

Lesson 4 – Change Happens

Key Concepts

- Facts, inference, variables, experiment
- Environmental change happens – natural process & human enhanced
- Organisms react to environmental change
- Indicator Species
- Refuges as laboratories

Materials

- Lesson 4 Workbooks – *Change Edition*
- Bird specimen
- Ruler
- Station boxes with samples, Fast Fact sheets, Laminated images
- Long Island Expedition Gear Checklist
- Timer
- Volunteer nametags

Set –up

- Students divided into 5 groups and tables/desks cleared
- Students have their observation notebooks ready
- Each instructor has the box of props for their station and picks a location to start
- Instructors have Lesson 4 Workbooks to hand out

1. Intro (5 minutes)

1. Welcome and introductions – Explorers in Training will acquire additional skills today
2. Recap of ‘web of life’ lesson – What connects organisms and habitats?
3. 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).
4. Check field notebooks – have instructors split up and check student books, lavishing specific praise on sketches and notes (one comment per child).

2. Lecturette (10 minutes)

1. *Change happens* in and to the web of life – animal and plant populations rise and fall (snowy owls irrupt every 6 years, invasive species), storms and natural events (floods, fires, and windstorms) alter habitats, humans can change habitats for better or worse. Change can happen on a local, regional, national, global scale (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.



2. *Willapa is all about change* – life here is adapted to daily tides, and seasonal winds and floods. These processes create rapid changes to L.A.WS. 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 help wildlife:
 - a) use your understanding of Willapa NWR's habitats and the adaptations of organisms (**facts** that you have gained in previous lessons);
 - b) apply **inference** (educated guess) as to what may happen due to a human-influenced change to the habitat;
 - c) test your guess using a simple **experiment**.

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 complete 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. An example would be that the measurement of a particular bird's bill that is 4 inches long and $\frac{1}{4}$ inch around and I observed the bird in the mudflat habitat.

Inference: The act or process of using the information we know to make an educated guess. An example would be observing the structural adaptations of a bird's bill and inferring what it eats. Based on the measurements above and the habitat I found the bird in, I can guess that it probes in the mud to catch prey.

Experiment: A test with the purpose of discovering something unknown or to support an idea. An example of an experiment based on this inference would be to make a series of observations about how the bird feeds (does it stick its bill in the mud or does it catch things out of the air?).

Variable: Something that may or does change. It is important to note things that may change the results of an experiment. For example the bird may have several different behaviors it uses to find food, the bird may use a habitat to rest or nest rather than feed.

3. "Let's practice your Refuge Explorer skills of knowing facts, making inference and observing experiments to test your inferences about refuge habitats." Split students into 5 groups and begin stations.

3. Learning stations (30 minutes)

Each station is based on refuge habitats and includes at least one specialist species from previous lessons. Specific information and experiment instructions can be found on Lesson 4 Fast Fact Sheets.



1. Instructor facilitates students understanding of facts associated with the habitat (using photos, reference to L.A.W.S., species adapted to specific habitat, etc.) through sharing and/or questioning. Use photos and descriptions.
2. Instructor shares a variable that has changed the habitat.
3. Students make inferences about what happens to habitats based on change
4. 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?
5. Instructor shares what refuge staff have been doing to help wildlife impacted by this change.
6. Students rotate to next station after 5-6 minutes.

4. Closing (5 minutes)

1. 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 serve as laboratories - refuges are a good place to test our understanding of wildlife and habitats. Refuge staff work with many partners to accomplish the mission through inventory and monitoring, restoration, enhancements, outreach, citizen science and more. Partners include other agencies, organizations, landowners, tribes, and people just like you. Congratulations Refuge Explorers - Based on your exemplary performance, you are now ready to help at the Refuge next month!

5. Fieldtrip Prep (10 minutes)

The Lesson 4 Workbook contains important prep activities and a habitat map of Long Island to prepare the students for the field trip. Each student will create a list of at least two inferences to test on the field trip using facts from lessons, workbooks, and additional research. These inferences are questions/subjects the student would like to know more about. Teachers will place students in groups of XXXXXX. Each student group will choose three questions that the group thinks are the most important for the Refuge to know the answers to. Explorers and scientists have to choose good questions –limited time, money, & facts. Each student group will create a list of tools they may need for their experiment. Each group will use the habitat map to determine where you may need to go to test their inferences. Teachers will help students choose questions that fit the location and available tools. Teachers will send the questions to the refuge prior to 2 weeks before the field trip, so staff may complete preparations and training for expedition.

Hand out Long Island Expedition Gear Checklist to students.

