



# Schoolyard Biodiversity Investigation Educator Guide





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## **Preface**

Textbooks often take students to far-off places to learn about biodiversity. They see pictures of rainforests and organisms they may never observe in person. It is difficult to grasp the variety and abundance of plants and animals through flat, inanimate images.

The Schoolyard Biodiversity Investigation provides students with the opportunity to learn about biodiversity in a tangible and available environment – their own schoolyard. Whether the campus is a sea of cement and monoculture or contains a diverse garden or forest, the opportunity for students to investigate first-hand will deepen their understanding of biodiversity, ways to measure it, and the impact people have on it. After looking at their schoolyards, students can then apply their newly-gained knowledge to understand biodiversity and its deeper issues in their local habitats, as well as in far-reaching places.



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# Section 1

## Introducing Biodiversity

### What is Biodiversity?

Biodiversity can be defined on a variety of levels. Ecosystem biodiversity refers to the variety of habitats within a particular area or region. The Schoolyard Biodiversity Investigation focuses on species biodiversity, or the variety of plants and animals in a particular habitat. On a more complex level, genetic biodiversity looks at the variety of characteristics within a particular species.

The opposite of species diversity is a monoculture. The term monoculture refers to a situation in which only one species occupies a particular area or region. Examples of man-made monocultures include lawns and farms (such as wheat fields or pumpkin patches).

This section includes several activities that can help students develop their own definitions of biodiversity and look deeper to understand the importance of species biodiversity.

### Sentence Strip Definitions

1. Begin by asking, “Who has heard the word biodiversity?” and then ask “What do you think of when you hear the word biodiversity?” (option – write responses on the board)
2. Have students work with a classmate or small team to develop an initial definition of biodiversity. Remind the students to look at the parts of the word and break it down (bio and diversity). Initial definitions can be written on a scrap paper or in student journals.
3. Provide students with a variety of definitions of biodiversity (easily accessed by typing define: biodiversity in Google) or have students research the term with their partners/teams.
4. Once students have conducted further research, they can revise their definitions as needed.
5. Students write final definitions on sentence strips to be posted on the board.
6. Post and share sentence strips. Look at similarities and differences between the definitions, circling and/or highlighting key words in all definitions.

### Why is Biodiversity Important?

Habitats that have a greater variety of different species of plants and animals have a greater biodiversity. These habitats are also healthier and more stable. One reason diverse communities have greater levels of health is that organisms of the same species tend to be more spread out. This reduces the ability of a disease to spread throughout a habitat. Additionally, if a certain type of species of tree or plant does become infected, the other species will remain and continue to provide the habitat components for the organisms in that area.

In an area consisting of a monoculture, an area with only one type of plant species growing, the plants are more susceptible to disease and other stresses because they are all the same and less spread out (no other types of plants between them). As a result, [the entire habitat can be dramatically altered when impacted by disease or other stresses]. Human-made monocultures (crops, etc.) are created to make

harvesting easier. However, they typically require larger amounts of pesticides and herbicides (to prevent diseases and/or “weeds”) and larger amounts of energy and labor to maintain before harvesting.

### **Biological Diversity – Preventing Complete Loss of Habitat Due to Disease**

This is simple activity that demonstrates the impacts disease has on both a monoculture stand of trees and a biologically diverse community of trees. Students become trees and see very quickly that in a monoculture, disease spreads easily and it can eliminate an entire habitat. However, in a more diverse community, disease does not spread as much, resulting in a more intact habitat.

For more details and instructions, see Appendix A.



## Section 2

### Mapping the School Grounds

See Appendix B for a list of materials for the school biodiversity investigation.

**School maps can be created by individual students, partners or small groups in a variety of ways:**

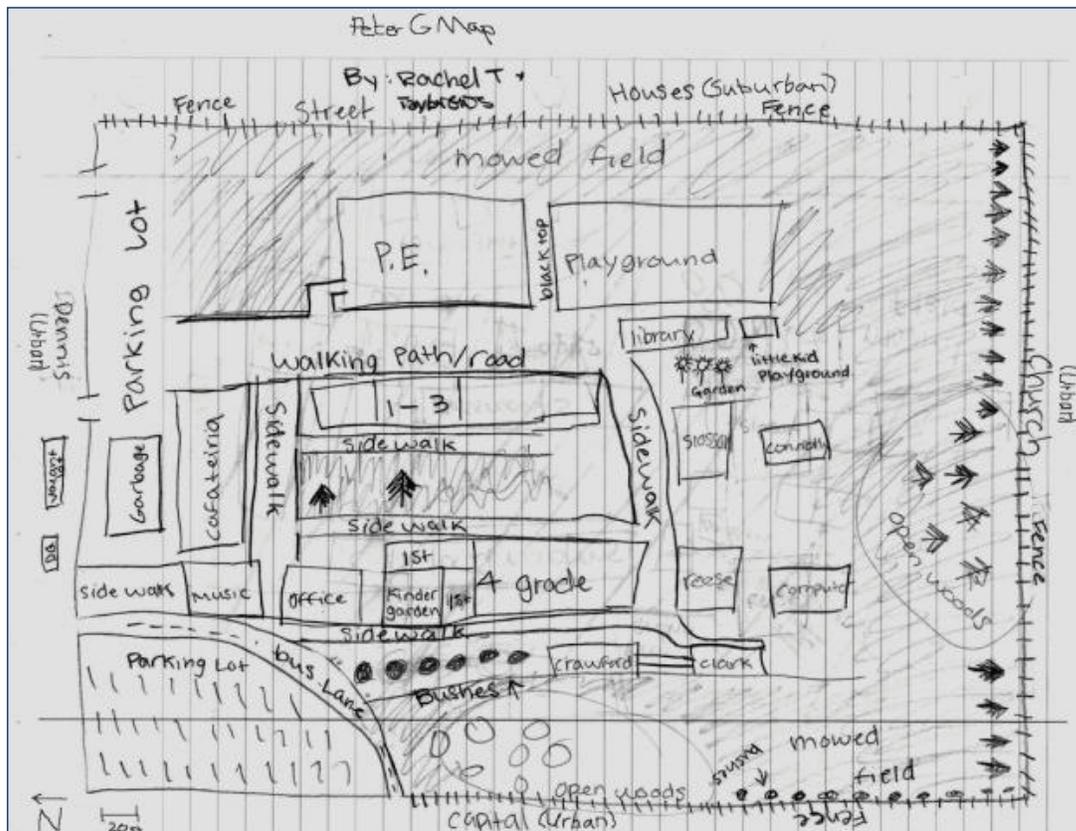
- A. Student partners or teams can create maps of the entire school grounds, working first to draw the main structures, boundaries, etc. and then adding details/descriptions of the various habitat/land types using the Suggested Classification of Habitat/Land Types list.

As students create or enhance their maps, be sure they draw and label both natural and man-made features, while also labeling the habitat/land types of each area, if desired. Also remind students to include a title, an approximate scale (if desired) and the North arrow (↑N).

This can be an involved process, but can be connected with lessons related to understanding maps, legends, keys, etc. and will allow all students to explore the entire school site.

Once students have mapped the school campus, a master map (a large map drawn on butcher paper) can be created, incorporating information from all of the students.

#### Example of Student-Created Map:



B. The school site can be divided into sections, with different student pairs/teams assigned to each section. Students can add and label features such as trees and bushes, fill in the habitat types, and add other details.

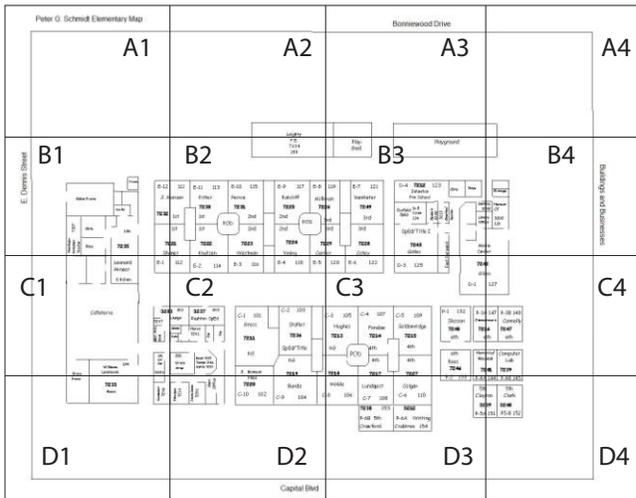
An easy way to create a large master map is to project a copy of the map typically given to substitutes by the school secretary onto a large piece of butcher paper or pieces of butcher paper taped together. (If not using a school site, outline maps of areas can sometimes be located on the Internet.)

Once the master map is created, lines can be drawn to divide it into sections, and it can be cut and distributed to each student team.

**Example:**

**Suggested Classification of Habitat/Land Types:**

- |  |  |
|--|--|
| Grass/meadow – maintained (mowed)                  | Sand/beach   |
| Grass/meadow/shrub – not maintained (“wild”)       | Agriculture/Farms                                      |
| Savannah/wooded grassland – mixed trees and grass  | Developed – Suburban (houses, some green space)        |
| Forest – mostly coniferous (needles)               | Developed – Urban (in the city, little/no green space) |
| Forest – mostly deciduous (leaves)                 | Water – large pond, lake or ocean                      |
| Forest – even mix of both coniferous and deciduous | Other (be sure to describe)                            |
| Wetland/marsh                                      |  |



**Note:** It can be helpful to label each section using numbers, codes or letters to ensure ease of re-assembly.



## Section 3

### Conducting the Biodiversity Investigation

Teachers can work with students to determine the question or give them the investigation question.

#### Step 1: Vegetation Survey

During this step, students will look at the vegetation of the school grounds to determine the potential (possible) plant biodiversity.

\*Discussions and activities related to plant identification can be helpful. While students do not need to know the names of plants, the ability to look at certain characteristics of plants to determine differences can be helpful.

#### Investigation Process

(For student instruction sheets, see Appendix C.)

1. Work with students to look at the master map to determine the area or areas of your school grounds they will observe.

For a descriptive study, the students may divide up the entire school grounds and each team can collect data in different sections.

For a comparative investigation, the students should choose two sites that they think have the greatest potential biodiversity.

2. Explain the study site (or plot) size and shape for each area to the students. Square plots are recommended, but the size will vary depending upon the school site and the type of study/ investigation being conducted. If comparing two sites, the plots should be the same size. Students can measure plots by using paces, pre-measured string or tape measures. To designate each plot, pencils or wooden stakes with ribbon or flagging tape tied to one end can be used to mark each of the 4 corners.

[Note: If you plan to compare the school site to other locations, you may want to keep in mind that 1/10th an acre would be a square plot with 66' sides. While this can be too large an area for students to work with, it can be used to inform an appropriate plot size.]

3. Before the students leave the classroom:
  - a. Take the students through the data collection process using the Alien Habitat and Key (See Appendix E) while in the classroom. It can be helpful to have students actually fill out a data sheet. To conserve paper, this step can be done in small groups. (Note: The Vegetation Survey is much easier to complete outdoors when students first practice and understand how to fill out the boxes, etc.)
  - b. Once students are comfortable filling out the data sheets, provide them with fresh/clean copies and have them fill out the basic information at the top of the data sheet, including name, school,



date, the investigation question, their prediction/hypothesis (if desired), the site location (where it is on the school grounds), and plot size (if needed).

4. Outside, students can record the current weather by entering the temperature and circling the proper descriptions on the data sheet. (If each student team takes a thermometer with them, it should remain in the study area/outside for at least 5 minutes before reading. Determine with the class where the thermometer should be placed – such as on the ground, hung from a tree or held by a student.)
5. Students should create their plots as instructed. If surveying the entire school grounds, plots should not overlap and gaps between plots should not exist.
6. Once plots are established, students should document the number of different types of plants and total numbers of plants (estimating the grass coverage within the plot area) on their data sheets using tally marks.
7. Students return to classroom upon completion of data collection.

## **Step 2: Schoolyard Biodiversity Wildlife Survey**

During this step, students will look for wildlife and/or signs of wildlife on the school grounds, typically within the same plots that were established to study plant biodiversity. The variety (different types) and abundance (amount) of wildlife also affect area's biodiversity.

### **Before going outside:**

- \* Discussions and activities related to animal identification can be helpful. While students do not need to know the names of animals, the knowledge of field marks or ways to look for animal signs can be helpful.
- \* Practice using the data collection sheet.
- \* Work with your students on proper way to observe wildlife – quietly and calmly. The less they make their presence known, the more likely they are to see live critters!

## **Investigation Process**

(For student instruction sheets, see Appendix D.)

1. If students have completed a habitat survey, they will return to the same area observed for that survey. (If students are conducting the wildlife survey first, see steps a and b below.)
  - a. First, work with students to look at the map to determine the area or areas of the school grounds they will observe. Students may choose two sites that may have the greatest potential biodiversity, one area with a high potential and one with a low potential, or a random site (if every team in the class is observing an area).
  - b. Establish the size of the study area. If comparing two sites, they should be the same size. Students can measure plots by using paces, pre-measured string or tape measures. To designate each plot, pencils or wooden stakes with ribbon or flagging tape tied to one end can be used to mark each of the 4 corners.



[Note: If you plan to compare the school site to other locations, you may want to keep in mind that 1/10th an acre would be a square plot with 66' sides. While this can be too large an area for students to work with, it can be used to inform an appropriate plot size.]

2. Before students leave the classroom, they should fill out the basic information at the top of the data sheet, including name, school, site location (where it is on the school grounds), date, and survey beginning time, length of stationary wildlife observation and number of observations the students should conduct.
  - \* Students should also determine the location(s) where they will make their stationary observation(s), marking the location(s) on the master map, if desired.
3. Once outside, students will QUIETLY and CALMLY walk to their sites, find their stationary observation location and sit down (if the ground is wet, trash bags or student-made sit-upons can be used as seats).
4. Students then record the current weather and temperature. (If taking a thermometer out, they should wait at least 5 minutes before reading it. Determine with your class where the thermometer should be placed – such as on the ground or held by a student.)
5. While sitting, students conduct the first (or only) observation for the designated length of time. As wildlife observations are made, students record findings on the data sheet.
6. Once the (first) stationary observation is complete, students continue to stay QUIET and CALM while moving to a second location within the site, if needed. As second and/or third stationary observations are conducted, students will continue to add to their data sheets.
7. After stationary observations are completed, students may QUIETLY and CALMLY (remind them that other students may still be conducting stationary observations) move around the site, looking for other animals or signs of animals. Students use the second page of the Schoolyard Biodiversity Wildlife Study data sheet to record their findings. (See Student Instruction Sheet for Wildlife Study, Appendix D.)
8. Students return to classroom upon completion of data collection.



# Appendix A

## Biological Diversity – Preventing Complete Loss of Habitat Due to Disease\*

### From How It Stops Disease From Spreading written by Kathy Paris

(<http://www.accessexcellence.com/AE/ATG/data/released/0534-KathyParis/index.php>)

(\*Modified from original activity by Erica Baker )

In this simulation, one set of cards represents the monoculture (the opposite of diversity) of a developed area. In this case, Douglas-fir trees were planted in a “green-belt” (open area where buildings are not built) of a constructed neighborhood in which all of the original trees and plants were cut down before construction. A disease hits one of the Douglas-fir trees and because of the proximity of the other Douglas-fir trees, disease spreads quickly. The other set of cards represents a biological diverse community – a neighborhood in which a builder planted a mixture of native trees (including Douglas-fir, Sitka Spruce, and Western Hemlock, Western Red Cedar) in the “green belt.” In this scenario, the Douglas-fir gets a disease, but the other native trees do not die. As a result, the majority of the habitat still exists. (Note: for North-Eastern Washington, the native trees would be Douglas-fir, Western Larch, Ponderosa Pine, and Lodgepole Pine.)

\* Printable cards (with photos and general information) are available from the Washington Native Plant Society’s website: [http://www.wnps.org/education/resources/plantid\\_cn.html](http://www.wnps.org/education/resources/plantid_cn.html)

\* To preserve cards, laminate them and give each student a sticky note (or ½ a sticky note) to put on the back of the card, or have the students use erasable markers.

### Simulation 1: The First Set of Cards:

1. Give each student a Douglas-fir card – face down so that they do not know they all have the same tree species.
2. Pass out sticky notes and ask each student to place one sticky note on the back of the card. (If it is a larger sticky note, the students can draw a line to divide it in half – using the 1st half for the 1st simulation and the 2nd half for the 2nd simulation.)
3. Each person is to find 4 (or appropriate number based on class size) other people who have the same tree and have them write their names on the sticky note on the back of card.
4. All are to return to their seats and remain standing after they get 4 signatures
5. The teacher introduces the term “monoculture” and explains that this forest/habitat is a monoculture – a region with only one type of plant variety/species.
6. The teacher symbolizes the disease and touches one of the students. Ask that person to sit down (they have been infected and are now dead) and then read names on his/her card. As the names are read, those students sit too since they have been “infected.”
7. Then ask another one of those sitting (dead) to read the names on his/her card- continue until all (or almost all) are sitting.



8. Ask them to explain why the disease spread so fast (they are so alike genetically; lack of diversity).

## **Simulation 2: The Second Set of Cards:**

1. Collect the monoculture Douglas-fir forest cards and then pass out a mix of other cards (have students keep sticky notes, if needed) – again face down.

For Western Washington Forests you can use Maple (vine or big-leaf), Sitka Spruce, Western Hemlock, Western Red Cedar and ALSO some Douglas-fir cards. For Eastern Washington (intermountain region), the native trees would be Maple (Douglas maple), Western Larch, Ponderosa Pine, Lodgepole Pine, and ALSO some Douglas-fir cards.

2. Pass out sticky notes and ask each student to place one sticky note on the back of the card or to transfer the sticky note from simulation 1 to the back of the second card.
3. Explain that in some forests (and even neighborhoods) there are a variety of trees. These habitats have a greater biodiversity.
4. Repeat steps 2-6 above. This time only those students that are the same variety as the diseased tree (Douglas-fir) that touched them will sit. Different variety trees don't sit (don't die) even if they are sitting near the diseased tree.
5. Many of the students will remain standing (didn't die).
6. Ask students to explain why the disease didn't spread and damage/destroy the entire forest this time (genetic or biological diversity)

## **Follow-Up Questions**

**For discussion or journal entries/discussion after the second simulation.**

1. What does biological diversity mean?
2. What is a monoculture?
3. Why didn't all the different trees get the disease? (hint - genetics)
4. In which forest would you need to use more chemicals to control disease: the Douglas fir forest or the more varied forest? Why?
5. Which forest would have more diversity of wildlife? Why?
6. If you cut down a forest that has a variety of trees and replanted with 1 type of tree:
  - a. What will happen to much of the wildlife that was adapted to that prior forest? (Hint: they can always just move elsewhere. If other habitats are good, they will probably be near carrying capacity already. In other words, the surrounding areas may already have good-sized populations growing in them.)
  - b. Will this happen to all the wildlife? Explain.
7. Growing one plant, as is the case of growing only Douglas-fir, is called monoculture. Besides in neighborhoods, where else might we find monocultures?



# **Appendix B**

## **Master List of Biodiversity Investigation Materials**

Pencils

Colored Pencils

Campus Maps

Plain paper for student-created maps

Large butcher paper and copy of school map for large, cut-up map

Schoolyard Biodiversity Data Sheets

(1 set for investigation, extra copies for practice, as needed)

Vegetation Survey Data Sheet

Wildlife Survey Data Sheet

Alien Planet Habitat and Key (1 set per pair of students)

Clipboards

Tape measures

Stopwatches/timers

Thermometers



# Appendix C

## Student Instructions for Vegetation Survey

### Materials

Pre-measured rope or tape measure

“Flagged sticks” (sticks or pencils with flagging tape tied on top) – 4 per plot

Clipboard

Student Instructions for Vegetation Survey (this paper)

Schoolyard Biodiversity Investigation – Vegetation Survey – Data collection sheet

Invasive Plant Identification Cards

### Instructions

#### INSIDE:

1. Work with your teacher and classmates to look at the campus map and decide where your team’s plot will be located.
2. After learning how to fill out the Schoolyard Biodiversity Investigation – Vegetation Survey data collection sheet, collect the other materials listed above from your teacher.
3. Calmly and quietly walk outside with your class.

#### OUTSIDE:

4. Locate the area for your plot. Place one flagged stick in the ground, flagged end up.
5. Stretch out the pre-measured rope or tape measure (using the designated plot size) from the stick. Place another flagged stick in the ground at the other end of the rope. \*PAY ATTENTION – be sure you are marking off the proper area.
6. Continue using the rope and sticks to measure off a box. This is your plot study area.
7. Now search the area for grass. Be sure to tally the Different Species of grass, if you find more than one, and estimate the percentage of the plot covered by grass. (It can help to think of the area as a grid divided into 4 smaller squares and each square is 25%.)
8. After writing down grasses, look for flowers. Are there any invasive flowers? If so, mark each type in the Tally of Different Species column and tally the total number of all invasive flowers in the Tally of All Plants Found section.
9. Now do the same for native and non-native flowers.
10. Repeat steps 8 and 9 for Thick Ground Cover, Thick Brush and Bushes, Loosely Spread Out Shrubs or Bushes, Trees, and Fungus, Mosses or Lichens.  
\*BE SURE to tally different species as well as the total number of all plants found for each plant section.
11. Let your teacher know when you are finished.



## Schoolyard Biodiversity Investigation – Vegetation Survey

Name \_\_\_\_\_ School \_\_\_\_\_ Date \_\_\_\_\_

Question \_\_\_\_\_

Hypothesis/Prediction \_\_\_\_\_

Site Location \_\_\_\_\_ Plot Size (if needed) \_\_\_\_\_

Current Weather

Circle all that apply:

Temperature \_\_\_\_\_ °F or °C      Clear      Scattered Clouds      Complete Cloud Cover  
 Rain      Wind: calm breezy gusty

Item/Type	Description	TALLY of <u>DIFFERENT</u> <u>SPECIES</u> of Plants	<u>TALLY of ALL Plants Found</u> <u>or Percentage of Area Covered</u>			
			Less Than 50 (COUNT AND GIVE A NUMBER)	Between 51 and 100 (GIVE AN ESTIMATE)	More than 101 (GIVE AN ESTIMATE)	Percentage of Coverage (WHEN TOO MANY TO COUNT)
*If none, X through and skip to the next Item/Type.						
Grass	Mowed lawn/grass					
	Meadow or tall grass (not mowed)					
Flowers (annuals or perennials: <u>not</u> bushes or trees)						
Thick Ground Cover (outer edges less than 12” <u>apart</u> and less than 12” tall)						



Item/Type	Description	TALLY of DIFFERENT SPECIES of Plants	TALLY of ALL Plants Found or Percentage of Area Covered			
			Less Than 50 (COUNT AND GIVE A NUMBER)	Between 51 and 100 (GIVE AN ESTIMATE)	More than 101 (GIVE AN ESTIMATE)	Percentage of Coverage (WHEN TOO MANY TO COUNT)
*If none, X through and skip to the next Item/Type.						
Thick Brush and Bushes (outer edges less than 12” <u>apart</u> , more than 12” tall)						
Loosely spread out shrubs or bushes (outer edges more than 12 inches apart)						
Trees (spread out/not close together; planted in separate areas, etc.)						
Wooded Area (Forest; trees growing in a group/close together)						
Fungus, Mosses or Lichens						



# Appendix D

## Student Instructions for Wildlife Survey

### \* Remember: If you want to see and hear wildlife, BE STILL AND QUIET!

1. Once you are outside, QUIETLY and CALMLY walk to your Stationary Observation location and sit down.
2. Record the current weather. If necessary, wait 5 minutes before recording the temperature. (Remember to place the thermometer where your class determined.)
3. While sitting, set your timer for the Stationary Observation time. Start the timer and begin making observations, recording your findings on the front page of your Schoolyard Biodiversity Wildlife Survey data sheet.

### Every time you see or hear a species of animal:

#### ON SITE (within the boundaries of the plot):

- If it is the first time you have seen or heard this animal, place a tally mark in the column labeled TOTAL Number of DIFFERENT SPECIES of Animals ON SITE.
- Then place a tally in the correct ON SITE column under the TOTAL Number of ALL Animals for that first animal seen or heard.

#### OFF SITE (outside the boundaries of the plot):

- DO NOT place a tally in the left-hand column labeled TOTAL Number of DIFFERENT SPECIES of Animals ON SITE.
- DO Place a tally in the correct OFF SITE column under the TOTAL Number of ALL Animals for that animal seen or heard.
- \* HANGING OUT: An animal is considered hanging out if it is sitting, standing or crawling/slithering/running but generally staying in an area.
- \* PASSING THROUGH: An animal is considered passing through if it is flying over or moving so far away it disappears into the distance.

4. Once your (first) stationary observation is complete, stay QUIET and CALM and complete the total number of stationary observations listed on your sheet.
5. You may now walk QUIETLY and CALMLY around the site, looking for other animals or signs of animals. Be sure to describe your findings with enough detail that you will be able to write about them later.

\* REMEMBER: Other students may still be conducting stationary observations. DO NOT DISTURB other groups.

\* Don't just look down at the ground. Look up in the trees, behind bushes and even under rocks. Just remember – you're messing with somebody's home!



- \* ALWAYS be gentle and put things back the way you found them. (DO NOT completely lift large rocks. You may roll them up and look below IF it is OK with your teacher. When placing a rock back down and there are insects or other animals in its space, put a small rock towards the edge of the space and lower the larger rock down on it gently. This will ensure animals have room to move and not get squished!)
- \* Accurately record where you find evidence of wildlife (on or off site) by placing a tally mark in the proper column each time you find something different. For example:
  - An on-going trail of the same-sized animal tracks = one tally mark
  - More than one cluster of animal tracks or trails of animal tracks of different sizes = more than one tally mark (each cluster or different size of track = one tally mark)
  - The remains of an animal (including bones); a cluster of feathers or tuft of fur; or something similar = one tally mark each
  - A clump of scat = one tally mark
  - If you find something that is not on the data table, such scratches on trees or a deer rut, thoroughly describe it in the Other section.

6. Once you have completed the wildlife survey, return to your classroom.



## Schoolyard Biodiversity Wildlife Survey

Student Name \_\_\_\_\_ Date \_\_\_\_\_

Name of School \_\_\_\_\_ Site Location \_\_\_\_\_

Question \_\_\_\_\_

Hypothesis \_\_\_\_\_

Survey Timing      Beginning Time \_\_\_\_\_ am/pm      Ending Time \_\_\_ am/pm

Stationary Observation(s) \_\_\_\_\_ min.      Number of Times to Sit/Observe \_\_\_\_\_

Current Weather      Temperature \_\_\_\_\_

(circle all that apply)

Clear      Scattered Clouds      Complete Cloud Cover      Rain      Wind: calm breezy gusty

Wildlife Seen or Heard	<u>TOTAL</u> Number of <u>DIFFERENT SPECIES</u> of Animals <u>ON SITE</u>	<u>TOTAL</u> Number of <u>ALL</u> Animals Seen or Heard:			
		On SITE		Off SITE	
		Hanging Out	Passing Through	Hanging Out	Passing Through
Birds					
Mammals					
Reptiles or Amphibians					
Insects or Spiders					



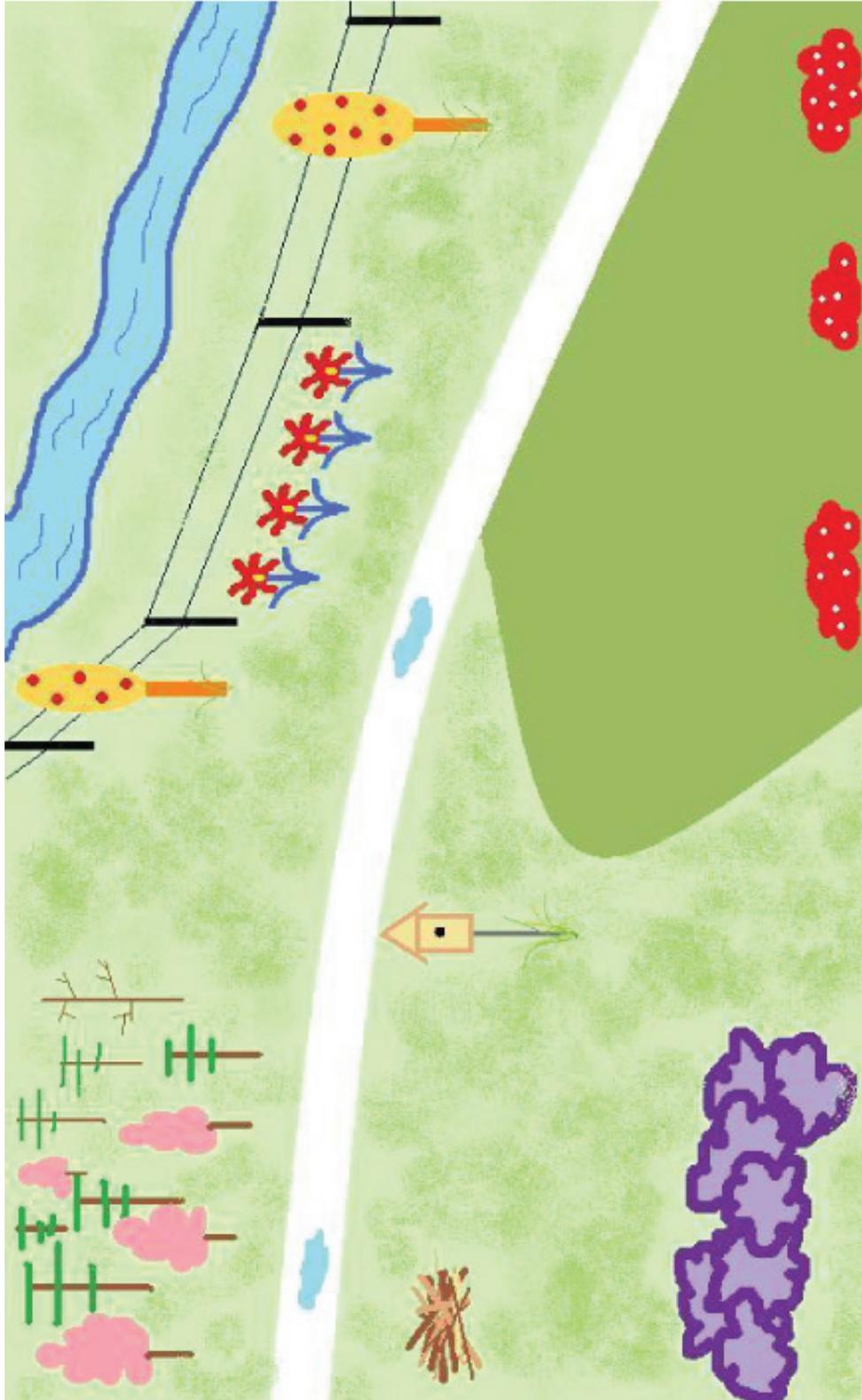
### Schoolyard Biodiversity Wildlife Survey – Continued

Evidence of Wildlife	Description (What does it look like? Where exactly was it found?)	Total Number	
		Found On Site	Seen Off Site
Scat			
Tracks			
Feathers			
Fur			
Nests			
Chewed Food			
Other (bones, scratches, ruts, etc.)			

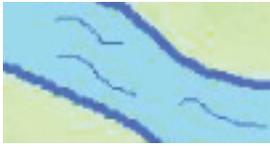
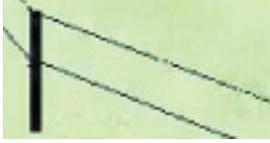


# Appendix E

## Alien Planet Habitat



## Alien Planet Habitat Key

Object	Brief Description	Object	Brief Description
	<p><b>Cotton Candy Tree</b></p> <p>This tree is a deciduous tree (loses its leaves in the fall/winter). It grows up to 50 feet in height.</p>		<p><b>Mowed Tuff Tuff Grass</b></p> <p>This is the type of grass preferred for lawns and playgrounds. It is chemical resistant and grows in dense, tough mats.</p>
	<p><b>Dead Cotton Candy Tree (Snag)</b></p>		<p><b>Wild Monkey Grasses – Not Mowed</b></p> <p>This wild grass is frequently found in open areas. It can grow up to 12 inches tall.</p>
	<p><b>Telephone Pole Tree</b></p> <p>This coniferous tree (has cones) is a native to only one area of the planet. It can grow as tall as 80 feet when the conditions are right.</p>		<p><b>Ripple Creek</b></p> <p>This creek flows year-round and feeds into the Big Ol' River.</p>
	<p><b>Funkyfruit Tree</b></p> <p>The funkyfruit tree blooms in the winter and bears fruit in the spring. It resembles a lollipop when it is a young tree and can grow to heights of 100 feet or more.</p>		<p><b>Puddle</b></p> <p>This puddle is a result of last night's heavy rain.</p>
	<p><b>Purple People Eater Bush</b></p> <p>Tourists beware! This carnivorous bush grows from 1 to 4 feet high and can remove a person's finger or toe with ease. And we thought stinging nettles were bad!</p>		<p><b>Brush Pile</b></p> <p>This is a pile of branches that were collected from a storm last year.</p>
	<p><b>Little Berry Bush</b></p> <p>This bush provides a tasty berry for native wildlife. Its roots give off a chemical that prevent most other plants from growing within 1 or 2 feet of it.</p>		<p><b>Sidewalk</b></p>
	<p><b>Ruby Butterfly Flower</b></p> <p>This flower's distinctive scent can be smelled up to 100 feet away. As a rich nectar source, it is a favorite flower for numerous birds and insects.</p>		<p><b>Fence</b></p>
	<p><b>Nest Box</b></p>	<p><b>*Assume plants are native or non-native unless the description says otherwise.</b></p>	



November 27

**It's early.** Like, birds-aren't-even-chirping-yet early. But the way the grass crunches under my feet in this frost almost makes 7 a.m. bearable.

**Using the GPS device** to tell our group we're exactly 2,912 ft. above sea level definitely makes it worth it. We hike north with our instructor - I announce our exact longitude and latitude - into deep forest. Signs are all around us. Signs, the instructor says, of cougars. We all laugh nervously. Everyone works together.

**We collect evidence - cougar evidence - that we'll use in our classroom labs over the next few weeks.**

We're not only learning how cougars hunt and live and survive, but we're actually using math and science to figure it all out.

**Best of all, my work could actually help make a difference for the cougars.**