Lesson 3 – Change Happens

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 put their knowledge of local habitats and wildlife to the test by making and testing their educated guesses about the effects of habitat change. Refuge staff go through a similar process to drive real-life conservation efforts.

Key Concepts

This lesson's activities will help students to understand:

- **Environmental change** happens. It can be caused by natural processes and human enhancement, alterations or interactions. Nature is not static.
- Organisms react to environmental change. Specialist species can be an **indicator** of habitat change.
- National Wildlife Refuges are good places for **scientific experimentation**.
- People can use **facts** to make educated guesses, or **inferences**. **Experiments** allow people to test the inferences the make through the collection of more facts, i.e. data.

Materials

- Lesson 3 Workbooks – *Change 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)
- Expedition Letter and Gear Checklist (one for each student, plus one for teacher)
- Timer or some way to keep track of time
- Volunteer nametags and vests

Set –up

- Students have their observation (*Let's Go Outside*) notebooks ready
- Ensure the students are divided into 3 groups, their tables/desks are cleared, and pathways between groups are free of tripping hazards. *Note - keep the number of stations to a minimum because more time is needed for each station.
- 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.
- Station Instructors have Lesson 3 Workbooks to hand out

1. Intro (10 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're very close to becoming a Refuge Explorer. There are just a few more skills you'll need to help Willapa National Wildlife Refuge help wildlife."

b) Recap of 'web of life' lesson - "Our observations can help us understand what connects organisms and habitats. Last time we were together you made guesses about how organisms are connected to each other and their habitat by observing their adaptations – the way they are structured or behave. Can anyone share an example of an adaptation they observed?"

c) Introduce today's lesson – "Explorers in Training have been learning different ways to use observations to "know" about the refuge and who lives there. Today we will be putting these skills and knowledge to the test.

First let's check on your homework assignment (field observations recorded by the students in their *Let's Go Outside* notebooks)." If students do not have their notebook, ask them to take out a sheet of paper and record an observation they remember or can make through the classroom window. Station instructors each choose the nearest group of students and start checking notebooks.

d) Check field notebooks – have instructors split up and check student books, lavishing specific praise on sketches and notes (one comment per child). If the student does not have an observation to share, station instructors can ask a few questions to ferret out something the student has seen either from the last lesson or during the break. Questions can include: Do you remember a plant or animal you've recently seen? What adaptations did it have and why? What habitat might it live in and why do you think that?

"From what I saw in your observation notebooks, you are ready for the next step in becoming a Refuge Explorer. Recording details and making educated guesses is a strong beginning, and there is more to discover!"

2. Lecturette (10 minutes)

a) *Change happens* in and to the Web of Life – animal and plant populations rise and fall (snowy owls irrupt every 6 years, invasive species infiltrate a habitat), storms and natural events (floods, fires, and windstorms) alter habitats, and humans can change habitats for better or worse. Change can happen on a local, regional, national, or global scale (e.g. climate change). Changes in populations or behaviors of specialist species can be an indicator of a change in the habitat because they cannot easily move or use another habitat. For example, the decrease in the Western snowy plover population can be an indication of habitat change in the coastal dune habitat.

b) *"Willapa is all about change* – life here is adapted to daily tides, and seasonal winds and floods. These processes create rapid changes to the L.A.W.S. on habitat edges as sediments move, trees and plants change (death or growth), and salinity and temperatures fluctuate. You have been learning about how organisms adapt to use habitat and how things are connected in the Web of Life. Today you'll be learning about what happens to organisms when their habitat changes. You will do this by using a simplified process like the one Refuge scientists use to model the effects of change and to help wildlife. There are basically three steps in this process:

1. use your understanding of Willapa NWR's habitats and the adaptations of organisms (**facts** that you have gained in previous lessons);
2. make an **inference** (educated guess) as to what may happen due to a human-influenced change to the habitat;
3. test your inference by conducting a simple **experiment**. Make observations before, during and after the experiment to collect data – more facts!"

"When scientists test their inferences, they try to create an experiment to ensure the results accurately reflect what they are testing for. They do this by eliminating or accounting for **variables** (things that may change the results) that may distract from or confuse the experiment's outcome. They also **repeat** the experiment many times to increase the likelihood that the results did not happen by chance."

> **Fact:** A thing that has actually happened or is actually true; the state of things as they are. For example: the number of Western snowy plovers counted, the specific location/habitat in which they were found, and the behavior observed in each location.

Inference: An educated guess based on information you know to be true. For example: Because the Western snowy plover populations were decreasing dramatically in the area, Refuge scientists made an educated guess that the invasive beach grass was crowding out the plover's nesting habitat.

Experiment: A test with the purpose of discovering something unknown or to support an idea. Experiments are often repeated several times to compare results. For example: In 2001, Refuge staff removed several acres of beach grass. The following spring, plovers were observed nesting in the newly restored habitat. The Refuge continued to remove new areas of beach grass each winter, and more and more plovers were found nesting.

Variable: Something that may or does change. It is important to note things that may change the results of an experiment. For example: there are many factors that affect the numbers of plovers, such as nesting and feeding habitat, winter habitat, predation, disturbance, etc. Through careful observations, Refuge staff discovered that crows and ravens were using the closure signs as perches from which to find and prey on plover eggs and chicks.

c) "Let's practice your Refuge Explorer skills of knowing facts, making inferences and conducting experiments to test your inferences about refuge habitats."

3. Learning stations (30 minutes – 3 stations, 10 minute rotations)

If they are not already, split students into 3 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 station will include at least one specialist species from previous lesson. Specific information and experiment instructions can be found on Lesson 3 Fast Fact Sheets.

a) Instructor facilitates students' understanding of facts associated with the habitat (using images, reference to L.A.W.S., species adapted to specific habitat, etc.) through sharing and/or questioning. Use images and descriptions found on Fast Fact Sheets and within the Station Box.
b) Instructor shares a variable that has changed the habitat.
c) Students make inferences about what happens to the habitat based on the change.
d) Students do/observe a simple experiment to determine effects on habitat and associated species. Instructor directs student observations to note specific changes. What do they observe? Were their inferences correct? How might this discovery impact the wildlife and habitat?
e) Instructor shares what refuge staff have been doing to help wildlife impacted by this change.
f) Students rotate to next station after 10 minutes.

4. Closing (10 minutes)

a) Recap Refuge system mission and local environmental change effects.

> *The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.*

"Because NWRs are places where wildlife comes first, refuges are a good place to test our understanding of wildlife and habitats. Refuge staff work with many partners to accomplish the mission through inventoring and monitoring, restoration, enhancements, outreach, citizen science and more. Partners include other agencies, organizations, landowners, tribes, and people just like you. It takes the observations of many people and a sharing of resources to conserve wildlife."

b) "Based on your exemplary performance and training, I would like to extend a big Congratulations to each of you, Refuge Explorers, on behalf of Refuge Staff. You are now ready to help at the Refuge next month!" Have station instructors give a proclamation letter to each student, while the lead instructor reads it. Go through the expedition checklist and answer questions about the upcoming data collection trip to the Refuge.