animal is. Pelts, skulls, feathers, 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.

Assessment Ideas

Ask students the following questions:

1. How do the following physical adaptations help each animal survive? Discuss the feet or paws, fur, shape or size of animal, whiskers, legs, eyes, ears, tail, feather, claws or talons, head or skull, etc.
2. What happens if an animals environment changes and it can't adapt to the changes?
3. What changes can happen to an animals 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.

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

4-6

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 Pictures
Animal Skulls
Student Handout

Background Information

Every species of animal or bird is different in its abilities 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 a 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.

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

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 these relate 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 their findings about their specific mammal to the other groups and give their hypothesis.

They 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 learn about the animal and aid in group presentations.

Assessment Ideas

Ask students the following questions per group:

1. How do the following physical adaptations help your animal survive? Note specific items 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 animals environment changes and it can't adapt to the changes?
3. What changes can happen to an animals 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 Adaptations

INDOOR LAB ACTIVITY

Overview

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

Classroom Capacity

45 maximum

Activity Capacity

30 students

Duration

30 minutes

Grades

3-5

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 Identification Video
Bird Adaptation Game
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 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 only 2 minutes at each station. Keeping students moving relays 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 Refuge staff 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 the Refuge's rules, regulations, trail system, and the day's lesson plan, activities and time schedule. A staff member or Refuge volunteer will hand off 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 the specific adaptations for birds of prey, including physical adaptations of size, weight and overall appearance but special features such as sight, hearing, and talons.

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:
- understand how birds use their beaks for eating
 - note how different adaptations are for different environments
 - name 2-3 different bird 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.

Followup activity, Raptor Habitat Walk, is led by staff or volunteer naturalist outside on the Refuge. Please see next lesson.

THIS LESSON IS STILL IN CONSTRUCTION.

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.

Binocular vision—?

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) will lead all indoor lab activities.

A presentation about the most common raptors found on the Refuge will be shown to discuss the adaptations of the various species. Students will learn about through a power point presentation, props

and a video, the unique physical features of birds of prey including talons, vision, coloration, overall size and bills.

We will discuss: Coopers hawk, Northern Harrier, Bald Eagle, Red-tail hawk, Osprey, American Kestrel, and Great Horned owl.

Students will fill in their handouts during the presentation and note key features of the raptors discussed to help them during the Raptor Habitat Walk outdoor activity on the Refuge.

References

Flying Wild. *Fill the Bill*.

Project Wild. *Adaptation Artistry*.

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 up outside on the Refuge once students have taken the indoor lesson. This follow-up activity led by Refuge staff or Refuge volunteer, 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.

Raptor Habitat Walk

Overview

In this activity, students will hike through and compare different refuge habitats to the raptors discussed in Raptor Adaptations activity.

Activity Capacity

30 students

Duration

1 hour

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 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 adaptations specific to them

Materials

- student handout "Habitat Hunt Sheet"
- clipboard
- pencils
- bird field guide
- plant field guide
- 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 different habitats found on the Refuge.

THIS LESSON IS STILL IN CONSTRUCTION.

Oak woodlands once covered much of the Willamette Valley foothills. These "savannas" 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 **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 from surface and ground water before they enter a stream or river. Fish depend on the riparian zone for food and 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) that borders each side of a pond, creek, river, or other aquatic area.

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

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.).

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

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

Suggested Procedure:

Though all the raptors previously discussed are found at the Refuge, which ones are found in which habitat and why? On the walk three habitats will be visited.

Coopers hawk, Northern Harrier, Bald Eagle, Red-tail hawk, Osprey, American Kestrel, and Great horned owl.

1. Begin at classroom porch to view wetland habitat, move to Oak Savanna for grassland, and then finish at River Overlook for riparian forest habitat. Return back to classroom porch, or rotate to another activity.

2. Students will spend time observing each habitat and discuss 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 each habitat?

Observe for a few moments and list on the

student handout the variety of plants and possible animals that use this habitat.

3. Recall from the notes taken during video presentation, the special adaptations each bird has that makes it suitable to this habitat. Write those adaptations down and decide which species would be found in each particular habitat.

4. Ask at each Station, “What kind of habitat is this?”

Define each habitat.

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

5. Compare the habitats as student proceed from one to another and finish at the river overlook.

6. Ask: “Which raptors would benefit from the *differences* or *similarities* you can see between the wetland, oak savanna and the riparian forest?”

7. All three of these habitats are important because they provide food, water, shelter, and space for many different plants and animals here at the Refuge. Birds of prey benefit from these varieties. Finish by discussing which raptor(s) they chose for which habitat and why.

References

Salt Marsh Curriculum. *Habitat Comparison Walk*.

Project Wild. *Adaptation Artistry*.

Wetland Plants of Oregon & Washington.

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

Groundwater 101

INDOOR LAB ACTIVITY

Overview

Freshwater comes from many limited sources. One source, groundwater, is used by many people. But what is groundwater, how is it connected to other sources of water and how can pollutants affect groundwater?

Classroom Capacity

45 maximum

Activity Capacity

30 students

Duration

30 minutes

Grades

5-8

Benchmarks

- People & Environment
- Dynamic Earth
- Earth Materials

Key Concepts

Groundwater, which many people rely on is connected to other sources of water and is susceptible to pollutants. Understanding the dynamics of groundwater can help students learn about the importance of clean water.

Objectives

Students will be able to:

- name 2-3 sources of freshwater on Earth
- define groundwater and how does it travel through sediments
- understand how water sources are connected and affected by contaminants

Materials

Globe of Earth
Groundwater Model
Student handout
Water Sources Activity

Background Information

Approximately 72% of the earth is covered with water. Sources of water are the oceans, icecaps and glaciers, groundwater, freshwater lakes, inland seas and salt lakes, the atmosphere, soil moisture and rivers and streams. Did you know that only 2.63% of all the water on Earth is freshwater and 0.6% is groundwater?

In this activity, students will learn the amounts of the different sources of freshwater and increase their understanding of groundwater and related concepts such as how water move through the Earth's sediment, groundwater's connection to other water sources, how contaminants flow through sediment and the importance of keeping our water clean.

THIS LESSON IS STILL IN CONSTRUCTION.

Vocabulary

Groundwater—water within the Earth that supplies wells and springs.

Aquifer—area that holds lots of water and can be pumped to the service through wells to be used by people.

Aquitard—area that can absorb and hold water but will not transmit water easily to a well or spring.

Precipitation—any or all of the forms of water particles, that fall from the atmosphere and reach the ground.

Artesian well—a water well drilled into a confined aquifer.

Water table—level below the earths surface at which the ground becomes saturated with water.

Permeable—the ability of water bearing material to transmit water.

Impermeable—material that does not permitting water to pass through.

Contamination—introduction into water of sewage or other foreign matter that will render the water unfit for its intended use.

Suggested Procedure

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

Students will learn the sources of freshwater, and the relative ratios of these water sources on the earth. Of all the sources of freshwater,

groundwater will be the main focus of the activity. Using a groundwater model for a visual presentation, students learn about how groundwater flows underground and how it is affected by contaminants. They will record their answers on provided handouts.

1. Show students a world globe. Ask them what percentage of the earth is covered in water (72%).
2. Ask the students to think about the different places that we find water. Where do we find the majority of the water on Earth (oceans, 97.2%)? Think about the other smaller sources of water. Write the 6 sources on the white board as students call them out. We will discuss freshwater the rest of the activity.
3. Have students work in small groups of 5-6 per group. Pass out one "water sources" activity per group. Working as a group they have 2 minutes to decide how much freshwater each source contains and place those in order from largest amount of water to least amount.
4. Ask students what they think the correct order is and write this on the board next to the sources already written. Then write the correct order next to the sources if it was not guessed correctly.
5. How does the order break down by amounts? Show the amounts of freshwater in the measuring cups and beakers. Of all the water on Earth, only 2.63% is freshwater and not all of that is available because of contaminants, pollution, can't be reached, or is locked up in polar ice caps.
6. Show the students the small amount of groundwater (beaker) that is left for humans to use. Groundwater is only 0.6% of all the freshwater on Earth, about 1/3 cup. Groundwater is the main focus of the activity and students will view the groundwater model, see how water travels through an aquifer and how groundwater is connected to many other water sources, and susceptible to contamination.

7. Its time for the groundwater model which has already been set up and working. Turn pumps on to start water flow.
8. Point out the features on the model as water flows through them: wells, river, lake, springs, septic, soil types and layers.
9. Water falls to the Earth as precipitation (rain, snow, sleet, hail). As water starts to build up on the soil, it will either run off the surface, flow over land into other bodies of water like streams and lakes (runoff), or it will soak into the ground (recharge).
10. Some water enters the soil as in our model by throughflow (lateral movement) or by percolating (going down).
What is groundwater? Water within the Earth that supplies wells and springs; water in the zone of saturation (like a giant sponge) where all openings in rocks and soil are filled with water, the upper surface of which forms the water table. The water table is the level just below soil surface where the ground becomes saturated with water.
50% of all people in the United States use groundwater as their source of drinking water.
11. Note on the model where the water is flowing or has been stopped. There are different soil layers and these layers have varying spaces between the rocks and soil particles that allow water through. This area is the clay area.
12. Groundwater is stored in 2 geologic regions: aquitards and aquifers. Point these out on the model. The water has hit the aquitard. Why isn't it still flowing down? Where is the water trying to flow?
13. The water continues flowing into the model. Describe those areas. Where has the water eventually reached?
14. That's how water runs through the ground but what about contaminants? What is a contaminates? What kinds of contaminants can get into the groundwater? Start the dye to view spread of contaminates in groundwater
15. How will/are the contaminants spreading through the groundwater model? What will eventually happen? Why is it important to

understand groundwater?

16. ???????????

Assessment Ideas

Use the student handout to conclude. Ask students the following questions:

1. How much of the Earth is water and how much is freshwater? (72% of Earth is water but only 2.63% is freshwater)
2. How much is available for human use? Less than 2.63% - not all of that is available because of contaminants, pollution, can't be reached or is locked up in polar caps.
3. What's the difference between aquitard and aquifer?
4. In those 2 geological regions, what can stop water flow?
5. Why is groundwater important?
6. Contaminants????

References

Project Wet. *A Drop in the Bucket*.

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

United States EPA Office of Groundwater and Drinking Water.
www.epa.gov/safewater/

enVision Environmental Education, Models & Products
www.gwmodel.com

Groundwater Foundation
www.groundwater.org

Related Follow-up Outside Activity

Refuge staff recommends this activity be followed up outside on the Refuge with

"Water Quality Survey" activity from the Refuge's curriculum book, On-Site Activities section. This activity allows students to test different ??? in Rock Creek or the Tualatin River and discuss how water and contaminants travel through ????????