

Lesson 2 – Everything is Connected in the Web of Life

Willapa National Wildlife Refuge offers an opportunity for students to build on what they already know and begin to explore the scientific process. In this lesson students expand their knowledge of local habitats and wildlife by making educated guesses about the interrelatedness of Refuge wildlife through focused observations.

Key Concepts

This lesson's activities will help students to understand:

- All life is **interrelated**.
- **Adaptations** are behavioral and structural characteristics that allow a plant or animal to survive.
- Plants and animals have roles within an ecosystem, including **producers, herbivores, carnivores, omnivores, detritivores/decomposers/scavengers**, as well as **predators** and **prey**.
- Animals and plants can be labeled as either **generalists** or **specialists** depending on the number of habitat elements they can utilize as food, water, shelter or space.

Materials

- *Let's Go Outside* notebooks (one for each student)
- Lesson 2 Workbooks – *Web of Life Edition* (one for each student, plus one for teacher)
- Station boxes with samples, Fast Fact sheets, laminated images (each station box includes samples unique to that station – see attached list of station box contents)
- Sample web drawings
- Large paper & markers (enough for one paper for use during each rotation at each station)
- Timer or some way to keep track of time
- Volunteer nametags and vests

Set-up

- Give workbooks to teacher
- Ensure the students are divided into 3 (or 4, depending on the number of habitats being explored) groups, that their tables/desks are cleared, and pathways between groups are free of tripping hazards.
- Each instructor has the box of props for their assigned station. When indicated by the lead instructor, station instructors will each go to a different student group to start the station rotation activities. The station instructor will stay at this location until all the student groups have rotated through.
- Instructors have notebooks to hand out

1. Intro (5 minutes)

- a) Welcome and introductions – “Good morning Refuge Explorers in Training. I’m (your name) and I brought Station instructor’s names) with me today because you’ll acquire additional skills today in your journey to become a Refuge Explorer. With these skills you’ll be able to help us help wildlife.”
- b) Recap of habitat lesson, including L.A.W.S. (the non-living elements that support the survival of plants and animals) and the 3 (or 4) Refuge habitats. Ask, “What observations did you make about local habitats since we last met? Can someone share an observation they made about the forest (or estuary or wetland) habitat?” Choose one student to share an observation. Depending on time available, you may ask for an observation about one or two additional habitats. Provide specific praise to students for details in observation, educated guesses, and mention of L.A.W.S.



- c) Overview of today's lesson: "Today we'll discover how all living things are interrelated. Refuge Explorers, that's what you are training to be, can use observation skills, what they already know about refuge habitats and plants and educated guesses to understand how things are connected. Let's give it a try!"

2. Lecturette (20 minutes)

a) Intro to Adaptations (10 minutes)

Adaptations can be defined as how an organism's structure or behavior allows it to survive in a particular ecological niche/habitat. Remember, the various amounts of L.A.W.S. create different habitats. Adaptations help an organism find and get food, water, shelter and space from a habitat.

Behavioral Adaptations include how an organism gets food, water, and shelter. What time of a day an organism is most active and seasonal movements (migration) are behavioral adaptations.

Examples: Feeding and traveling at night (nocturnal) or dawn & dusk (crepuscular) help animals hide. Much of Willapa's wildlife is either nocturnal or crepuscular, including: bats, beaver, porcupine, flying squirrels, owls, cougar, deer and elk. **Migration** (yearly or twice yearly animal movements) maximizes access to food and minimizes competition with other organisms. Shorebirds, such as the Red knot, travel through Willapa Bay each spring on their way to the arctic from Mexico and Central America. Some Red knots travel from the southernmost tip of South America to the arctic and back each year - a distance of 9,300miles (15,000km).

Structural Adaptations include how the organism is shaped or how parts of an organism function to utilize its habitat.

Examples: Plants that live in the water (like Eel grass or Different-leaved water starwort) don't have or don't need a rigid structure because the water supports the stems and leaves.

Many adaptations can be observed. They can help us learn about the organism and help us make an educated guess about their lives. For example, birds with webbed feet, such as the Green-winged teal, most likely are adapted to live in a wet habitat (like an estuary or freshwater wetland).

b) Adaptations determine the role an organism plays in the ecosystem (7 minutes)

- **PRODUCER:** makes food from non-living elements like sunlight or minerals in the soil. Plants do this through photosynthesis.
Adaptations: leaf shape and size, evergreen or deciduous
- **HERBIVORE:** eats plants
Adaptations: Clipping teeth in front, grinding teeth in back for eating plants
- **CARNIVORE:** catches and eats animals
Adaptations: Sharp teeth for catching, holding, tearing and eating animals. Most have large, strong feet and claws for catching animals.
- **OMNIVORE:** eats both plant matter and animal flesh
Adaptations: Mix of all teeth; sharp teeth for cutting, grinding teeth for chewing.
- **DETRITIVORE/DECOMPOSER:** Eats dead plants or animals, or waste
Adaptations: could have a slimy or hard cover to protect from decomposing material.



- **SCAVENGER:** an organism that eats animals killed by other organisms
Adaptations: good sense of smell, strong jaws, minimal fur or feathers near mouth. Many omnivores and carnivores are also scavengers.
- **PREY:** An organism that is eaten by another
Adaptations: Eyes on sides of head to see danger.
- **PREDATOR:** An organism that catches and kills another organism to eat
Adaptations: Eyes facing forward for binocular vision which helps to pinpoint and catch prey.

c) Everybody is connected in a “Web of Life” (3 minutes)

It’s easy to see how things are connected by who eats whom: Plants **produce** food using the sun (some steal it from other plants – saprophytes). Herbivores and omnivores eat plants and are **prey** for **predators**. Sometimes predators are in turn eaten by other predators. Waste (dead plants and animals, scat, cough pellets and urine) is not wasted - it is recycled into nutrients and soil by fungi, bacteria, worms and other invertebrates, and/or scavenged by other animals. AND there is more to the Web of Life – think about habitats and where an organism gets its food, water, shelter and space. This may link an organism to something else in the web – not because it eats or is eaten by another organism, but because it needs that organism for shelter.

Refuge Staff and Explorers use all of their senses and their great minds to ‘read’ clues in nature and unravel the Web of Life: You can use your observations of adaptations to determine what an organism’s role is and you don’t even need to see the whole animal to make a good guess. Since most wildlife can move, and doesn’t like to be around humans (we are predators after all!), – you can use what they leave behind to make an educated guess about their connections in the Web of Life. Scat, tracks and bones all provide valuable insights to the lives of the animals that left them behind. (Remember that owl pellet? What about a hair-filled coyote poop, or berry-filled bear scat?)

3. Web of Life Learning Stations (21 minutes, 7 minutes for each rotation)

If they are not already, split students into 3 (or 4) groups and direct each group to one station. A station should be able to accommodate a group of students in a circle so everyone in that group can experience (see, touch, smell) the samples.

Each station is based on a Refuge habitat: 1) Forest. 2) Freshwater Wetlands, Ponds and Streams. 3) Estuary. *Optional* 4) Grasslands. Each of the stations will include at least one plant from Lesson 1 and a variety of organisms that are connected together because of food, water, shelter or space within that specific habitat. The organisms may be represented by one or several of the following: live specimen, skulls, pelts, study skins, shell, photos, illustrations, etc.

*See attached information sheets for examples of specimens for each habitat station. Each station also has large pieces of paper and markers.

- Students examine the organism’s adaptations and determine their roles within the habitat. Station instructors provide novel information about the organism and direct student observations to note specific adaptations, such as teeth type, eye placement, etc.; what body parts are important to observe; where might it live; what might it eat; what time of day is it active; basically, what is its role in the ecosystem? Place samples on large piece of paper in preparation for next activity.



- b) Students build a food web for each habitat by arranging the images and samples on a large piece of paper and connecting them by drawing lines on paper with markers (or have them direct the station instructor to create a web of life in which the organisms are interrelated).

4. Closing (5 minutes)

- a) Recap adaptations, roles and associated organisms.
- b) Nature is complicated, doesn't follow our rules, and is all connected.
- a. Note that some organisms in one habitat are connected to organisms in another or use more than one habitat (like elk, coyote and bear). These organisms are called **Generalists** because they can use a broad range of habitat. **Specialists** can only live in specific places, like the Marbled murrelet, or eat a few things, like the Oregon silverspot butterfly. This will be important in the next lesson as we explore what happens when a habitat changes during our next visit.
- c) Pass out notebooks to each student and discuss recording field observations as another tool to sharpen their observation skills to prepare them to become Refuge Explorers. Refuge staff depends on their knowledge of wildlife and how plants and animals are connected to make important conservation decisions. *Note that the teacher now has a set of Wildlife Pocket Guides for use in the classroom.
- Students will make at least 3 wildlife observations in their notebook; including date, time and location of observation; a sketch (noting color, texture and patterns); a description of the weather, and other notes.
 - Students will have their observations ready for review by the beginning of the next classroom lesson.
 - Students will retain their notebooks for future observation recording on the Refuge Expedition.

