

# LESSON 2: Litter, Wildlife, and Decomposition

## LESSON'S CONCEPTS

- Litter can be dangerous to wildlife.
- Some litter decomposes rapidly, while other litter can take hundreds and even thousands of years to break down.

### PURPOSE

Students learn how wildlife can be injured by litter. They also find out how long it takes for certain types of litter to decompose or break down.

### OVERVIEW

In this lesson students will:

- Observe how a plastic bag can create problems for wildlife.
- Use a toy animal to show how wildlife can get injured by litter.
- Guess how long it might take for specific litter to decompose or break down; then conduct an experiment to determine the decomposition rates of different types of litter.
- Compare the students' guesses and observations concerning the time it takes for various objects to decompose or break down to those made by scientists.
- Write a story about litter and wildlife.

### CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS

- Students compare the decomposition rates of various litter.
  - "Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept . . . students will . . . follow verbal instructions for a scientific investigation." (*Science Content Standards, Grades K–12; Grade 2; Investigation and Experimentation, Standard 4g*)
  - "Change is affected by surroundings."

(*Science Framework, page 52*)

- Students describe how litter can injure wildlife.
  - "Different types of plants and animals inhabit the Earth." (*Science Content Standards, Grades K–12; Kindergarten; Life Sciences, Standard 2*)
  - "Human practices can often affect the well-being of other species in the environment. Humans should respect living things and foster their survival." (*Science Framework, page 141*)
  - "To develop geographic literacy, students must understand human and environmental interaction." (*History–Social Science Framework, pages 15 and 16*)
- Students write a story about litter and wildlife.
  - Students "select a focus when writing." (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 8*)
  - Students "write narratives (that) (a) provide a context within which an incident occurs; (b) include well-chosen detail to develop the plot; (c) provide insight into why the selected incident is memorable." (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 18*)

### SCIENTIFIC THINKING PROCESSES

observing, communicating, comparing, relating

## TIME

30 minutes to prepare for the lesson; 60 minutes for “Part I” and 60 minutes for “Part II” to implement the lesson; plus 15 minutes to

observe the experiment every two to four weeks for a period of three months

## VOCABULARY

decompose, biodegradable

## PREPARATION

- \_\_\_ 1. Read the “Background Information for the Teacher” at the end of this lesson.
- \_\_\_ 2. Ask students to bring stuffed animals or other toy animals to class; toy birds are especially needed.
- \_\_\_ 3. Make a transparency of “Ways Litter Injures Wildlife” (page 180) and “Litter Over Time” (page 181).

## MATERIALS

### For “Pre-Activity Questions”

- \_\_\_ The transparency, “Litter Over Time”

### For “Part I, Identifying Ways Litter Injures Wildlife”

- \_\_\_ The transparency, “Ways Litter Injures Wildlife”
- \_\_\_ Transparent plastic bag
- \_\_\_ An aquarium or other transparent container of water
- \_\_\_ Plastic six-pack holders, plastic bags, fishing line, cans, and other litter that can injure wildlife (Make sure that the litter is safe for students to handle.)
- \_\_\_ A variety of stuffed or other toy animals brought in by students (Have some extras for those students who forget to bring a toy to class.)

### For “Part II, Determining How Long It Takes for Litter to Decompose”

- \_\_\_ Eight containers (These can be 2-liter-size or gallon-size beverage containers or plastic half-gallon or gallon containers with lids [check your school’s cafeteria for large plastic jars with lids]. All six containers should be the same size.)
- \_\_\_ Enough garden soil to fill four containers half full (Use garden soil not potting soil bought at garden stores because it is usually sterilized and therefore lacks microorganisms necessary for the decomposition of organic material.)

- \_\_\_ Enough water to fill two containers half full of water (If possible, use water from a creek, pond, or lake, because it usually contains organisms that can eat or decompose items.)
- \_\_\_ For each of four containers: piece of banana peel, leaf, potato peel, piece of bread
- \_\_\_ For each of four containers: marble (glass); one ring from a plastic six-pack drink holder; and a 1- by 1-inch piece of: notebook paper, milk carton, plastic from a sandwich bag, wool material, leather, polystyrene, and aluminum foil

**Note:** Wool material and leather can be purchased in secondhand stores or at yard sales.

## PRE-ACTIVITY QUESTIONS

- A. Place a transparent plastic bag in an aquarium or other transparent container of water.
  - Ask students how this bag could create a problem for wildlife living in the water. *The bag could get wrapped around an animal or parts of an animal; some animals, such as turtles, might eat it.*
  - Explain that sea turtles can mistake plastic bags for one of their foods, which is jellyfish. Ask students what could happen if an animal eats plastic? *It could get sick or die.* Tell students that plastic is not digestible, and the bag can get caught in an animal’s stomach or intestines. The animal could die from starvation or illness.
- B. Ask students what might be some ways that wildlife can be injured by litter. List students’ ideas on the chalkboard or on a piece of butcher paper.
- C. Ask students whether litter ever “goes away” by itself. *Yes, some of it can become part of soil.* Can litter break down naturally or decompose? (You might need to discuss with students the definition of the word *decompose*. This topic is covered in the K–3 Module, Unit 3.) *Some litter can decompose.*

Is there any litter that can last a very long time in the environment? *Yes. Why? It doesn't break down very fast.* (Students will learn more about this in this lesson.)

- D. Cover the second column of the transparency, "Litter Over Time." Show the transparency and have students guess how long it might take for a specific litter item to decompose or break down. Record students' answers on the chart. Tell students that organic materials (those that came from living things; i.e., bodies of plants and animals) can be decomposed by decomposers.

## PROCEDURE

### Part I, Identifying Ways Litter Injures Wildlife

- A. Show the transparency, "Ways Litter Injures Wildlife." Have students describe other ways that wildlife can be injured by litter and add these to the list generated by the class in "Pre-Activity Questions." This list should be saved for later use in the "Discussion/Questions" section "A." Ask students to describe how animals they know might be injured by litter. *My dog might eat foil with food on it.*

**Note:** Students should be aware that domestic animals can also be injured by various types of litter.

- B. Have students share the toys that they brought to class.
- C. Provide litter items, such as plastic six-pack holders, plastic bags, fishing line, and cans. Have students use the litter and their stuffed animal to demonstrate to the class different ways that animals can

get hurt by using litter. For those students who did not bring a toy, ask them to draw or describe a situation where a bird or other wildlife might be injured by litter and to share these with the class.

- D. Discuss the ways students can keep animals from getting injured by litter. *Keep an area clean. Cut apart the plastic six-pack holders before placing them in a garbage can. Keep garbage cans covered.* Why should we care about wildlife getting injured? *I like animals and I don't want them to be hurt; animals are important because they are natural resources and other animals depend on them.* Encourage students to elaborate why they think animals are important.

### Part II, Determining How Long It Takes for Litter to Decompose

- A. Discuss with students:
- What do you think happens to litter on the ground? *It stays there for a long time; it may decompose* Does it ever become part of the soil? *Yes; maybe.*
  - What might determine whether an item breaks down (decomposes) or not? *What the item is made of.*
  - What effect might moisture have on the decomposition of items? *It might make some items decompose faster.*
  - What effect might sunlight have on the decomposition of items? *Sunlight might break down some items.*
  - How can we find out the answers to the questions we just discussed?
  - What type of experiment can we do to find out what types of litter decompose quickly? (One suggestion is described

(Use school's letterhead.)

Dear Parent or Guardian,

Please read the following information with your child:

Our class is studying litter. Tomorrow we will look at ways animals can get injured by litter. For example, plastic six-pack holders and fishing line can wrap around the neck, wings, or legs of a bird, causing the bird problems when it tries to walk, swim, or fly.

Please have your child bring a toy animal (ideally, a bird, but any animal will do) to class tomorrow, so that the ways litter can affect wildlife can be demonstrated.

Thank you,

below, but your students might come up with other ideas.)

- B.** Do the following as a class or in eight groups (if in groups, provide one container for each group).
1. Use eight containers. Fill four containers half full of garden soil. Fill two containers half full of water. Place the items listed below in the corresponding containers. Label the containers.
  2. Ask students to predict how long they think these items will take to decompose.
    - **Containers 1 and 2**—soil, piece of banana peel, leaf, potato peel, piece of bread. Keep container 1 moist and container 2 dry. Lay the pieces on top of the ground to represent litter.
    - **Containers 3 and 4**—marble (glass); one ring from a plastic six-pack drink holder; and a one inch by one inch piece of: notebook paper, milk carton, plastic from a sandwich bag, wool material, leather, polystyrene, and aluminum foil. Keep container 3 moist and container 4 dry. Lay the pieces on top of the ground to represent litter.
    - **Container 5**—water, piece of banana peel, leaf, potato peel, piece of bread.
    - **Container 6**—water, marble (glass); one ring from a plastic six-pack drink holder; and a one inch by one inch piece of: notebook paper, milk carton, plastic from a sandwich bag, wool material, leather, polystyrene, and aluminum foil.
    - **Container 7**—piece of banana peel, leaf, potato peel, piece of bread. Wipe each piece with a paper towel to remove moisture.
    - **Container 8**—marble (glass); one ring from a plastic six-pack drink holder; and a one inch by one inch piece of: notebook paper, milk carton, plastic from a sandwich bag, wool material, leather, polystyrene, and aluminum foil. Wipe each object with a paper towel to remove any moisture.

**Note:** Containers 7 and 8 are the control of this experiment. These containers do not have soil or water.

**Note:** Students might want to bury litter, but you can remind them that litter is usually found on top of the soil or on top of or in the water. However, if students want to experiment to see which materials decompose faster in soil, they can bury them about three to five inches below the surface, in a planter box or large flower pot, or somewhere on the school grounds. After three months they can examine the litter. Note that in dry areas, the organic items may not decompose very rapidly.

- C.** Discuss with students the following questions about the objects that students buried in soil:
- What do you predict will happen to the banana peel, leaf, and other organic items?
  - Which objects do you think will decompose first?
  - Which objects will take the longest to decompose?
  - Which objects that will decompose might enrich the soil?
  - Do you think moisture will increase the decomposition of certain items?
  - Which objects are breaking into little pieces but are not decomposing?
  - Which objects might “never” decompose?
- D.** Discuss with students the following questions, which are about the objects in water:
- What happened to the water in which litter was placed?
  - What happened to the litter in the water?
  - How might this littered water affect the plants or animals that live in the water?
  - What would you do if this water was your supply of drinking water?
- E.** Check the decomposition of each item of litter every four weeks. Encourage students to take notes and to illustrate how each item has changed (if at all). Conduct “Discussion/Questions,” section “C.”

## DISCUSSION/QUESTIONS

- A. Discuss with students:
- What are some reasons not to litter? *It is ugly; it could injure living things.*
  - How does litter affect wildlife? *It can injure animals or make them sick.*
  - Let's review your answers in the "Pre-Activity Questions" about ways litter injures wildlife. Do you think any of your original ideas need to be changed? If so, which ones and why?
  - How long will litter stay in an area if it is not cleaned up by people? *Depends on what the litter is made of.*
- B. Project the transparency, "Litter Over Time." Compare students' responses to the decomposition or break-down time estimated by scientists. Keep a record of students' responses to review at the conclusion of the experiment.
- C. At the conclusions of their experiments, review with students the questions in "Part II," sections "C" and "D."

## APPLICATION

**Homework Assignment:** Have students take their toy animals and litter home to educate their families on the hazards of litter on wildlife.

- A. Have students report back on the results of their discussions with their families (homework assignment).
- B. Have students make a time line or bar graph of decomposition rates, based on their predictions. Then they can make a graph of the time it took for the decomposable litter to decompose. Each type of litter can be represented by a piece of litter glued to the time line or graph.
- C. Ask students to write a story about animals and litter in their journals. They can elaborate about helping to save an animal and cleaning up an area to provide a litter-free habitat for wildlife. This can be done in a "fortunately" and "unfortunately" format. For example, fortunately, there was a beautiful park. Unfortunately, someone threw

a bunch of litter in the park. Fortunately, it was all in one big pile. Unfortunately, the wind blew and scattered the litter around. Fortunately, most wildlife that lived there kept away from the litter. Unfortunately, one young raccoon . . . The stories could be submitted for the school's newspaper or shared with another class.

**Note:** Younger students can dictate the story while someone else writes it down. The story can also be recorded on a tape recorder, or it can be written as a class. For older students, ask them to write a narrative that provides a context within which the incident occurs and include details to develop the plot.

## EXTENSIONS

- A. Encourage students to set up other experiments on the decomposition or breakdown of items. For example, a container of soil and litter can be placed in the sunlight to see whether sunlight will make certain materials decompose or break down faster.
- B. Plan a cleanup trip to a local playground or park. Your class can also participate in a yearly beach clean-up day. Contact the California Coastal Commission at 1-800-COAST-4U to participate in the yearly beach cleanup day and become involved in other projects through their program called "Adopt-A-Beach."
- C. Read *Kiya the Gull* by Fen Lasell. Encourage the class to write and illustrate its own book about litter and wildlife.
- D. Invite a representative from a park or zoo to visit your class and discuss how litter impacts the animals. Have students prepare questions ahead of time.

## RESOURCES

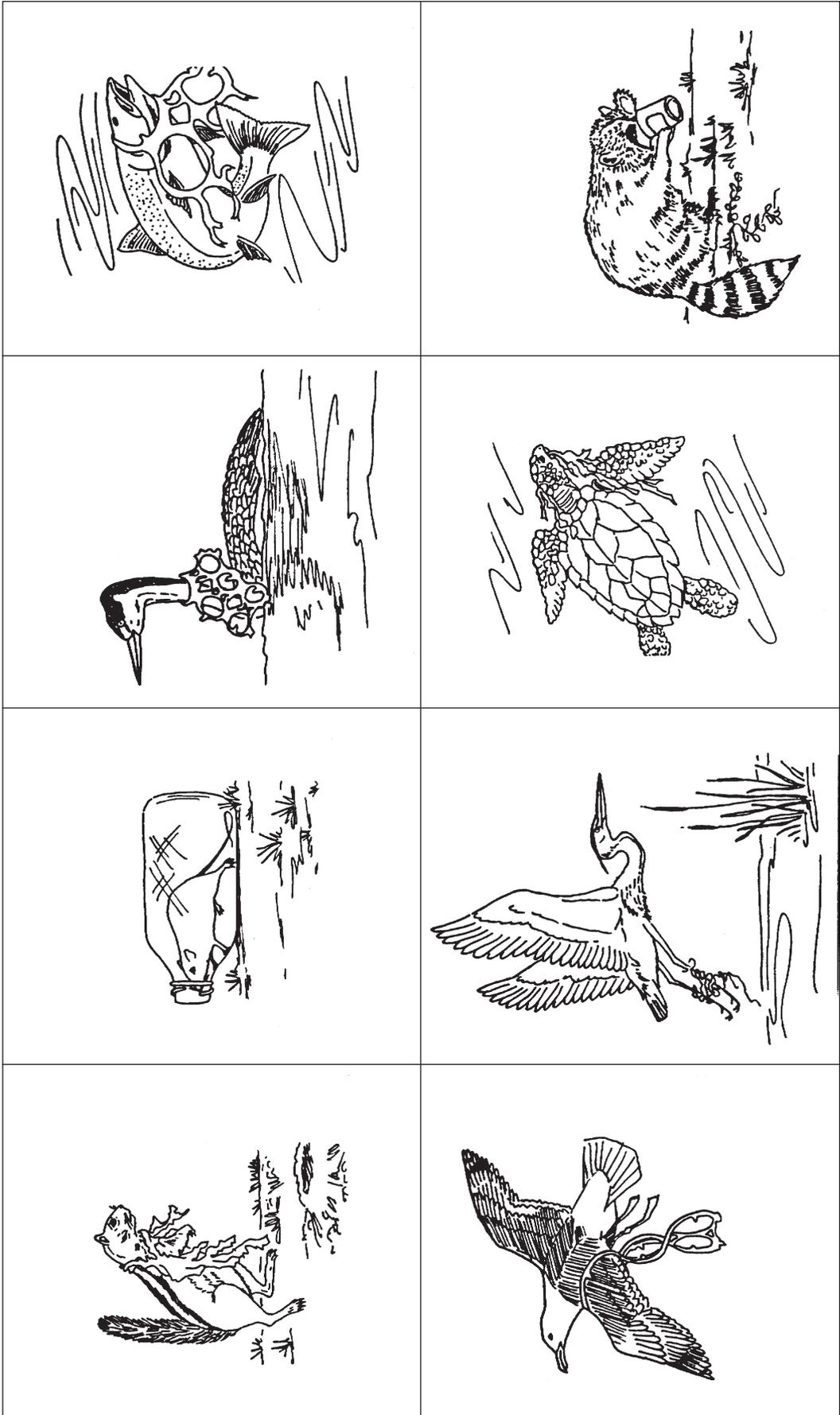
### Book

Lasell, Fen H. *Kiya the Gull*. Reading, Mass.: Addison-Wesley Publishing Co., 1969.

A boy rescues a gull that became tangled in fishing line.

Transparency

# WAYS LITTER INJURES WILDLIFE



## LITTER OVER TIME

Estimated decomposition or break-down time for objects exposed to light and air.

Litter	Decomposition or break-down time guessed by students	Observed decomposition or break-down time	Decomposition or break-down time estimated by scientists*
Banana peel			2 months
Notebook paper			3 months
Comic book			6 months
Wool mitten			1 year
Cardboard milk carton			5 years
Wooden baseball bat			20 years
Leather baseball glove			40 years
Steel can			100 years
Aluminum soda can			350 years
Plastic sandwich bag			400 years
Plastic six-pack ring			450 years
Polystyrene foam cup			maybe never
Car tire			maybe never
Glass bottle			maybe never

\*Source: Cornell University Cooperative Extension of Albany County in New York and the Environmental Protection Agency.

## BACKGROUND INFORMATION FOR THE TEACHER

Most people know that broken glass can injure people, pets and other domesticated animals, and wildlife. But many people are unaware that other types of litter on land and in the water can also cause injury, illness, and even death to wildlife. Litter can be blown by the wind or washed by the rain into storm drains or water channels and get into lakes, rivers, and the ocean. Plastic litter, such as six-pack holders, fishing line, and fishing nets, is especially deadly. It is estimated that up to one million seabirds and 100,000 marine mammals die each year after ingesting or becoming entangled in plastic debris.

Fishing line discarded carelessly or accidentally into the waterways often wraps around legs, wings, and beaks of water birds like geese, grebes, herons, and pelicans. The line entangling birds' legs and wings prevents them from walking, flying, or swimming. Fishing line wrapped around birds' beaks prevents them from eating.

Sometimes fish or birds get caught in the loop portion of plastic six-pack holders. The loop will not stretch as the animal continues to grow and the animal ends up dying. These loops can also get tangled around the feet of waterfowl or get wedged around birds' bills. Birds with a ring from a plastic six-pack holder around its neck can get strangled when another ring in the holder gets snagged on an object.

Plastic is indigestible and pieces often accumulate in the gut of the animal that eats them. When cellophane wrappers and polystyrene pieces are swallowed, they can get caught in the digestive system, filling up the animal's stomach, causing the animal to starve to death.

Sea turtles are especially vulnerable to plastics in the ocean. Plastic sandwich bags and balloons look like food to sea turtles that eat them. The plastics can get caught inside a turtle's digestive tract, causing starvation or infection and often death.

Animals are also affected by other types of litter they might swallow. For example, bottle caps can cause damage to the internal organs of wildlife that eat them. Cigarette butts can become compacted in an animal's digestive system.

Other types of litter injure wildlife in other ways. Raccoons and other animals can cut their tongues on the sharp opened edges of food and soda cans. Mice and shrews crawl into opened bottles and get trapped inside, unable to get a footing on the slippery glass to push themselves back out through the small opening. Some litter, such as leftover food, can be eaten by wildlife, but in many cases the litter causes harm to wildlife, including ants, birds, and squirrels.

Some litter, such as apple cores, banana peels, and newspaper, decomposes rapidly and can become part of soil. Note that nonorganic litter, such as plastic, glass, and aluminum, cannot be decomposed by decomposers. It can only break down into smaller pieces. Plastic, glass, and aluminum can remain unchanged in the environment for hundreds, even thousands, of years.