

## Investigating Seed Dispersal

### Objectives:

1. Students will be able to describe four ways in which seeds are dispersed (wind, water, explosive fruit opening, external animal transport).
2. After an introductory activity to become familiar with seed dispersal mechanisms, students will use their gained knowledge to set up an experiment to measure two things: the distance a seed travels and the time it takes to land when wind is applied. Students will record data, make observations, and draw conclusions.

**Major Concepts:** Seeds utilize many methods of dispersal. Physical characteristics of seeds often determine the ways in which they are dispersed, greatly improving their distribution and survival in a given ecosystem(s).

**Suggested Ages:** middle school.

**Vocabulary:** dispersal, dispersal mechanism, distribution, ecosystem, seed coat, native, non-native, invasive.

**Materials:** a variety of seeds with the four different dispersal mechanisms (attempt to collect a variety of seeds that display different dispersal mechanisms, for example: seeds with wings or hairs, and small and large seeds of varying shapes and sizes), window or table fan, tape measure, watch/stopwatch, and blank paper.

### Benchmarks Addressed:

LA.A.1.3, Standard 1, #3: Demonstrates consistent and effective use of interpersonal and academic vocabularies in reading, writing, listening, and speaking.

LA.A.2.3, Standard 2, #5: Locates, organizes, and interprets written information for a variety of purposes, including classroom research, collaborative decision making, and performing a school or real-world task.

LA.B.1.3, Standard 1, #3: Produces final documents that have been edited for correct spelling, punctuation, sentence structure, etc.

LA.B.2.3, Standard 2, #1: Writes text, notes, outlines, comments, and observations that demonstrate comprehension of content and experiences from a variety of media.

MA.A.2.3, standard 3, #3: Adds, subtracts, multiplies, and divides whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator.

MA.E.3.3, Standard 3, #1: Formulates hypotheses, designs experiments, collects and interprets data, and evaluates hypotheses by making inferences and drawing conclusions based on statistics (range, mean, median, and mode) and tables, graphs, and charts.

SC.G.1.3, # 2: Knows that biological adaptations include changes in structures, behaviors, or physiology that enhance reproductive success in a particular environment.

SC.H.1.3, #5: Knows that a change in one or more variables may alter the outcome of an investigation.

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**Introductory Activity:**

**Step one:** Using various seeds, have students examine them. They should pay attention to things like size, shape, texture, and weight.

**Step two:** Once students have examined seeds, they are ready to describe what they see. Using a blank sheet of paper, have students create a table similar to the one below.

**\*Sample table for first activity**

<b>Seed Name</b>	<b>Seed Sketch</b>	<b>Dispersal Mechanism</b>	<b>Physical Characteristics of Seeds</b>

**Step Two, continued:** once students have made their table/data sheet. They should fill in information for all seeds they examine. Have students record data for 5-7 seeds. In the first column: students will name each seed; second column: have students use their art skills to sketch each seed; third column: have students name the dispersal mechanism of each seed. Finally, in the fourth column, students will use their vocabulary/language skills to describe (in words) what they observe about the physical characteristics of each seed. Included below are some examples of native Pine Rockland plants/seed and common south Florida plants/seeds, and their dispersal mechanisms.

### **Examples of Native Pine Rockland Plants/Seeds and their Dispersal Mechanism**

**Common Name:** Brickell Bush

**Latin Name:** *Brickellia mosieri*

**Dispersal Mechanism:** **Wind** (seeds have fluffy, white fibers; they are picked up by wind and dispersed away from the parent plant).

**Common Name:** Tiny Polygala

**Latin Name:** *Polygala smallii*

**Dispersal Mechanism:** **Water??** (seeds have a bubble-like structure, which is thought to make them buoyant in water. As water washes over the seeds they are flushed away from the mother plant, thus being dispersed. Note: water is not a common dispersal mechanism in Pine Rocklands. This does not mean that water never assists in the dispersal of seeds. As we all know, south Florida experiences frequent heavy downpours, capable of moving seeds around a forest, or given area).

**Common Name:** Green Antelopehorn

**Latin Name:** *Asclepias viridis*

**Dispersal Mechanism:** Wind (seeds have white, fluffy hairs).

**Common Name:** Downy Milkpea

**Latin Name:** *Galactia pinetorum*

**Dispersal Mechanism:** Explosion (seed pods eventually dry out, forcing them to twist and spring open sending seeds shooting away from the mother plant).

**Common Name:** Winged Sumac

**Latin Name:** *Rhus copallinum*

**Dispersal Mechanism:** Animals (seeds are contained within a small fleshy, berry-like fruit, making them tasty to animals, like birds. Birds will gather seeds and carry them away. Some seeds may be dropped (dispersed) as birds move away from the parent plant).

### **Examples of Common Plants/Seeds in South Florida and their Dispersal Mechanisms**

**Common Name:** Mahogany Tree

**Dispersal Mechanism:** Wind (seeds have fan-like blades on their seed coats which permit them to float around as wind carries them away from the parent plant).

**Common Name:** Brazilian Pepper (**Note: NON-NATIVE, INVASIVE** plant, yet common in south Florida).

**Dispersal Mechanism:** Animals (animals, especially birds, love the berries from this plant. Animals will gather and eat seeds, spreading them around).

**Common Name:** Orchid Tree

**Dispersal Mechanism:** Explosion (seeds are contained in pods, the pods eventually dry out, spring open and disperse seeds).

**Common Name:** Spanish Needle

**Dispersal Mechanism:** Animals (small projections found at either end of seeds attach easily to animal fur, hair, and clothes).

**Common Name:** Red Mangrove

**Dispersal Mechanism:** Water (Red Mangrove is a coastal plant that typically grows in shallow bay areas. The seeds, referred to as Propagules, fall from the tree into the water. The Propagules float through the water, eventually being deposited and germinating).

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### Make Seeds Move, An Experiment!

The purpose of this experiment is to replicate the way seeds are dispersed by wind. To do this, students will use a fan to make seeds move in the classroom. The distance the seed travels, and the time it takes the seed to land will be measured through a series of trials. The trials will be averaged and the data obtained will be displayed in bar graph.

**Materials:** window fan, a variety of seeds, tape measure, watch or stopwatch, blank paper.

**Setup:** a fan should be placed on the floor. Make sure watch/stopwatch and tape measure are handy. Students will also need a sheet of paper and pencil to record trials. Before starting trials, it should be determined how high and how far away from the fan students will drop each seed. For example, you may decide that students will hold each seed 40 cm above the floor and 40 cm in front of the fan. Whatever measurements you choose, they should remain constant throughout the experiment.

#### Procedure:

- Using a variety of seeds, drop one seed at a time in front of the fan, taking two measurements for each seed dropped (one measurement for distance, and one measurement for the time it takes seeds to hit the floor). You may have students work in teams. One student will drop seeds, while the other student records data and vice versa.
- Students will perform, record, and average six trials, (six trials: three trials for the distance each seed travels, and three trials for the time it takes the seed to land).
- Once trials are complete, have students find mean average of all trials.
- Students should now create bar graphs to display the mean average of their trials. Have students make two bar graphs; one for distance traveled, and one for time.

- You may have students answer several questions for homework:
    1. Which seeds traveled farthest and why?
    2. What about the design of the seeds causes them to be dispersed by wind?
    3. How would you improve seed design to make them travel farther?
    4. What forces in nature contribute to wind dispersal?
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### **Additional Resources:**

<http://www.plantatlas.usf.edu/>

<http://plants.usda.gov>

\*The above web sites are excellent for viewing images, and obtaining some information about south Florida native plants.

### **Sources**

Taylor, F. *Designer Seeds*.

[http://www.accessexcellence.org/AE/AEC/AEF/1995/taylor\\_seeds.php](http://www.accessexcellence.org/AE/AEC/AEF/1995/taylor_seeds.php)

Rice, S., Russell, A. *Sailing Seeds: An experiment in wind dispersal*, Amy Russell and Steven Rice, Union College, NY: <http://www.botany.org/bsa/misc/mcintosh/dispersal.html>

*Atlas of Florida Vascular Plants*. <http://www.plantatlas.usf.edu/>

*USDA Plants Database*. <http://plants.usda.gov>