

# Lesson #5: Seeds, Fruits and Their Dispersers

**Objective:** To discuss how effective dispersal of seeds is critical to successful plant reproduction. To illustrate how fruits are specially designed to disperse seeds through the actions of different dispersers. To understand how the process of fruit dispersal further illustrates the importance of preserving plant diversity.

**Introduction to Activity:** The reproductive cycle in plants wouldn't be complete without taking a look at the seeds and fruits that plants produce. Many students don't understand that the fruits and nuts they eat were once flowers that happened to get pollinated and fertilized. More importantly, it is valuable for students to understand why plants produce fruits, to see the diverse types of fruits that plants produce, and to understand that these fruits are designed uniquely for specific dispersers. Thus, many plants cannot live without the animals that disperse their seeds, and many animals cannot live without the critical food resources that fruits provide. Fruit diversity supports animal diversity, providing yet another important reason to conserve our plant heritage in its entirety.

There are two parts to this activity:

Part One involves a short dissection of a fruit (an apple). This part of the activity is optional. It will reinforce the processes of pollination and fertilization and will help students to see how fruits originate from fertilized flowers. This may be a useful investment of time, if you have a long class period.

Part Two is the core of this activity. Your students will examine a variety of fruits and try to determine the methods of dispersal for which they are designed. Students will then complete a reading assignment that reinforces what they learned.

## Materials Needed:

- one apple per pair of students
- knives (plastic are fine) for dissecting apples
- hand lenses
- copies of pictures of fruits (one set per group of four students)
- fruit samples that you gather (optional); examples of fruits you might be able to collect on your own: dried red berries (e.g. holly), burdock, walnut or hickory nuts, milkweed, tree of heaven or maple samaras, cocklebur, Osage Oranges. You can save most of these collected fruits to use for future labs. Real fruits are preferable to photos, if you can find them.
- a copy of the "Fruit Dissection" lab sheet for each student (Part One: optional)
- a copy of the "Fruits and Their Dispersers" lab sheet for each student (You may want to adapt this sheet to include fruits that are found in your area.)
- a copy of the reading "Seed Dispersal/Fruit Dispersal" for each student

- a copy of “Why Plants Are Endangered” and accompanying worksheet for each student (to be completed at home in preparation for lesson #6)

### **Activity:**

Part One (optional): Begin this activity by doing a quick review of pollination and fertilization. Explain that when a plant’s eggs are fertilized, they become seeds. These seeds are embedded in a fruit of some sort. A fruit can be something that we commonly refer to as “fruits,” such as apples, oranges, and mangos; nuts (almonds, walnuts, and hickory nuts, to name a few); and many things that we call vegetables, for example, tomatoes, squash, and peas.

Explain to your students that a fruit contains the remnants of the flower that they once were; they will be dissecting an apple to identify some of these parts. Pass out a “Dissecting a Fruit” lab sheet to each student. Distribute an apple and a knife to each pair of students. Give them a few minutes to complete the dissection. Students should be able to identify what used to be the stamens, eggs, and ovary.

Part Two: Now, move onto the important question of why plants produce fruits at all. The following points and guiding questions may be helpful:

- Seeds, if they end up in the right conditions, can grow into new plants of the same species. The reproduction process is complete!
- But how do plants distribute their seeds if they cannot move around?
- Why does the apple surround its seeds with tasty fruit? The baby plant’s food is in the seed—the endosperm. And why is the apple red? It doesn’t seem like proper care of a baby plant! A host of animals can come along and eat it! The answer is that many plants want animals that can move around to eat their seeds. The animal eats the fruit, but does not digest the seeds. The animal moves away, and eventually the seeds come out in the animal’s wastes. The seeds have been carried away and deposited with their own supply of fertilizer.
- There are lots of different kinds of fruits, each designed for specific dispersers. The plants and their fruit dispersers have evolved together in ways that are often mutually helpful. In the case of the apple, red is a fine color for mammals to see.

Let your students examine a variety of fruits and predict the disperser each is designed for. Pass out a “Fruits and Their Dispersers” lab sheet and clue sheet to each student. Provide a set of fruit photographs to each table group. (You can also use fruits that you have gathered and brought in. If this is the case, you will need to label them.) Ask your students to work together to predict what disperses each of the fruits. When they are done, review the answers together.

Pass out a copy of the reading “Seed Dispersal/Fruit Dispersal” to each student. This is a short reading that will reinforce what they have learned in this activity. If your students don’t have time to finish it in class, assign it as homework. Give a

workable due date for your students. It is important that they complete “Why Plants are Endangered” before the next activity. The “Seed Dispersal/Fruit Dispersal” reading can be completed at a later date.

Wrap up the activity by reminding the students of the following important points:

- Plants have fruits that are designed for specific dispersers.
- Close relationships between plant and pollinator (Lesson #4) and plant and fruit disperser play an essential role in maintaining the health of habitats.
- Many plants simply can't survive without their dispersers, and many animal dispersers cannot survive without the food that fruits provide them. An ecosystem's full complement of animal dispersers depends upon its plant diversity and vice versa.
- Plants support animal diversity in a wide variety of ways:
  - They provide critical habitat by providing food, homes, nesting space, and protection.
  - All parts of the plant provide critical food—leaves, flowers, fruits, stem/trunk/bark, and roots. Animals feed on specific parts of the plants, so one plant can provide food to a large number of different animals.

At the end of the activity, pass out the assignment for the next class, “Why Plants Are Endangered” and its accompanying worksheet.

# Dissecting a Fruit Lab Sheet

Student name: \_\_\_\_\_ Class/section: \_\_\_\_\_

You will be dissecting an apple in order to identify former flower parts within the apple.

1. Cut the apple into quarters.

- Find the seeds. What did the seeds used to be in the apple flower?  
\_\_\_\_\_
- Look at the fleshy part of the fruit (the part you eat). What part of the flower was this?  
\_\_\_\_\_
- Look at the “bottom” of the apple with the hand lens. You should see tiny, blackish, wiry structures. What part of the flower were these?  
\_\_\_\_\_



*An apple flower*

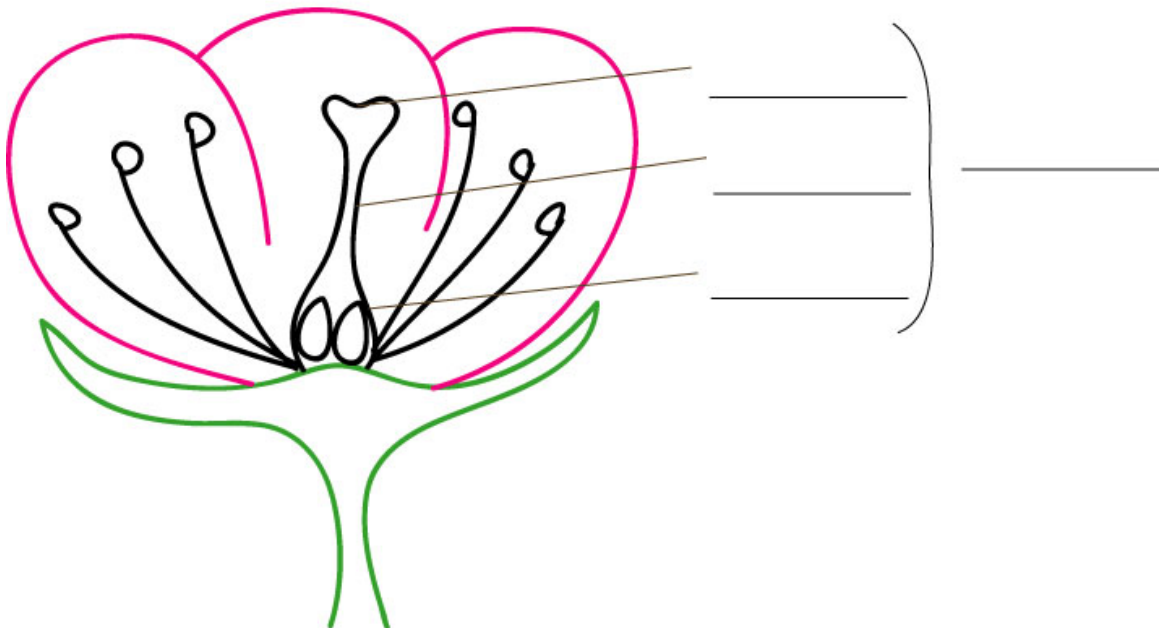
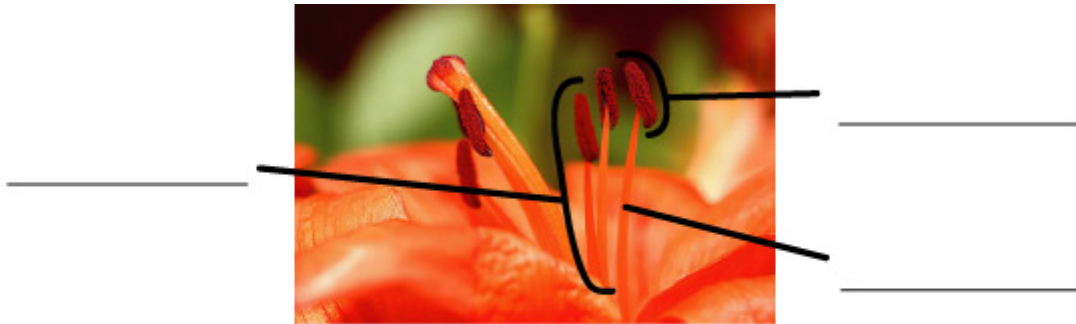
Photo: Bev Sykes

2. Review the process of how seeds and fruits are made by filling in the blanks below.

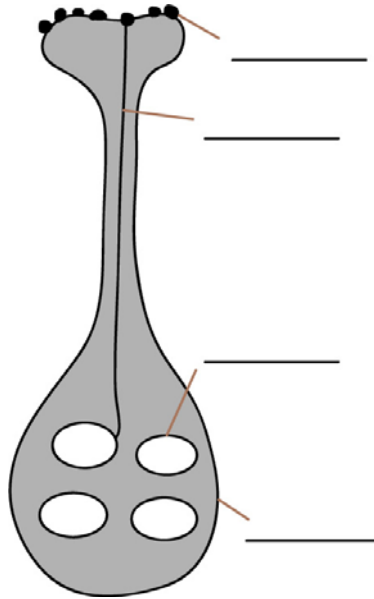
Word list to choose from:

seed	anther	ovary	fruit	fertilization
pollen tube	stigma	stamen	pollen	filament
ovule or egg	style	carpal (pistil)	pollination	

a. Pollen from the \_\_\_\_\_ (name the part of the stamen) lands on the \_\_\_\_\_ (part of the carpal). This process is called \_\_\_\_\_. Identify the flower parts by filling in the blanks on the two diagrams below.



b. The pollen grows a \_\_\_\_\_ that joins with the \_\_\_\_\_ in the ovary. This process is called \_\_\_\_\_.



c. The fertilized ovule becomes a \_\_\_\_\_, containing the embryo of a new plant.

d. The plant ovary becomes a \_\_\_\_\_.

# Fruits and Their Dispersers Lab Sheet

Student Name: \_\_\_\_\_ Class/section: \_\_\_\_\_

On the table you will find a variety of fruits, each specially designed for a particular fruit disperser. Please look them over and try to predict what disperser each fruit is designed for.

1. Holly Berry: \_\_\_\_\_

Reason: \_\_\_\_\_

2. Burdock: \_\_\_\_\_

Reason: \_\_\_\_\_

3. Walnut: \_\_\_\_\_

Reason: \_\_\_\_\_

4. Milkweed: \_\_\_\_\_

Reason: \_\_\_\_\_

5. Maple: \_\_\_\_\_

Reason: \_\_\_\_\_

6. Osage Orange: \_\_\_\_\_

Reason (This next one has a very surprising answer!):

\_\_\_\_\_  
\_\_\_\_\_

# Fruits and Their Dispersers Clue Sheet

You can use the information clues below to help you predict the correct fruit dispersers on your lab sheet.



Photo by Bruce Marlin

## **Osage Orange** **Fruit size = 7-15 cm diameter**

- These are the largest fruits that grow naturally in the United States.
- You usually find the seed fruits piled up at the base of the tree trunk.
- The tree's natural range is very small – only the Red River Valley of east Texas – making it very rare in the wild. However, it grows well when planted in people's yards.

You can occasionally find someone's yard covered with Osage oranges that have fallen from the tree.

- Mammoths, mastodons, saber-toothed cats, giant rhinos, giant ground sloths and other large animals once roamed North America. These animals became extinct around 13,000 years ago.



Photo by Michael Wilson

## **Burdock** **Fruit size = 2.5 cm diameter**

- If you could look with a hand lens at the tips of these fruits, you would see little spines with hooks on them.





Photo: [www.flickr.com/photos/dicemanic](http://www.flickr.com/photos/dicemanic)

**Walnuts (and Acorns)**  
**Fruit size = 3 cm diameter**

- If a squirrel actually eats one of these nuts, it will destroy the young tree embryos. (Squirrels don't pass whole seeds in their wastes; they've chewed the seeds up.) How, then, can squirrels serve as effective dispersers?



Photo: Jackie Fritsche

**Holly**  
**Fruit size =  $\frac{3}{4}$  cm**

- These attractive red berries can be found even in winter!



Photo: Dan4th Nicholas

**Maple Tree**  
**Fruit size = 12 cm wide**

- These are often called "helicopters."



Photo: Tracy Ducasse

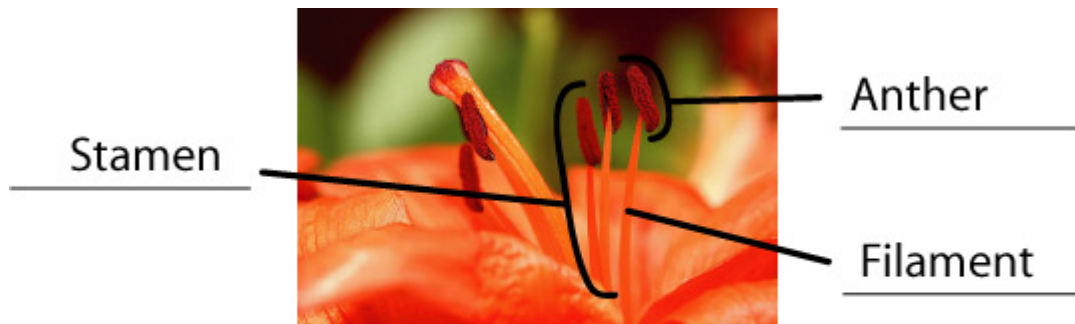
**Milkweed**  
**Seed size =  $\frac{3}{4}$  cm**  
**length**

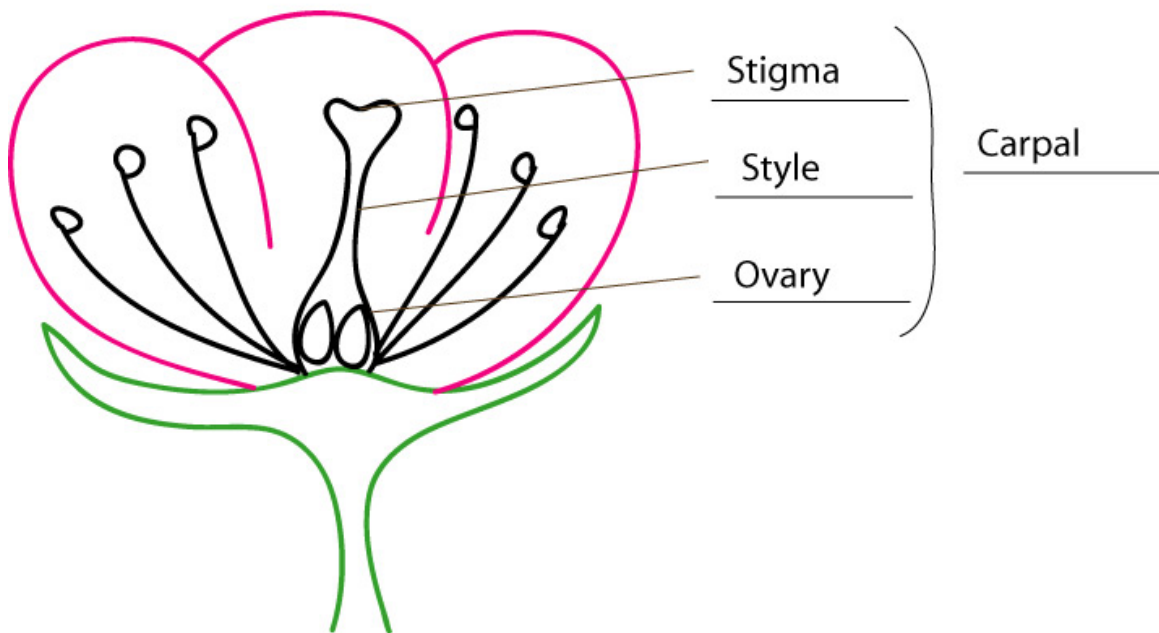
- Each seed pod contains hundreds of seeds and fluff!

# Dissecting a Fruit Answer Sheet

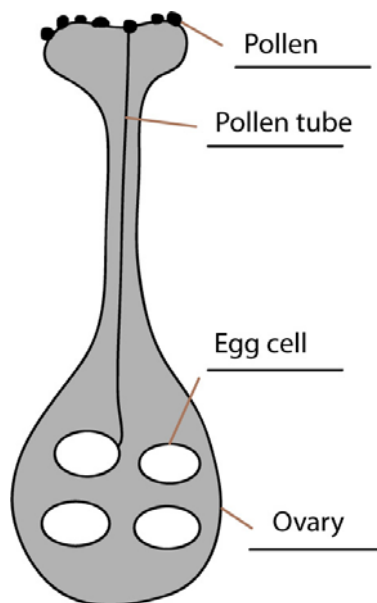
You will be dissecting an apple in order to identify former flower parts within the apple.

1. Cut the apple into quarters.
  - Find the seeds. What did the seeds used to be in the apple flower? egg cells
  - Look at the fleshy part of the fruit (the part you eat). What part of the flower was this? the ovary
  - Look at the “bottom” of the apple with the hand lens. You should see tiny, blackish, wiry structures. What part of the flower were these? These are old filaments, and you can sometimes find old anthers, as well.
2. Review the process of how seeds and fruits are made by filling in the blanks below.
  - a. Pollen from the anther (name the part of the stamen) lands on the stigma (part of the carpel). This process is called pollination. Identify the flower parts by filling in the blanks on the two diagrams below.





b. The pollen grows a pollen tube that joins with the egg cell(s) in the ovary. This process is called fertilization.



c. The fertilized ovule becomes a seed, containing the embryo of a new plant.

d. The plant ovary becomes a fruit.

# Fruits and Their Dispersers Answer Sheet

1. Berry: birds

Reason: They are red, which is a color that birds can readily see. Red will stand out among green foliage. They are relatively small; the right size for the beaks of berry-eating birds. Birds eat the berries, but do not digest the seeds inside the fruits. They later disperse the undigested seeds through their wastes.

2. Burdock: mammals (animals with fur)

Reason: The tips of burdock have small shooks that readily get stuck on fur (and people's clothing). Mammals, then, carry these fruits with them until they fall off somewhere else.

3. Walnut or hickory nut: squirrels

Reason: Squirrels readily store nuts for later consumption. Fortunately for the trees, the squirrels forget about or don't retrieve all of them. These lucky nuts now have a chance to reproduce. When squirrels eat nuts, they are consuming the seed itself, including the embryo. It is impossible for these nuts to reproduce.

4. Milkweed: wind

Reason: Milkweed seeds have a feathery, white "parachute" attached that helps them blow in the wind. They are very light in weight.

5. Tree of Heaven or Maple "Helicopter": wind

Reason: Such "helicopters" are known as samaras. These dangle from twigs, where they can catch the wind. They are aerodynamically designed to spin and float from the parent tree.

6. Cocklebur: mammals (animals with fur)

Reason: Like burdock, these fruits have spines that catch on fur and clothing.

7. Osage Orange: Before people began widely planting these trees, they were only found along the Red River in east Texas. What do you think might have dispersed these enormous, sticky fruits?

Reason: Connie Barlow, in her book “The Ghosts of Evolution,” theorizes that Osage Oranges were dispersed by giant ground sloths or mammoths when they roamed North America over 10,000 years ago. Now that these large animals have gone extinct, the Osage orange can’t easily be dispersed.

## Assignment: Seed Dispersal/Fruit Dispersal

Once a flower is pollinated and a seed produced, the plant must meet one more challenge before reproducing successfully: It must distribute its seeds to places where they can grow. Generally, it does not help a plant if its seeds simply drop off and pile up underneath the parent plant where they will certainly not find enough space and nutrients to sprout. Neither the plants nor the seeds, however, can move on their own. How are seeds going to get themselves out in the world?

Plants solve this problem by putting their seeds into fruits. To us, fruits are food, but to plants, fruits are devices to disperse their offspring. A great variety of fruits exist, ranging from tiny grass seeds to apples to coconuts. Why are there so many different kinds? It's because plants choose different strategies to spread their seeds. The strategy chosen by a plant determines how its fruit is designed.

For example, many plants use the wind to disperse their seeds, just as some use it to disperse their pollen. Perhaps you have picked up a dandelion flower that has gone to seed. Once a bright yellow flower and now a puffy white ball, you blow the little white "parachutes" into the air. Far from destroying the flower, you have now done exactly what it wants. If you look closely at one of the "parachutes," you will see a tiny seed



Photo: Kumon

attached at the bottom (see right photo). The dandelion parachute is a fruit designed to be carried off by the wind, and your breath will do just fine. Other wind-dispersed fruits include aspen and cottonwood parachutes, as well as the "helicopters" of trees such as maples, ashes, and tulip trees. When these are ripe, you can see them spinning down to the ground, away from their parent trees where they can start life on their own.

At first glance, it is more difficult to understand the strategy behind the design of a cherry or an apple. You will recall that when plant sperm meets egg, one sperm cell fertilizes the plant embryo itself while another sperm cell fertilizes two polar nuclei that become endosperm to feed the baby plant. Why, then, is a cherry seed enclosed inside good-tasting pulp? The baby plant isn't going to eat it; its food is inside the seed. A cherry tree seems to be asking for trouble. Not only is the cherry tasty, it is red, and hungry birds and bears can easily spot and eat it. It seems like a poor way to take care of a baby plant!

It turns out, however, that the cherry tree benefits from animals eating its fruit. If a bird devours a cherry, it digests the fruit around the seed, but not the seed itself. A hard seed coat protects the seed, preventing it from being digested. The seed



passes through the bird and emerges intact in the bird's wastes. But the bird is no longer in the cherry tree. It has flown away, so the seed is now far from the parent tree lying in fresh fertilizer (the bird's waste). The cherry tree has paid the bird to carry its offspring away.



Photo: Brian Reed

A great number of plants use animals to disperse their seeds in this manner. Berries of all sorts are relished by a wide assortment of birds and mammals. Larger fruits, like persimmons (photo) and papaws, are carried off by animals such as foxes, deer, and raccoons. In the tropics, many birds (such as toucans) and mammals (such as monkeys, apes, antelope, and wild pigs) spread seeds. Trees that produce nuts (like oaks, hickories, and walnut trees) depend on

squirrels to distribute their seeds. They rely on the squirrel habit of burying nuts and acorns to eat later and then forgetting where it put them! Some trees along the mighty Amazon River in South America depend on a very peculiar animal to disperse their seeds: When the river floods its banks, many species of fish swim over what used to be the forest floor. They eat fallen fruits floating in the water and disperse their seeds, which germinate when the waters recede!



Photo: Richard Stead

A few plants rely on animals to spread their seeds without paying them to do it. Examples include the burdock and the cocklebur. The fruits of these plants are covered with tiny hooks. When a hairy animal brushes the plants as they walk by, the fruits stick to their fur and get carried off. This may have happened to you as these fruits find it easy to stick to clothes.

To preserve plant diversity, then, it is essential to preserve animal diversity as well. If people overharvest fruit-eating birds, mammals like monkeys and wild pigs, and even Amazonian fish, fruit can remain uneaten and not distributed. They can end up in rotting piles rather than dispersed throughout the forest.

And the giant coconut? It is dispersed by sea water. Coconuts can float for months until they land on a tropical beach where they can take root and grow. This is why coconut groves have sprouted on beaches around the world. It's because of the coconut's successful seed dispersal strategy that people from Hawaii to India to Jamaica can all find the nuts and eat them. And it's because of the need to disperse seeds that we all have apples, peaches, raspberries, and pecans to enjoy.



## **Glossary**

Disperse: to have seeds transported away from the parent plant

Fruits: structures produced by plants to disperse their seeds; they are designed to be transported by various animals or by the wind; they can range from fleshy and sweet (e.g. apples) to hard-shelled (nuts) to light-weight and feathery (dandelion fruits)

Germinate: when a seeds sprouts and a plant begins to grow

Over-harvest: to remove so many individuals of a species through hunting, poaching, fishing, or collection (plants) that the population can't be sustained

Pulp: the fleshy part of a fruit

# Worksheet: Seed Dispersal/Fruit Dispersal

Student Name: \_\_\_\_\_ Class/section: \_\_\_\_\_

1. What is the difference between a seed and a fruit?
2. Look at the pictures of fruits below and decide what you think disperses each fruit.



Photo: Scott Robinson

What disperses this fruit? \_\_\_\_\_



Photo: Andy Hay

What disperses this fruit? \_\_\_\_\_



Photo: Johndan Johnson-Eilola

What disperses this fruit? \_\_\_\_\_



Photo: Kurt Stueber

What disperses this fruit? \_\_\_\_\_

3. Animals pollinate flowers and disperse seeds by accident. Please explain.

# Answer Sheet: Seed Dispersal/Fruit Dispersal

Student Name: \_\_\_\_\_ Class/section: \_\_\_\_\_

1. What is the difference between a seed and a fruit?

- A seed contains the plant embryo and the food (endosperm) to nourish it until the baby plant can begin to make its own food. A fruit is the device employed by the plant to disperse the seed.

2.

- A. Birds: Brightly-colored berries
- B. Squirrels: Nuts buried by the squirrels and left in the ground
- C. Hairy animals: Fruits are covered with tiny hooks to fasten onto fur
- D. Wind: Seeds attached to parachutes or sails so they can travel long distances in the wind

3. Animals pollinate flowers and disperse seeds by accident. Please explain.

- Animals do not intentionally pollinate flowers and disperse seeds. They are either trying to obtain food, or they are tricked by the plant to provide services for it.

## **Assignment: Why Plants Are Endangered**

You have learned at least three reasons why preserving plant diversity is important:

- 1) Practical reasons, as illustrated by natural medicines;
- 2) Ecological reasons, as illustrated by pollination and seed dispersal
- 3) Emotional reasons, as illustrated by how many people just enjoy plants.

Unfortunately, human actions are putting much of the world's plant diversity in danger of disappearing. Various conservation organizations have prepared lists of living things, including plants, that are in danger of becoming extinct. The state in which you live probably has a list of plants threatened with disappearing from within its borders.

Lists like these, however, only include the species of plants that scientists KNOW are edging toward extinction. The situation is actually more serious than it appears. First, there are so many plants around the world that conservationists can't know them all well enough to say whether they are threatened with extinction or not. Second, many plants not on these lists are also dwindling in number, but are not yet facing imminent extinction. Their disappearance from habitats where they once lived makes our environment less diverse, interesting, and healthy and less capable of supporting the living things that depend on them.

Plant diversity loss, then, is not just occurring in exotic tropical forests and far-away islands. It is happening in the forests, fields, marshes, beaches, roadsides, and neighborhoods all around us. It is a problem that is affecting us wherever we live. For this reason, it is a problem we can all do something about.

There are five basic ways in which humans are reducing plant diversity:

- 1) Destruction of natural habitats
- 2) Introduction of alien species
- 3) Over-harvesting of plants
- 4) Pollution
- 5) Bringing about global climate change.

### **Destruction of Natural Habitats**

The most significant cause of plant diversity loss is habitat destruction. Around the world, people are clearing native forests, draining swamps and marshes, and replacing native grasslands and prairies with croplands. When these habitats disappear, the diverse array of plants, insects, birds, mammals, and other living things found in them also vanish. Of particular concern are tropical rainforests, found chiefly in Central and South America, Africa, and Southeast Asia. These forests hold an amazing percentage of the life on Earth. Scientists estimate that,

though they only occupy roughly seven percent of the planet's land surface, tropical rainforests harbor 50-90% of the planet's living things. Scientists can't narrow it down more than that, because even today they still believe that these forests are hiding many species that we have not yet discovered. Every expedition that goes into tropical rain forests seems to find new species. This means that we lose a lot of plant species and other living things, not just trees, when we lose a rain forest.



Photo by Doug Sephton

In the United States, wetlands, such as swamps and marshes, and old and mature forests continue to dwindle. The habitat most at risk, however, is native prairie. Drive through the Midwestern states like Illinois, Iowa, and Nebraska, and you will see mile after mile of farmland, producing enormous quantities of corn, soybeans, wheat, and other crops. Before this land became the nation's breadbasket, however, it used to be covered

with native grasslands. They contained not only a great variety of grasses but many different wildflowers and animals, as well. Today, it can be a challenge to find remnant patches of this formerly extensive habitat and the living things that lived there.

What is happening to natural habitat where you live?

### **Introduction of Alien Species**

Alien species are plants, animals, and other living things that people introduce, intentionally or accidentally, to places where they have not lived before. People have spread a great variety of living things around the world, and occasionally these alien species have caused serious problems in their respective ecosystems. Examples of some notorious examples in the United States include the Asian tiger mosquito, the starling, the house mouse, and the Norway rat.



American chestnut leaves and seeds.

Photo: Timothy Van Vliet

Alien species that affect plant diversity include plant pests, diseases, and other plants. Introduced plant diseases and pests can devastate plants not used to



them. In the United States, for example, the Chestnut blight, an alien fungus originally from Asia, has all but wiped out the American chestnut, once one of our most common and valuable trees. Today, you can sometimes find chestnut saplings sprouting in eastern woodlands, but the blight almost always kills them before they mature and can produce the edible nuts that previous generations of Americans enjoyed. Dutch elm disease, also a fungus that came from Europe and Asia, similarly wiped out elms across the country, though elm populations these days appear to be rebounding. Today, a variety of trees in the Northeastern United States, notably ash, elm, and maple trees, are being threatened by the Asian long-horned beetle that kills trees when it tunnels into them to lay its eggs. Hemlock trees are being attacked by the woolly adelgid, a tiny white insect from Japan that sucks the trees' sap. And periodically we witness outbreaks of gypsy moths from Europe and Asia that can appear to eat every tree leaf in sight across hundreds of miles of forest.



Alien species like kudzu can overtake entire ecosystems.  
Photo: [www.jimfrazier.com](http://www.jimfrazier.com)

Alien plants reduce plant diversity by out-competing native plants for living space. Their true impact on our natural habitats can be deceptive. Many natural places, at first glance, seem to be healthy, with thriving plant populations. Closer inspection, however, reveals them to be overrun by alien plant species and missing the native plants that used to live in them. In many of our city parks and neighborhood woodland groves, alien plants like Japanese honeysuckle, kudzu vine, and English ivy have crowded out the original plant residents. The same is true of our pastures and roadsides, where many of the grasses and flowers have come from somewhere else. In southern Florida, even in Everglades National Park, it can be a challenge to tell native plant from alien. At home, most of the “weeds” that we find in our gardens and lawns are alien species.

Alien species particularly devastate island habitats. Isolated from the rest of the world, many islands have produced their own unique plants and animals. Living far away in these refuges, many of these plants and animals have not developed defenses against predators, pests, diseases, and competitors from other places. They are, therefore, particularly vulnerable and defenseless when alien species invade their habitats. It should come as no surprise, then, that Hawaii has more endangered plants than any other state. In many parts of the Hawaiian islands, particularly in the lowlands, almost all the common plants you see are alien. The landscape is lush, but native plants are missing.

How many of the plants that you see in your neighborhood are alien?

## Over-harvesting

Some wild plants are in such demand by people that intensive harvest has significantly reduced their numbers. Examples include the valuable tropical hardwood mahogany (with which many examples of fine furniture are made) and wild agave (which is harvested in Mexico to make the alcoholic beverage, tequila). In the United States, American ginseng has become scarce in many areas because it is highly valued as medicine in Asia. Likewise, rare species of wild cactus from the American Southwest and some wildflowers from other parts of the country are disappearing because people are collecting them to decorate their homes and gardens.



Venus flytraps are threatened by overcollecting and habitat destruction.  
Photo: Mandy Passon

## Pollution

Polluted air from factories, mines, power plants, and motor vehicles can also reduce plant diversity, particularly in urban areas.



Photo: Stian L.

Only hardy plants can tolerate the air of our most populous cities. Meanwhile, water pollutants like human sewage, manure from farms, and eroding soil can make water so murky that plants growing underwater often cannot obtain enough sunlight to survive. This is happening in lakes, ponds, streams, and ocean bays across America.

Insecticides are another category of pollution that indirectly has a major impact on plants.

When sprayed in a habitat, insecticides can wipe out the entire spectrum of insect pollinators that plants depend on to reproduce.

## Climate Change

Increasingly, we are becoming convinced that human activities are changing the world's climate. Many scientists are predicting that we are raising global temperatures and changing wind and rain patterns. Clearly, global climate change has the potential to significantly affect natural habitats. At present, however, the impact this will have on plant diversity is difficult to predict with certainty. We will need to watch the situation closely in the coming years.

## Glossary

Alien species: a species introduced to an area in which that species would not normally be found



Competitors: living things that use and compete for the same resources of other living things

Conservationist: a person who works to conserve or protect living things and the habitats in which they live

Extinction: the permanent loss of a particular species

Habitat: a place where a plant or animal can get the food, water, shelter, and space it needs to live; there are many different habitats for various species

Insecticides: chemicals used to kill insects; they are used by farmers on crops as well as by homeowners in their homes and yards

Pests: in this case, living things that are especially detrimental and destructive to native plant and animal species

Predators: living things that eat other living things

# Worksheet: Why Plants Are Endangered

Name: \_\_\_\_\_ Class/Section: \_\_\_\_\_

## Questions:

1. What are the five main reasons why plant diversity is being threatened?

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

D. \_\_\_\_\_

E. \_\_\_\_\_

2. What is the most significant reason?

Answer: \_\_\_\_\_

3. Why are island plants particularly vulnerable to the invasion of alien species?

4. What state has the highest percentage of native plants that are at risk of becoming extinct? Why?

# Answer Sheet: Why Plants Are Endangered

Name: \_\_\_\_\_ Class/Section: \_\_\_\_\_

## Questions:

1. What are the five main reasons why plant diversity is being threatened?

- a. Habitat Destruction
- b. Alien Species
- c. Overharvesting
- d. Pollution
- e. Climate Change

2. What is the most significant reason?

Answer: Habitat Destruction

3. Why are island plants particularly vulnerable to the invasion of alien species?

- Island plants evolved in habitats without the predators, competitors, diseases, and pests found on continents. As a result, when these are introduced into an island habitat by humans, plants are defenseless against them.

4. What state has the highest percentage of native plants that are at risk of becoming extinct? Why?

- Hawaii. The state consists of islands thousands of miles from the nearest continent. Its plants have developed no defenses against the alien species repeatedly introduced to the state.