Lesson 3: Seed Transport

Summary
Students learn about seed transport by seeing how they can act as a seed disperser and do the Seed Need activity. Students will examine different types of seed distribution methods and how they can disperse seeds.

Objectives
- Students will learn how seeds are transported.
- Student will be able to explain how seeds are transported.

Materials
Activity 1: Group Discussion Series (one of each per student)
- KWL worksheet
- Seed Dispersal worksheet

Activity 2: Seed Need (one of each per student)
- Socks
- Graph paper
- Seed Dispersal Lab worksheets

Making Connections
Students will examine how they can spread seeds themselves and relate it to seed anatomy from “Lesson 2: Seed Anatomy”. Students will also learn about dry forest seeds and connect it to what they see as they drive down the highway and what they learned in “Lesson 1: Introduction to the Dry Forest”.

Teacher Prep for Activity
Write the procedure for the activity on the board or ahead of time on chart paper. Make photocopies of worksheets for students (1 per student).

Background
Plants have different ways of distributing their seeds. Plants can use the wind (blown) or water (float) to distribute their seeds. They can also use animals to distribute their seeds. Animals can eat the seeds and disperse them in their feces, or the seeds and fruits can have adaptations that allow them to stick onto animals fur or feathers. They can even be explosive, which will distribute their seeds around the parent plant.
Seeds that are distributed by wind often have adaptations such as wings so they can float along in a breeze such as the invasive African Tulip. Other times, they are just extremely small and light-weight, like Ohia seeds, and can be carried by the wind themselves. Seeds can also float on water as a way to be distributed. One example of this is a coconut, which can float around in the ocean until it gets washed up on a beach. As the seedpods dry in the sun the pod splits in two. The seeds are flung out of the pod and spread around.

Animals can also disperse seeds. There are different ways an animal can distribute seeds. One way is by eating the fruit and then depositing the seeds with their feces. This occurs with mainly birds in Hawaii. Seeds can also have ways to attach themselves to the fur of animals. Many seeds have hooks on them that will attach themselves to fur. Explosive seed dispersal is common in pea plants.

**Seed Need background:** (Read to class in step 4)

Wildlife, like birds and pigs in Hawaii, contribute to the diversity and balance of ecological systems in ways that are not very obvious. One of these ways is in the process of seed dispersal. Animals carry many seeds—whether in the coats of fur-bearing animals or in seeds attached to and dropped by some birds. Animals distribute seeds in other ways too. For example, pack rats and mongoose gather seeds and store them in trees and in the ground. Some of those seeds are not eaten, and the seed cache, the place where these animals store their seeds, becomes a plant nursery. Many seeds are eaten but not fully digested. In those cases, animal droppings distribute and often fertilize seeds. When birds eat fruit, the seeds also get eaten. The seeds do not get digested and are distributed as the birds fly over an area. These seeds then have extra nutrients from the excrement from the birds.

**Vocabulary**

Distribute: to spread
Explosive distribution: a type of seed distribution where seeds explode out of the pod and spread around the parent plant
Diversity: the amount of different types
Environmental map: a physical map of a local environment

**Procedure**

1. Pass out the *KWL* worksheet and have the students fill out the first two sections (know and want to know) for seed dispersal.

**Activity 1: Group Discussion Series**

1. Pass out the *Seed Distribution* worksheet so the students can follow along and record their answers.
2. Topic: Seed distribution

*Question 1:* How are seeds distributed?

*Answer:* Plants spread by seed dispersal (although there are exceptions to this, like cactus which can form new plants when parts of it breaks-off; cactus still produce flowers and seeds). Seeds can be spread by the wind (Ohia), by floating on the water (coconuts), explosively by the seed bursting open and the seeds shooting out up to a couple of meters (wiliwili bean pods), and by animals. There are multiple ways animals can spread seeds. Fruits can be eaten and after they pass through the digestive tract, the seeds can be deposited in animal fertilizer. They can also get caught on the fur of animals and fall off at another location.

*Question 2:* What are some of the problems with seed dispersal?

*Answer:* Seeds cannot decide where they end up. They often end up in unsuitable habitats like in clumps of fountain grass or on the road. A seed from the wet forest would not survive in Waikoloa very well, but it could end up there if a bird carried it over.

*Question 3:* How do some of the seeds in the dry forest disperse?

*Answer:* Many of the dry forest plants, uhiuhi, wiliwili, and mamane, are in the bean family, like a kidney bean; the plant family Fabaceae. Wiliwili seeds are distributed explosively, others are eaten and deposited by birds. Fountain grass is dispersed by the wind, but can also get caught on animals.

*Question 4:* How do some of the seeds in the wet forest disperse?

*Answer:* Seeds in the wet forest use wind dispersal, like in Ohia, or often use animal dispersal by seeds and berries. One invasive plant that is spreading throughout wet forests due to animal dispersal is Waiwi (Guava). Pigs eat the waiwi fruits which contain the seeds and spread the seeds in their excrement.

*Question 5:* How do seeds attract animals that eat them?

*Answer:* Many times seeds are found in fruits. Animals will eat the fruits and then deposit the seeds. Animals also eat seeds as a food source, which does not benefit the plants.

*Question 6:* How do seeds attach to the fur of animals/clothing?

*Answer:* These seeds have hooks or barbs, which is pointy like barbed wire, on them. They can be covered in them or have only a few (show pictures attached by displaying them on an overhead or with a projector).
3. Read the Seed Need background information to the class so students can make sure they have correctly filled out their worksheet.

Activity 2: Seed Need
1. Create an “environmental map” of the school grounds in the classroom. Draw it on the board so the class can see it by asking the students to name different environments/habitats that might have different types of seeds (see example attached).
2. Split the class into small groups of 4 students, which they will work in during the rest of the lesson (includes going outside). Assign each group one area/zone to walk through.
3. Go over the procedure on the board
   a. Place a sock or masking tape over the shoe of the student.
   b. Release the students with instructions to listen carefully to be called back in 5 minutes.
   c. Walk through the assigned environmental area for 3-5 minutes.
   d. Return to the classroom, remove the sock, and place it neatly on their desk.
   e. Note: Masking tape can be wrapped around the ankle, sticky side out, instead of using a sock.
4. After the students have returned and neatly removed their sock and placed it on their desks, distribute the Seed Dispersal Lab worksheet and have each group count what was collected on their sock and record it on their worksheet.
5. Group Discussion: compare what has happened in each different area. During this discussion call on each group to report what they collected on their tape for each area. Have the students record the shared information on their worksheets individually while the discussion is going on.
6. Go over how to make bar-graphs with the students using the data collected in the previous step. Have the students make graphs of their own data on graph paper.
7. Give the students 10-20 minutes to compare results within their groups and finish their worksheets. When the students are finished with their worksheets, have them keep them because they will use them in the next lesson. Collect them after the next lesson.
8. Have the students finish filling out their KWL worksheet and collect it.
9. Collect the Seed distribution worksheet.

Assessments
1. Completed worksheet on seed dispersal
2. Completed lab worksheet with graphs
3. KWL worksheet

Resources
http://www.countrysideinfo.co.uk/seed_dispersal/index.htm
http://www.mbgnet.net/bioplants/seed.html
Extension Activities
Germinate the seeds to see what they grow into. Have the students keep data sets on what types of plants germinate and how many of each type of seed germinate. Seeds can be germinated by placing of them on the surface of the soil and watered regularly, keeping the soil damp.
Name: __________________  Date: ____________

Seed dispersal lab

1. What was found on the sock?

2. Why do you think these things are found on the sock?

3. Do the seeds look different from each other? Are some bigger than others? Do they have different shapes?

4. Draw a picture of one type of seed that was found on the sock.
5. Neatly make a bar-graph on graph paper of the total number of seeds and non-seeds collected from each area.

6. How many seeds were collected compared to other things (use the bar-graph from question 5).

7. How is the sock similar to animal fur?

8. Have you ever spread seeds? If so, how?

9. Could seed dispersal by humans help or hurt the dry forest? How?
10. Draw a picture of a seed that can attach to animals or humans and label the part of the seed that makes this possible.

11. How important are animals to seed dispersal? Write three complete sentences.
Sample Bar Graph:
Ecosystem map example:
Name: __________________

Date: _____________

KWL-Seed Distribution

What do you know about seed distribution?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

What do you want to know about seed distribution?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

What did you learn about seed distribution?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Seed Dispersal Worksheet

1. How are seeds distributed? Make sure to include examples.

2. What are some problems with seed dispersal?

3. What are some of the ways seeds in the dry forest disperse?

4. How do seeds that attract animals disperse?

5. How do seeds attach to the fur of animals or clothing?
Animal dispersed seeds:
Partnerships for Reform through Investigative Science and Math

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