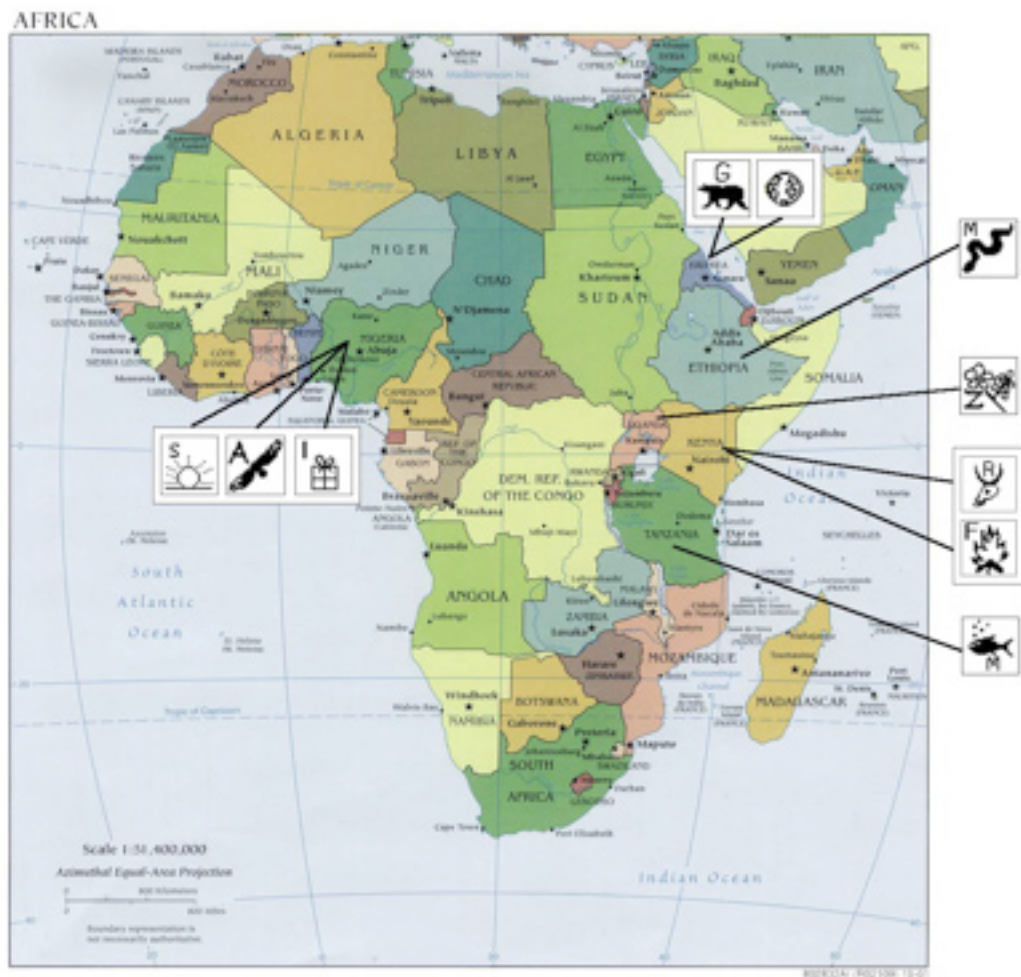


Lesson 1: What Types of Habitats Are Found In My Schoolyard?

Your team of biologists will be going into the schoolyard to collect information about the animals seen there and where they live. As a team, look at the map below and the tracker descriptions on the following page. Choose one of the trackers for your team name.

The members of my team are:











Our team name is:



Credits:

Map produced by the U.S. Central Intelligence Agency, used courtesy of The General Libraries, The University of Texas at Austin. http://www.lib.utexas.edu/maps/africa/africa_pol01.jpg

Tracker Names

- I**  **Isoke** [pronunciation: ih-so-key] is a tracker from Nigeria. Her name means “a beautiful gift,” so her icon is a wrapped present.
- F**  **Faraji** [fuh-rah-jee] is from Kenya. His name in Swahili means “consolation.” His icon is a fire because his father says he has such a fiery spirit.
- R**  **Rakanja** [ruh-kahn-juh] is also from Kenya. Her icon is an antelope skull because she found one of these once and keeps it as a special treasure.
- S**  **Sanjo** [sahn-joe] lives in Nigeria. Among the Yoruba people her name means “one who appreciates her past.” Her icon is a sunrise.
- A**  **Aren** [air-en] is also from Nigeria. His name means eagle so that is his icon.
- Z**  **Zahra** [zah-rah] is from Uganda. Her name means “flower” in Swahili, therefore she chose a flower for her icon.
- M**  **Miniya** [min-ee-yuh] is from Ethiopia. Her icon is a snake because as a child she was bitten by a snake. She survived and became an expert tracker.
- A**  **Alem** [ah-lem] is a tracker from Eritrea, neighbor to Ethiopia. His name means “world,” so his icon is the earth.
- G**  **Ghe’le** [jeh-lay] is Alem’s younger brother. The very strong bear is his icon because his name means “strength.”
- M**  **Mkali** [muh-kah-lee] is from Tanzania. She chose a fish to be her icon because she loves to go fishing and she loves to eat fish.

Name information came from the following web sites:

<http://www.heptune.com/names/afriname.html>

<http://www.swagga.com/name.htm>

http://www.parenthoodweb.com/parent_cfmfiles/babynames.cfm

Habitat Mapping

While outside today your team will be doing two things. 1) Use the following list of habitats to label the habitats in your zone of the schoolyard map. Some habitats may not exist in your schoolyard and others, such as “in the air”, exist throughout so do not need to be included. 2) After you have completed your map, collect some invertebrates for closer observation in the classroom.



bare ground



in the soil



short grass



tall grass



leaf litter or mulch



bushes



under something



in the air



single tree



trees together

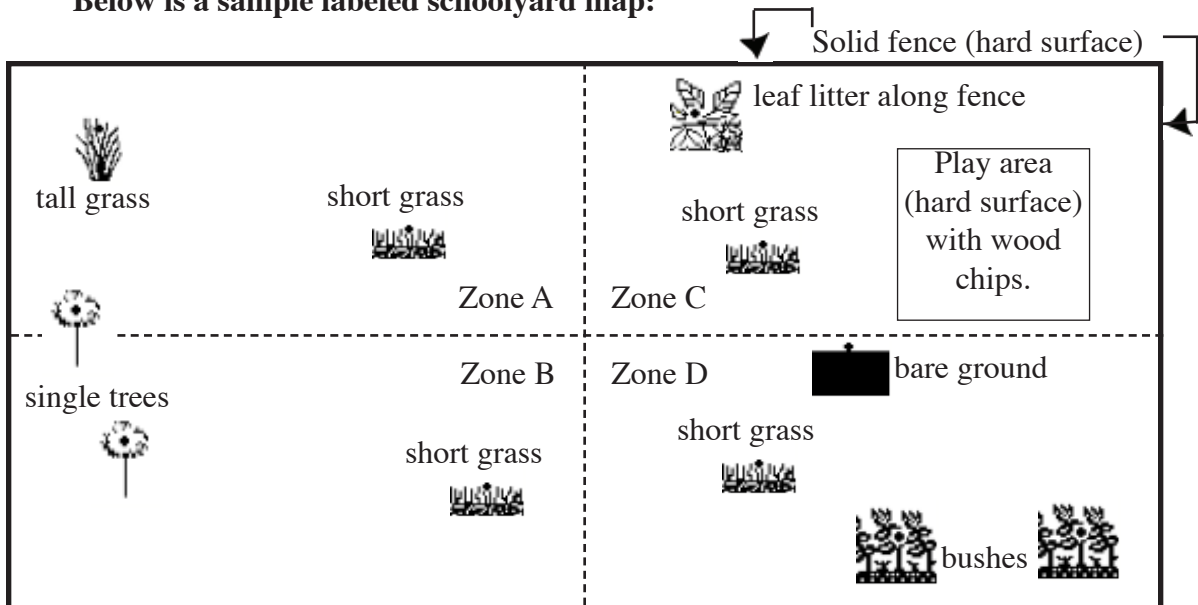


in water



near water

Below is a sample labeled schoolyard map:





Invertebrate Collection Data Sheet

Name: _____ Team Name: _____

Invertebrate means the animal is “not a vertebrate.” In other words, it does not have an internal skeleton. There are no characteristics that unite all invertebrates, just the absence of a backbone. Most species of animals are invertebrates.

Each biologist may decide to focus his/her research on just one type of animal. There are so many kinds of invertebrates in the world. Even within Michigan there are many that have never been seen, identified or named! Over 90% of all invertebrates are less than two centimeters long.

**In the table below, take notes on any invertebrates that
you collect from your zone.**

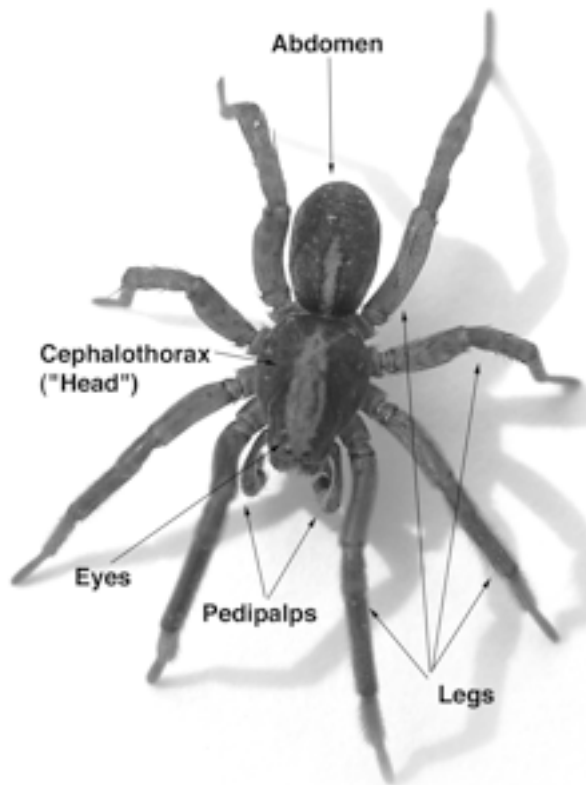
<u>Describe the animal.</u> Give details! Remember a name is not a complete description!	<u>In what type of habitat did you find the animal?</u>
<i>Example: A lot of small brown ants. They have thin bodies, six legs, and black eyes.</i>	<i>Example: At the base of the school building. On bare ground.</i>

Lesson 2:

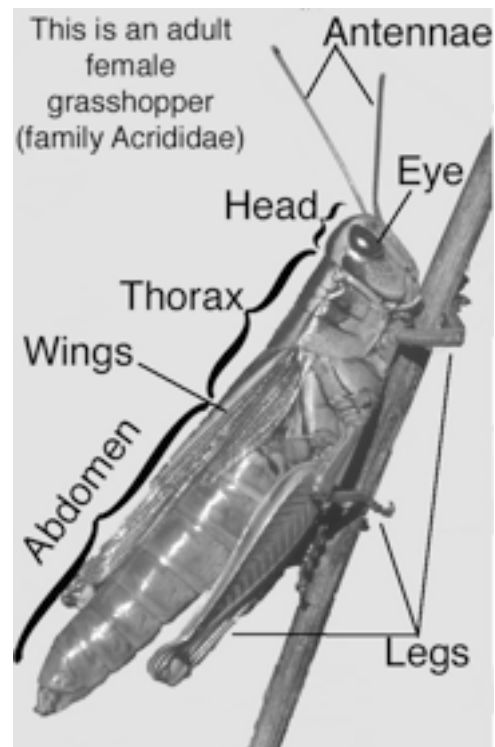
How do You Examine and Classify Invertebrates?

Working with your team, choose one invertebrate to observe carefully. Use a magnifying box or glass and microscope to answer the questions on the Invertebrate Observation Data Sheets. If you cannot tell, mark that answer with “*we cannot tell.*” Use the Invertebrate Identification Guide to help identify your animal at the end of the lesson.

Below are diagrams of an insect and an arachnid with the body parts labeled. Use these diagrams to help identify the body parts on your invertebrate.



Arachnid



Insect



Invertebrate Observation Data Sheet 1

Name: _____ Team Name: _____

Using a metric ruler, measure your invertebrate.

1. Measure the entire invertebrate

- How long is it? _____ mm
- How wide is it? _____ mm
- How high (tall) is it? _____ mm

If your invertebrate is longer than ten millimeters, use the magnifying box or glass to answer the rest of the questions. It may be necessary to use the microscope to answer some questions. If your invertebrate is shorter than ten millimeters, use the microscope.

2. Look more closely

- How many sections does it have? _____ sections
- How many legs? _____ legs
- How many antennae? _____ antennae
- How many wings? _____ wings
- How many eyes? _____ eyes
- What do the eyes look like? _____
What color? How big? What pattern?

3. Examine the body

- What color is the body? _____
- What is the body like? _____
Smooth? Fuzzy? Wrinkly? Does it have hairs? Plates?
- Does it have stripes or spots? No ☐ Yes ☐

If Yes, describe their color and shape:

4. Examine the legs (If there are no legs, continue to #5)

- How long are the legs? _____ mm
- What do they look like? _____
Fuzzy? Prickly? Smooth? Pinchers at the end? Claws?

Invertebrate Observation Data Sheet 2

5. Examine the antennae (If there are no antennae, continue to #6)

- How long are the antennae? _____ mm
- What do they look like? _____
Are they long and skinny? Short or thick?

6. Examine the wings (If there are no wings, continue to #7)

- How long are the wings? _____ mm
- What do they look like? _____
Are they clear? Do they have colors or patterns?

7. *Draw* your invertebrate here and *label* as many parts as you can.

Invertebrate Observation Data Sheet 3

Invertebrate Identification: There are many, many species of invertebrates. In Michigan alone there are at least 15,000 species, and around the world there are millions! No one knows for sure how many exist because most invertebrate species are not described or known by scientists. Since there are so many different kinds, it might be difficult for you to identify the exact species of each invertebrate you find. For example, you might find a little black and gray spider that jumps a lot and has two big eyes and six little ones. You can use the Invertebrate Identification Guide and figure out that it is a jumping spider. But which species? There are over 50 species of jumping spiders in southeastern Michigan, and the only way to identify them exactly is by detailed microscopic study! In this case, the best you can do is to say that your spider belongs to the group that contains all jumping spiders, the family Salticidae (pronounce it “sal-TISS-i-dee”). Your spider is a “salticid” (pronounced “sal-TISS-id”).

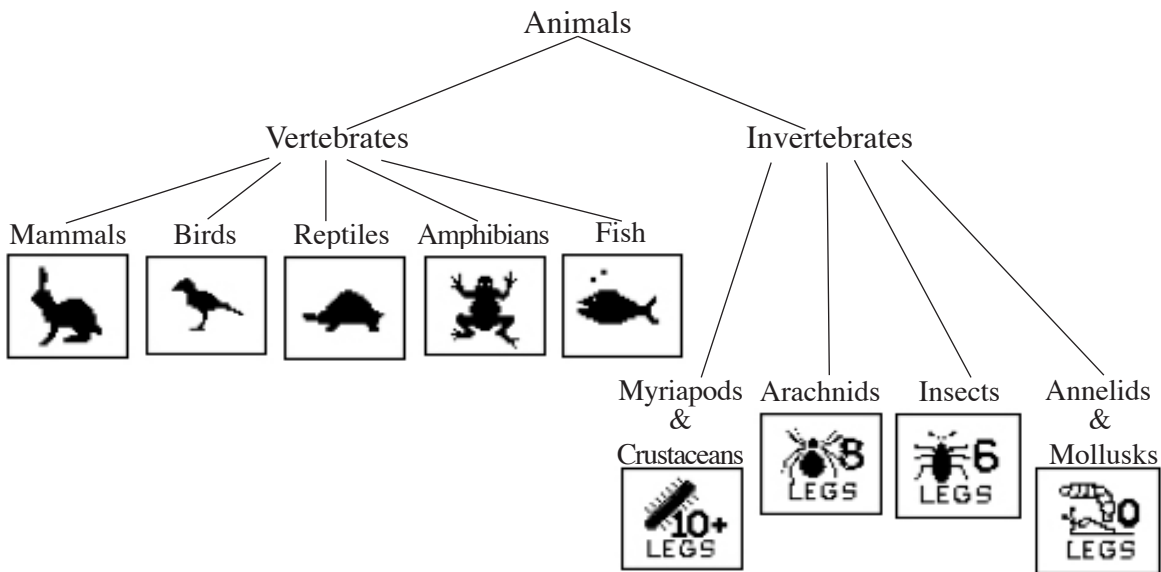
8. Using your observations and the Invertebrate Identification Guide, identify the type of invertebrate that you have found. Look on your *Invertebrate Collection Data Sheet*, to see the habitat where your invertebrate was found. Think about how the physical features that you have examined allow your invertebrate to live in this habitat.

My invertebrate is a(n) _____ and was found in _____.

Lesson 3: How Do You Group and Classify Animals?

Animal Classification Information

Scientists use systems to group and classify animals. They do this so they can communicate about the animals. Over time, scientists have used many different kinds of systems. Some systems are based on genetic history, some on appearance, and some systems are even based on size! The BioKIDS system is based on **physical features**.



All animals can be classified as either a vertebrate or invertebrate. **Vertebrates** all have a backbone, while **invertebrates** lack one.

BioKIDS uses nine **animal groups**. The five vertebrate animal groups include mammals, birds, reptiles, amphibians, and fish. In the Critter Catalog, invertebrates have been divided into the four groups: myriapods & crustaceans, arachnids, insects, and annelids & mollusks. This isn't exactly the same as how scientists classify animals. All species have characteristics that scientists can use to place them in one of the nine animal groups. This means that all species in an animal group share certain characteristics.

There are many, many species in each animal group.

A **species** is a kind of animal. All members of a species look very much alike and have the same way of life because they all had the same ancestors – they are related to each other. There may be small differences in how members of a species look or behave depending on where they live, but in most cases they are enough alike that they can **breed** with each other (make babies). For the most part, animals in one species cannot breed with animals of another species.



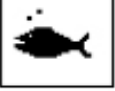








Animal Classification Data Sheet

Name: _____ Team Name: _____

Today we are going to identify the features that separate our nine groups.

1. Look at the animal drawings on the next three pages. For each animal group, identify at least two **physical features** that all three animals share.
2. Discuss these as a class and write them in the table below. This will be an important reference for future lessons.

Animal Group	Common Physical Features
 Mammals	
 Birds	
 Fish	
 Amphibians	
 Reptiles	
 Annelids & Mollusks	
 Insects	
 Arachnids	
 Myriapods & Crustaceans	

Animal Groups

Mammals



Birds

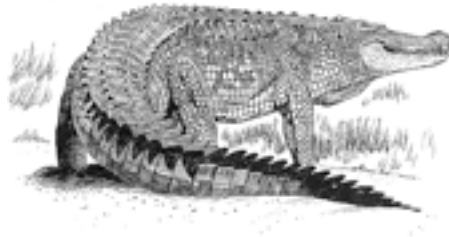
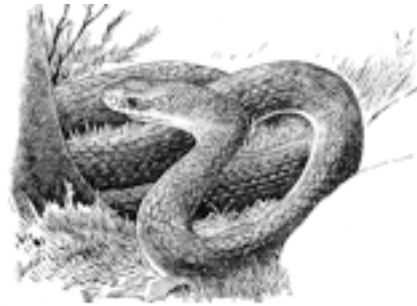
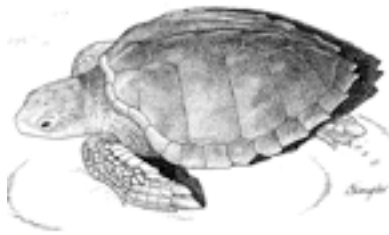


Fish



Animal Groups

Reptiles



Amphibians



Insects



Animal Groups

Annelids & Mollusks



Myriapods & Crustaceans



Arachnids





BioKIDS “Go Fish” Instruction Sheet

Name: _____ Team Name: _____

BioKIDS “Go Fish” Game

Practice using the characteristics of the groups to identify animals, by playing several rounds of the BioKIDS “Go Fish” game in groups of three or four. The rules of BioKIDS “Go Fish” are as follows:

- Shuffle the deck
- Deal out a hand of five cards to each player.
- Place the remainder of the cards in a face-down stack.
- The player to the left of the dealer starts.
- In each turn, the player asks any other player for a specific animal group. E.g. “Shanti, do you have any amphibians?”
- The player who asks must already have at least one card of the type being requested.
- If the player being asked (e.g., Shanti) has any of the requested cards (e.g., amphibians), they must hand over all cards of that type to the player who requested them.
- The player who made the original request then gets another turn to request an animal group from any player, providing they already hold one animal from the requested group.
- If the person asked does not have any cards of the named animal group, they say ‘Go fish!’
- The asker must then draw the top card of the un-dealt stack and the turn passes to the next player to the left.
- As soon as a player collects a complete set from an animal group (4 cards), this must be shown to the other players and placed face down in front of the player.
- The game continues until either someone has no cards left in their hand or the face down stack in the middle runs out.
- The winner is the player who has collected the most complete animal groups.

1. a. When playing “Go Fish”, which two animal groups were the most difficult to tell apart?

b. Why do you think you confused these two animal groups?



Animal Group Comparisons Data Sheet 1

Name: _____ Team Name: _____

All species in an animal group have certain features in common. That is why those species are grouped together. On an earlier worksheet, you wrote down some of those features. But sometimes animals in different groups also have things in common – frogs and dogs both have 4 legs, while snakes and worms don't have any legs. How can biologists tell groups apart?

Compare the animal groups below and find at least **two** differences that help you tell one animal group from the other. If you need more information, go to the computer and take a look at each Critter Catalog animal group page. The Critter Catalog website is: <http://www.biokids.umich.edu/critters/>

Insects vs. Arachnids		
Unique to Insects	Similar to both	Unique to Arachnids

Insects vs. Myriapods & Crustaceans		
Unique to Insects	Similar to both	Unique to Myriapods & Crustaceans

Insects vs. Annelids & Mollusks		
Unique to Insects	Similar to both	Unique to Annelids & Mollusks

Animal Group Comparisons Data Sheet 2

Fish vs. Amphibians		
Unique to Fish	Similar to both	Unique to Amphibians

Mammals vs. Birds		
Unique to Mammals	Similar to both	Unique to Birds

Reptiles vs. Amphibians		
Unique to Reptiles	Similar to both	Unique to Amphibians

Mammals vs. Arachnids		
Unique to Mammals	Similar to both	Unique to Arachnids

Birds vs. Reptiles		
Unique to Birds	Similar to both	Unique to Reptiles

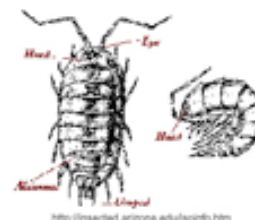


Mystery Animal Data Sheet

Name: _____ Team Name: _____

Sometimes biologists get phone calls or emails from people asking them to identify an animal. How would you respond if you got the following description?

Harry found a small animal in his yard. As shown below, it has a hard shell, many body parts, and lots of legs – he counted 14 of them. Harry wondered if it was an insect.



Scientific Question:
Is this animal an insect?

← **What is the main science concept covered in this question?** _____

Scientific Explanation:

Claim:

Hint:

A claim is a complete sentence that answers the question.

Evidence:

Hint:

Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.

Reasoning:

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence:
Therefore,

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

Lesson 1: How do I Track Animals in My Schoolyard?

When outside, biologists collect data on what animals they see and how many of each kind they see. There are many methods of recording this data, from paper and pencil to sophisticated computers.

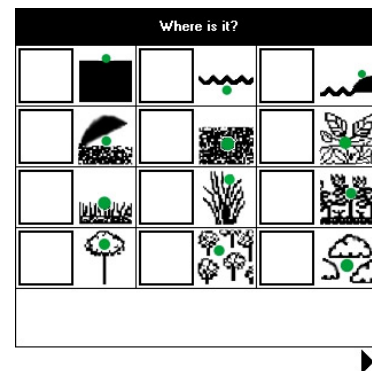
What is CyberTracker?

CyberTracker is a program developed for professional animal trackers in African animal reserves. CyberTracker runs on hand-held computers, such as Palm Pilot or a Handspring Visor. These hand-held computers are sometimes called Personal Digital Assistants, or PDA for short. The version used in BioKIDS has been changed to include Michigan animals you might see in your schoolyard. We will be using it in the schoolyard for a fast and accurate way to record animal sightings and signs.

1. Using the photos provided, enter data into your PDA. If you need help, there are instructions starting on the next page. Below are three tips to help you get started.

Three CyberTracker Rules to Remember

1. Pressing and holding on any icon on a screen shows what the icon means (it's name)
2. Right arrow ► advances to next screen
3. Down arrow ▼ (see figure to right) leads to more information





2. After using the program, describe the benefits of using CyberTracker on the PDA instead of paper to log animal data.

CyberTracker Instructions


The next four pages explain how to use the CyberTracker program on the PDA. Once you get the basic idea, it's easy to use!

1. Turn on the Personal Digital Assistant (PDA).
2. Tap on the Home icon (bottom left side of the screen) to see all the programs on your PDA. (Tap means use the pen to touch the screen.) If you don't see CyberTracker right away, switch to the "All" view.
3. Tap on the CyberTracker icon to start up the program.
4. The following steps you have to do **only ONCE per field session**.




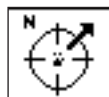
Class ID: Tap on the "BIOKIDS #" icon, then tap on the  arrow near the bottom of the screen. Enter your class ID (your teacher will tell you the number). You will need to tap on the digits in order, like with a calculator. If you make a mistake, tap on "<" to erase the wrong digits. When your number is entered correctly, tap on  to save your data.



Tracker Name: Tap on the N icon, then on the  arrow near the bottom. You will see the list of tracker names. Tap and hold any icon to see the name if you don't recognize the icons, or refer back to where you chose your team name for a reminder.

When you are doing training sessions inside, choose "T" for test. When you are collecting data, select your team's tracker name. (The tracker names are explained in Activity 1.)

(From now on, we will leave out the part about tapping on the .)



Zone: Your team has been assigned to work in a specific schoolyard zone. Select the zone from this list.




You may have already noticed that you can see your choices in the history bar at the top of the PDA screen. Check this to make sure your class ID, tracker name, and zone are correct.

5. The following steps you will do **for EACH entry** you make.








a) **Begin**

Tap on the “Begin” icon.

How do you sense it?	
<input type="checkbox"/>	See 
<input type="checkbox"/>	Hear 
<input type="checkbox"/>	Smell 

b) **Sighting Method**

Choose a sighting method: *See, Hear, Smell*. Mark how you are sensing the animal or its sign. You can select one, two or all three of these options, depending on how you observe the animal. (For example, you might smell a skunk but not see it.)










What do you sense?	
<input type="checkbox"/>	Live animal 
<input type="checkbox"/>	Track 
<input type="checkbox"/>	Carcass 
<input type="checkbox"/>	Scat 
<input type="checkbox"/>	Sign 

c) **Sighting Type**

Choose a sighting type: *live animal, track, carcass, scat or sign*. Indicate exactly what you are sensing. You can select one or more of these options. Scroll down to see the scat and sign options.

d) **Animal Group**

Choose the animal group that is appropriate for your animal.

What animal group is it in?				
				
				
20+ LEGS	6 LEGS	3 LEGS	10+ LEGS	

Your choices here are: *annelids & mollusks, insects, arachnids, myriapods & crustaceans, birds, mammals, amphibians, reptiles or fish*.

e) **Animal Name**

Use the Invertebrate, Vertebrate Identification Guides and Track & Sign Guide to help you identify the organisms.

For each Animal group, you work through one or more screens before you get to a list of animal names. Each list includes “other” and “unknown” as options. Use “other” when you are sure it is not on the list and “unknown” when you’re not sure what the animal is.

Note about **invertebrates**: Because there are so many invertebrates in the world and in your schoolyard, some of these groups use more than one screen for identification. Whenever you see “...” in a name (such as “Slugs and Snails...” or “Butterflies...”, that means it links to another screen with more choices.

Whenever you see a scrollbar at the right side of the screen, it means there are more choices than what you see. You will need to scroll down by tapping the down arrow at the bottom or by dragging the dark middle part of the scrollbar.

g) Count

Enter the number of individuals you saw, heard, or smelled. If you saw a track or sign (instead of live animals), enter “1” here.

Enter numbers as on a calculator, and use “<” to back up over wrong digits.

h) Exact or Estimate?

Next mark if you entered an exact count or estimated count.

(For example, if you are looking at an anthill, you probably want to estimate instead of count! This is also true if you see a flock of birds fly overhead.)

i) Habitats

Next you see a list of habitats. Tap the boxes next to the habitats where you see the animal. You can choose more than one habitat.

Remember to hold the pen down on a picture to see its description.

For a description of the habitats, you can ask your teacher to see *Part 3* in the *Reference Section*.

What is it doing?

Other		

▶

j) Behaviors

The final screen is behaviors and it works like the habitats. Choose one or more behaviors that your animal is doing.

For a description of the behaviors, see ask your teacher to see *Before You Begin* page xiv.

Final Screen - Save Data

(write notes here)

Tap here to save your data. V

◀ ◀

k) Stop

If there is anything extra you want to describe about your observation, the last screen is the place for it. You can tap on the “abc” rectangle to get letters to tap on to spell out your note. For example, if you are recording a squirrel nest, you could record “sign” as the sighting type, and type “nest” in this note area in order to be more specific. A note can say anything you want.

Finally, tap the ◀ button to save your data about this animal. You will return to the first screen, where you tap to enter your next animal sighting.



(Go back to step 5a in the directions if you need a reminder of what to do.)

NOTE: You MUST tap ◀ for the computer to save your entry.

TIP: The PDA turns itself off automatically after a certain time period to save battery power. When you turn it on, CyberTracker should be at the screen where you were when it went to sleep.

Lesson 2:

How do Animals Meet Their Needs in the Schoolyard Habitats?

















Name: _____ Team Name: _____

Using the CyberTracker program, Schoolyard Habitat Map, and the animal observation/ collection tools, you will now go outside to collect information about all the animals that you see in your zone. Each team will collect data in their assigned zone and then share it with the whole class. Have each member of your team choose a role.

Role	Job Description	Name of Responsible Team Member
Micro Observer	The MicroObserver will carry and use a shovel and Invertebrate Identification Guide to help find and identify the small animals.	
Macro Observer	The MacroObserver will carry and use Vertebrate Identification Guide to help identify the larger animals. This person will also use the Track & Sign Guide to determine if animals have been in the schoolyard.	
Mapper	The Mapper will mark on the Schoolyard Habitat Map where there are any animal sightings or signs.	
Tracker	The Tracker will be responsible for logging the animal sightings into CyberTracker on the PDA.	

Sample CyberTracker Habitat Summary Table

The animal sightings you collected on the PDAs have been downloaded into a CyberTracker Habitat Summary Table. A summary table is a chart that organizes the data so that it is easy to make calculations and see patterns in the data. Your team will get a copy of the CyberTracker Habitat Summary Table with data from the whole class. A sample summary table is shown below.

Habitat	Animal Group	Animal	How Many?	Location (Zone)
 Short grass	 6 LEGS Insects	Unknown beetle	13	A
 Short grass	 6 LEGS Insects	Bee	2	F
 Bare ground	 Mammals	Norway rat	1	D
 Bare ground	 Mammals	Rox squirrel	1	F
 In the soil	 10+ LEGS Myriapods and Crustaceans	Centipede	2	E
 Under rock or log	 0 LEGS Annelids and Mollusks	Earthworm	1	D
 In the air	 6 LEGS Insects	Bee	1	A
 Single tree	 Birds	American robin	1	F



Focal Animal Data Sheet 1

Name: _____ Team Name: _____

1. As a class, discuss what animals were found in your schoolyard. Choose three focal animals that were seen in many habitats for further investigation. Make sure you include at least one vertebrate and at least one invertebrate. Possible animals include: a) ants, earthworms or pillbugs and b) pigeons, starlings, robins or squirrels. If your CyberTracker Habitat Summary Table is available, use this information to back up your choices.

Focal Animal 1: _____

Focal Animal 2: _____

Focal Animal 3: _____

2. Now we will investigate the needs of each of the three focal animals.

a. Open the Critter Catalog (www.biokids.umich.edu/critters/) or get printouts for the focal animals from your teacher.

b. Review the following Critter Catalog sections for each animal:

“What do they eat?”

“What kind of habitat do they need?”

“What eats them and how do they avoid being eaten?”

c. Fill in the charts on the next page for each focal animal.

Focal Animal Data Sheet 2

Focal Animal 1: _____

Food	
Shelter from Weather and Other Animals	
Predators	

Focal Animal 2: _____













Food	
Shelter from Weather and Other Animals	
Predators	

Focal Animal 3: _____

Food	
Shelter from Weather and Other Animals	
Predators	

Focal Animal Data Sheet 3

3. Using your CyberTracker Habitat Summary Table, place an “X” in the table below in the habitat boxes where animals were seen:

		FOCAL ANIMALS YOUR CLASS CHOSE		
HABITATS		Animal 1:	Animal 2:	Animal 3:
 bare ground				
 in the soil				
 short grass				
 tall grass				
 leaf litter or mulch				
 bushes				
 under something				
 in the air				
 single tree				
 trees together				
 in water				
 near water				

Focal Animal Analysis Sheet 1

Name: _____ Team Name: _____

Use the information from your Focal Animal Data Sheets to help fill in the worksheet:

1. Choose an animal that was seen in more than one habitat:

Focal Animal: _____

Habitat 1: _____

Habitat 2: _____

Habitat 3: _____

Small animals are often able to meet all of their needs within one habitat. Large animals need to visit more than one habitat to gather food, obtain enough water, and find shelter.

Scientific question:

Can a _____ meet all its needs (survive)
(your focal animal)

in _____ ?

(one habitat where animal was seen)

What is the main science concept covered in this question? _____

Scientific Explanation:

Claim:

Hint:

A claim is a complete sentence that answers the question.

Evidence:

Hint:

*Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.*

Reasoning:

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence:

Therefore,

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!



Focal Animal Analysis Sheet 2

Name: _____ Team Name: _____

Scientific question:

**If there was no rain for one year, would
a robin visit habitats in different areas?**

(your focal animal)

← **What is the main science concept covered in
this question?** _____

Scientific Explanation:

Claim:

Hint:

A claim is a complete
sentence that answers
the question.

Evidence:

Hint:

Evidence is
observations, data,
or information that
support the claim.
Explanations need
two or more pieces of
evidence.

Reasoning:

Hint:

Reasoning tells why
your particular
evidence supports
your claim.

Concluding Sentence:

Therefore,

Hint:

Restate your claim
in the Concluding
Sentence.

Put it all together in a paragraph!

Focal Animal Analysis Sheet 3

Niche The unique role or way of life of a plant or animal species. Beavers and otters live in the same pond habitats in Michigan. While they live in the same pond habitats, they eat different things and so do not compete for food. Therefore, beavers and otters have different roles or niches in the pond habitat.

3. a. Choose two focal animals that share the same habitat:

Focal Animal 1: _____ Focal Animal 2: _____

Shared Habitat: _____

b. Based upon your research, describe any resources (specific food, water or shelter) that both species need.

c. Describe how the two animals may interact in the habitat (how the niches for the focal animals overlap).

Competition Competition occurs when two or more species need the same resource, but there is not enough for both of them. Animals also might compete for nesting spots, shelter or other resources.

4. As a class, discuss how you can tell if two species are competing for a resource. Describe two ways here:

(1)

(2)

Lesson 1: Who Eats What?

Pre-Reading Activity

Directions: Before reading “Animal Roles in the Food Web” and “The Food Web on Isle Royale,” make predictions about the animals and plants listed below. Put a check in the column you think they belong in—be ready to explain your choices to your classmates.

Predictions			Do I still agree with my predictions?
	Predator	Prey	
Bear			
Ant			
Robin			
Spider			
Wasp			
Squirrel			

What evidence did you use to make your predictions?

Predictions			Do I still agree with my predictions?
	Carnivore	Herbivore	
Bear			
Ant			
Robin			
Spider			
Wasp			
Squirrel			

What evidence did you use to make your predictions?

Predictions		Do I still agree with my predictions?
	Producer	
Bear		
Ant		
Grass		
Spider		
Wasp		
Maple Tree		

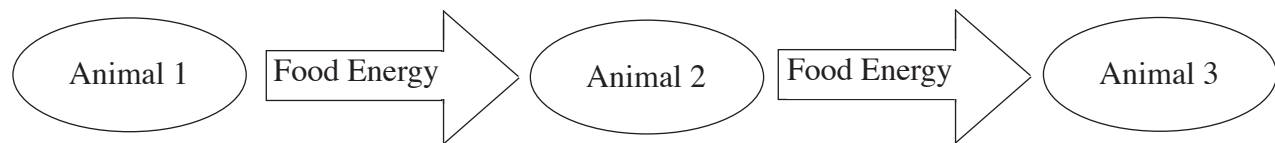
What evidence did you use to make your predictions?

Animal Roles in the Food Web Data Sheet 1

You already know a lot about predators and prey from watching animals in your schoolyard. What do you see? Ants? Spiders? Squirrels? Did you ever wonder what each animal eats or where animals get energy?

Think about what a hawk eats. A hawk eats robins and squirrels. The hawk is a **predator** because it is an animal that kills and eats other animals for food. What about robins? Robins eat worms and spiders, so robins are predators too. Prey are animals that are eaten by predators. So when a hawk is eating a robin, the robin is prey. When a robin is eating a spider, the robin is the predator and the spider is the prey. In nature, many animals can be both predators AND prey—it depends on who is eating who!

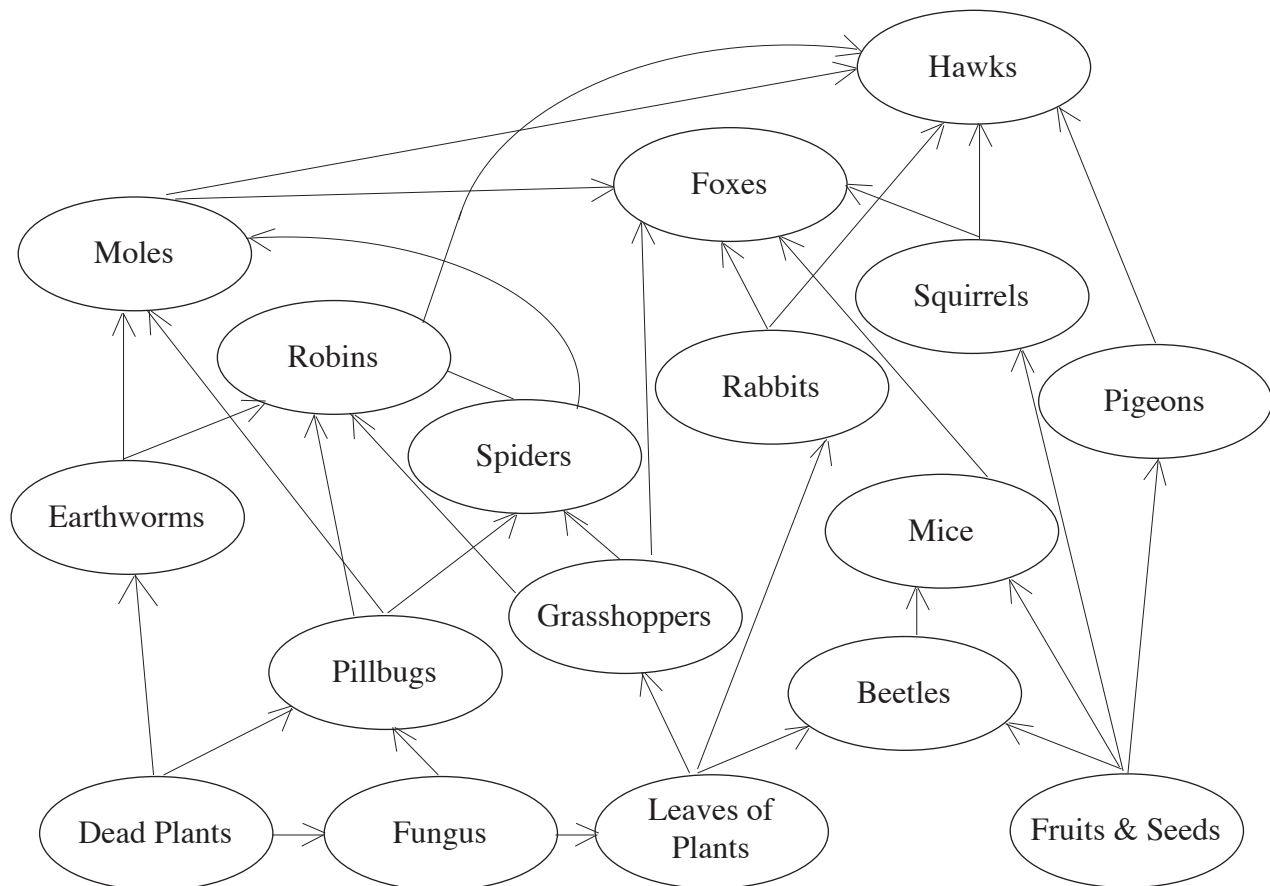
Animals eat to get energy, so when a robin eats a spider, the spider provides energy for the robin. Let's take a look at a simple **food chain** below, which describes what animals eat and what eats them. In this food chain, the arrows show where each animal is getting its energy:



Animal 3 is eating animal 2.
So animal 3 is getting energy from animal 2.
Similarly, animal 2 eats animal 1.

Animal Roles in the Food Web Data Sheet 2

Food chains are short and easy to follow, but there are more than just three animals in your schoolyard. When you put all the chains together, it ends up looking like a big web called a **food web**. Look at the food web below, which helps us describe more complicated relationships among predators and prey. Lots of predators and prey can make the food chain complicated to draw so you can make more than one food chain to make things easier.



Not all animals eat other animals. Squirrels mostly eat nuts and seeds and other part of plants, so they do not have prey. Animals that mostly eat plants are called **herbivores**. Animals that eat other animals are called **carnivores**. When animals such as humans and bears eat a mix of plants and animals, they are called **omnivores**. Every food web *must* have some animals that are not carnivores. Without herbivores and omnivores, the carnivores could only eat each other and all the animals would eventually starve!

What about plants? While very few plants are predators, many plants are eaten by animals, and so they are a very important part of the food web. Plants are called **producers** because they get their energy directly from the sun instead of eating animals. Herbivores, carnivores, and omnivores are called **consumers** because they get their energy from eating other living things.



Drawing a Food Web

Name: _____ Team Name: _____

Directions: Draw the food web described in the paragraph below. Write the name of each animal in a circle and draw arrows between the circles.

Hawks eat robins. Robins, along with eating spiders, also eat crickets and pillbugs for energy. Robins don't usually eat wasps, but wasps like to eat caterpillars and crickets. Crickets eat seeds and grass.

REMEMBER: The arrows in a food web tell you which way the energy is flowing (humans eat chickens, and get energy from eating chickens—so the arrow would point from the chicken to the human since the energy is going from the chicken to the human)

The Food Web on Isle Royale

One of the most famous food webs in the world is right here in Michigan on a large island in Lake Superior called Isle Royale. The island is twenty miles from land and there are not many kinds of wild animals there: no deer, no bears, no porcupines, no coyotes. Some beavers and rabbits live there, but not many.



About 100 years ago, some moose swam all the way to the island. Moose are animals that are similar to deer, but much bigger. They are herbivores who only eat plants, so the island was the perfect place for them—lots of food, and no predators! The moose lived on the island for many years, reproducing and growing until there were so many moose that they were eating too many plants too fast.

Soon there were not enough plants to feed all the moose. Then things got worse.

One winter, the surface of Lake Superior froze all the way from the island to the shore. The ice was thick enough for animals to walk across it to the island. Some wolves decided to walk all the way to the island and were excited to see the island filled with lots of delicious moose! Wolves are predators and carnivores, so the island was a perfect place for them to get food. After a few years of both moose and wolves living on the island, the wolves ate so many moose that there were not that many moose left on the island. This was good for the plants, because lots of moose were not eating them anymore, but it wasn't so good for the wolves. There were not too many other animals on the island besides moose for wolves to eat, so when the number of moose went down, the wolves got very hungry and some started to starve. Because of this pattern, the number of



moose and the number of wolves change every year, depending on how much and what type of food is available.



Scientists have been studying moose and wolves on Isle Royale ever since the wolves arrived. They try to count the number of wolves and moose each year. We can study the simple food web on Isle Royale as an example of how all food webs work, and what happens when the numbers of prey and the numbers of predators in a food web change over time.



Post Reading Questions

Name: _____ Team Name: _____

Check the statement(s) that are true based on the reading:	True
1. Robins can be predators.	<input type="checkbox"/>
2. Prey kill and eat other animals.	<input type="checkbox"/>
3. Moose and wolves live on Isle Royale, an island in Lake Superior.	<input type="checkbox"/>
4. Living things that get their energy from the sun, like plants, are considered producers.	<input type="checkbox"/>
5. Moose are predators of wolves.	<input type="checkbox"/>
6. Wolves and moose are living together on Isle Royale.	<input type="checkbox"/>
7. All energy for living things comes from the sun.	<input type="checkbox"/>
8. Spiders are only predators.	<input type="checkbox"/>
9. Introducing a new animal to a habitat will probably not affect the existing food web.	<input type="checkbox"/>
10. Herbivores are an important part of a food web because they provide a link between producers and carnivores.	<input type="checkbox"/>



Focal Animal Analysis Sheet

Name: _____ Team Name: _____

Scientific question:

What happened to the moose population and the plant population when wolves arrived on Isle Royale?

← *What is the main science concept covered in this question?* _____

Scientific Explanation:

Claim:

Hint:

A claim is a complete sentence that answers the question.

Evidence:

Hint:

Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.

Reasoning:

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence:

Therefore,

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

Lesson 2:

What are My Animal's Predators and Prey?



Food Chain Data Sheet 1

Name: _____ Team Name: _____

1. Using the CyberTracker Habitat Summary Table, as a team choose one habitat that has at least four different species.

Habitat: _____

2. Have each team member choose one of the animals to research.

Animal that was seen in that habitat	Assigned Team-member

predators animals that kill and eat other animals.

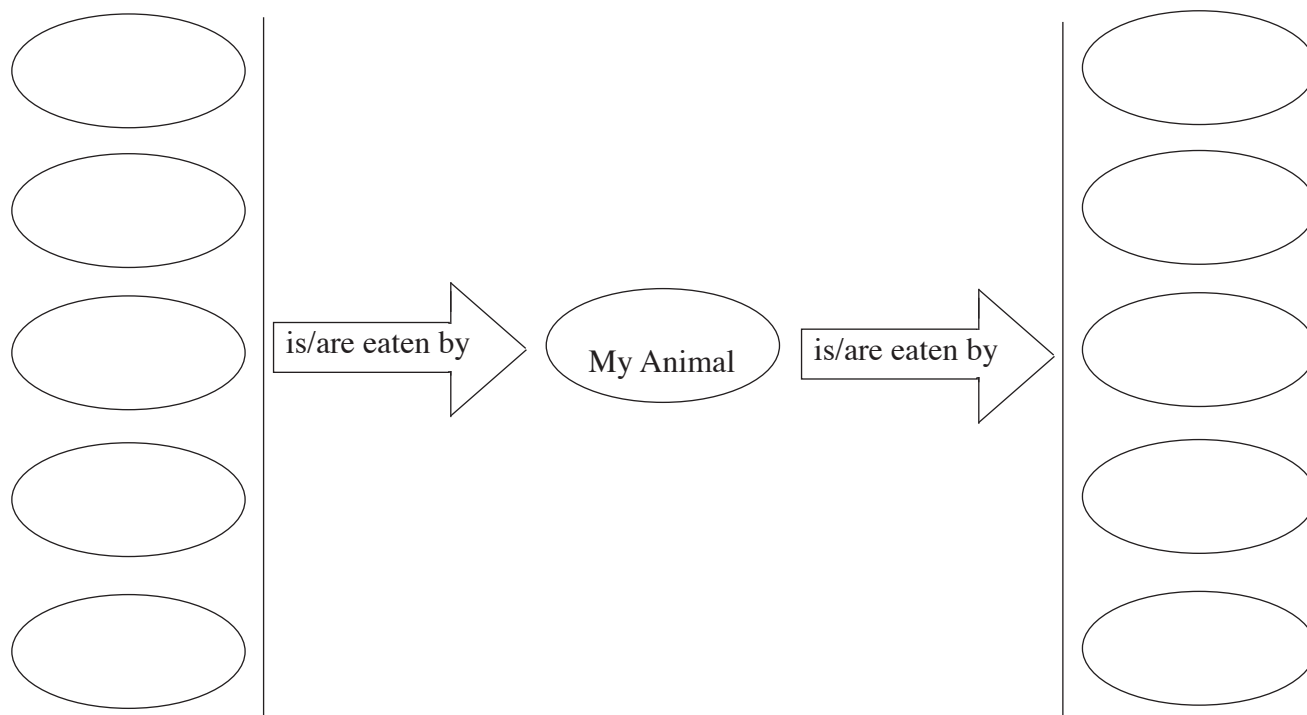
prey animals that are eaten by predators.

In a food chain, animals can be both predators and prey.
In addition to eating other animals (their prey), some animals also eat plants.

Food Chain Data Sheet 2

Gather information on your animal using the Critter Catalog to fill in the food chains below.

3. Place your animal's name in the middle circle.
4. Place animals or plants that your animal eats for food in the circles to the left.
5. Place animals that eat your animal for food in the circles to the right.



6. a. Look at your food chains. Is your animal predator, prey or both?

(circle one) predator prey both

b. Describe how you know this.

Food Chain Data Sheet 3

Food chains help biologists understand the flow of energy. In addition to predators and prey, organisms also have other roles in the food chain.

producers get their energy directly from the sun.

consumers get their energy through eating living things.

All living things are either producers or consumers.

7. a. _____ is/are a **producer** from my food chains on the previous page.
 b. If there are no producers in your food chain, explain why.

8. a. Are you a producer or a consumer?
 (circle one) producer consumer

- b. Where do you get your energy? (Include one example.)

Food Chain Data Sheet 4

Consumers are grouped based upon the type of food they eat.

Herbivores: animals that mostly eat plants

Carnivores: animals that mostly eat other animals

Omnivores: animals that eat both plants and animals

9. Look at all four food chains made by your team. Determine if each is an herbivore, carnivore, or omnivore.

Animal	Circle the appropriate consumer type
	Herbivore / carnivore / omnivore
	Herbivore / carnivore / omnivore
	Herbivore / carnivore / omnivore
	Herbivore / carnivore / omnivore

Top predator a predator that is at the top of the food chain, one that is not often preyed upon by others.

10. a. Pick a top predator in your food chain.

Top predator in my food chain: _____



Food Chain Data Sheet 5

Name: _____ Team Name: _____

Scientific question:

If a volcano exploded and ash blocked the sunlight for one year, would _____ survive?
(your top predator)

← **What is the main science concept covered in this question?** _____

Scientific Explanation:

Claim:

Hint:

A claim is a complete sentence that answers the question.

Evidence:

Hint:

*Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.*

Reasoning:

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence:

Therefore,

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

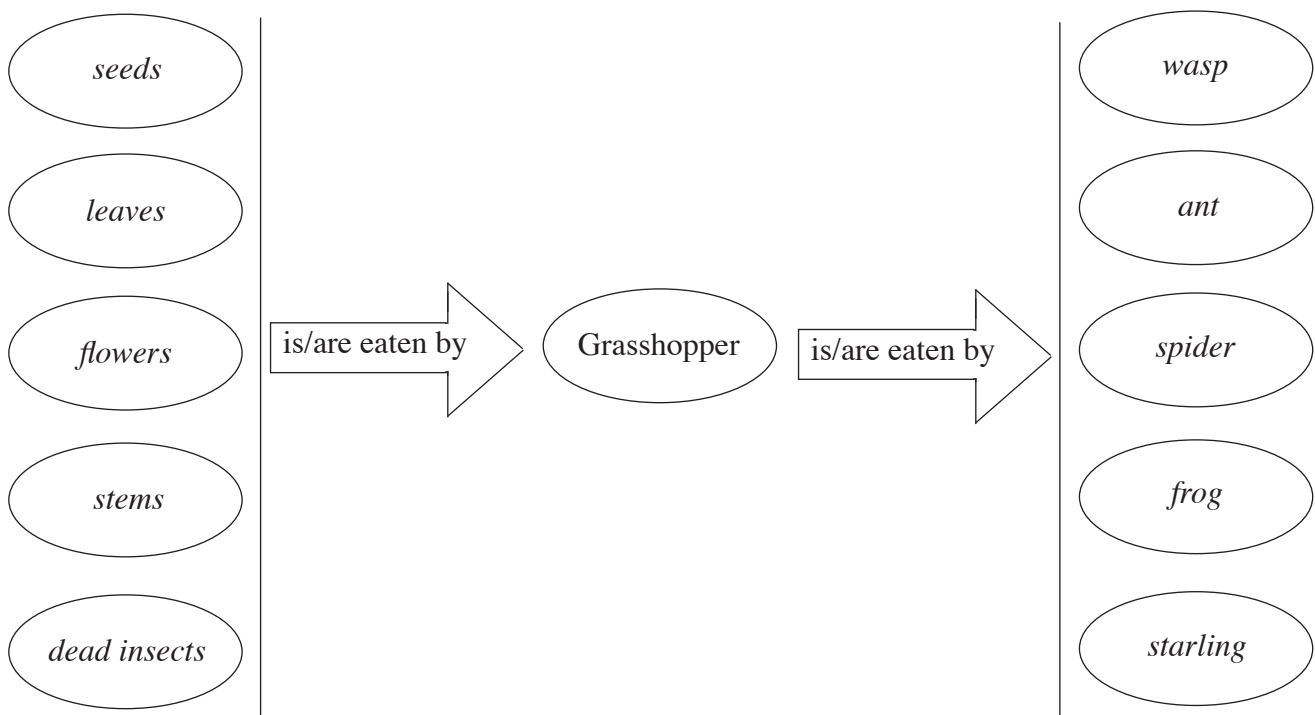


Food Chain Follow-up Exercise

Name: _____ Team Name: _____

Below is a set of food chains with a grasshopper in the center. Circle and label the following things in the diagram:

- (1) a predator
- (2) an animal that is prey
- (3) a producer
- (4) a consumer



In the blank food chain below fill in one food chain from diagram.

_____ → _____ → _____

Lesson 3: How do Animals Live with Each Other?

Have each team member make plant, and animal cards to use when building a team food web.

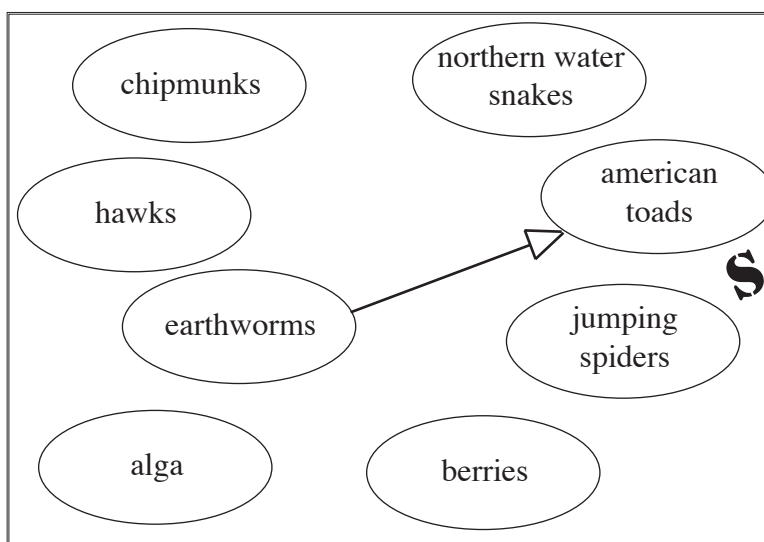
1. Create one card with your animal's name.
2. Create up to four cards with foods your animal eats including both plants and animals.
3. Create up to four cards with the names of predators that eat your animal.
4. Finally, mark any cards that are of animals you or your classmates saw in your schoolyard with a star (*), this includes plants or other things that you did not collect CyberTracker data on but did see.

My animal's name:	One food my animal eats:	One food my animal eats:
One food my animal eats:	One food my animal eats:	One predator of my animal:
One predator of my animal:	One predator of my animal:	One predator of my animal:

Food Web Building Instructions

Your team will create a food web of one habitat from your schoolyard to explore the interactions among the organisms in that habitat. Here is what you need to do:

1. In your team, organize the note cards that you created on your board like this:
 - Place all non-animal note cards including garbage, plant, and other vegetation note cards at the bottom of the board.
 - Above these cards place all invertebrate cards.
 - Above the invertebrate cards, place the reptile, amphibian, mammal, fish, and bird cards.



2. Draw arrows from each living thing (prey) to the things that eat it (predators) to show how energy flows through the food web. To help remember which way the arrow (and the energy flow) goes remember that the arrow goes from an animal into the mouth of the animal that eats it.
3. Continue connecting organisms until every predator/prey relationship is shown with an arrow showing the energy flow.
4. Your food web is not complete without a sketch of the original energy source for all living things – the sun. Add this to your food web.
- 5.

decomposers animals that eat the wastes and remains of other living things. They break down wastes and dead organisms and release nutrients that are food for plants. Pill bugs and worms are examples of decomposers.

In addition to using energy from the sun, the producers also need nutrients to grow. Decomposers release these nutrients after eating the wastes and remains of other living things. Place these decomposers and nutrients into your food web.



Food Web Data Sheet 1

Name: _____ Team Name: _____

Here are some questions to help you think about your food web, why your animal lives in this habitat, and how your animal is connected to the other animals in the habitat where it lives.

Scientists can use food webs to begin predicting how animal populations may respond to changes in the habitat.

1. What would happen to the food web if **you removed all of the plants** from the web?

2. If someone sprayed insecticide and **killed all the ants** in the habitat, how would this affect the ants' **prey**?

3. If someone sprayed insecticide and **killed all of the ants** in the habitat, what would happen to the ants' **predators**?

4. What would happen to the other organisms in your food web if a **top predator is removed** from your food web?

Food Web Data Sheet 2

Grey Wolves

A wolf's diet consists only of meat, and they can consume up to 20 pounds of meat at one meal. Wolves are among the most social carnivores in the world, living in family groups called packs. Wolf packs use their group to hunt large animals like moose, elk, bison, white tailed deer, and reindeer. By themselves, wolves hunt smaller prey, such as beavers, rabbits, and other small mammals.



Wolves usually move at night over large distances, so they need large spaces to live. Around town or cities, wolves might live in an area of about 100 square miles. In Alaska or Canada, where there are fewer people, wolves live in areas of up to 1000 square miles.

Wolves once lived throughout most of the United States. Now they remain in only a few places. In most states wolves are endangered due to habitat destruction. As human populations have grown the amount of wilderness where wolves can live has gotten smaller. Protecting the wilderness helps protect the wolf.

4. Wolves once lived in both the Lower and Upper Peninsulas of Michigan, but since their habitat has been destroyed, now they only survive in the Upper Peninsula. Imagine that wolves were reintroduced to the Lower Peninsula and into your food web.

a. Where would you place them in your web?

b. Give one reason why you placed wolves there.



Food Web Data Sheet 3

Name: _____ Team Name: _____

5. Scientific question:

As a biologist, would you recommend reintroducing Grey Wolves to Southeastern Michigan?

← What is the main science concept covered in this question? _____

Scientific Explanation:

Claim:

Hint:

A claim is a complete sentence that answers the question.

Evidence:

Hint:

Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.

Reasoning:

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence:

Therefore,

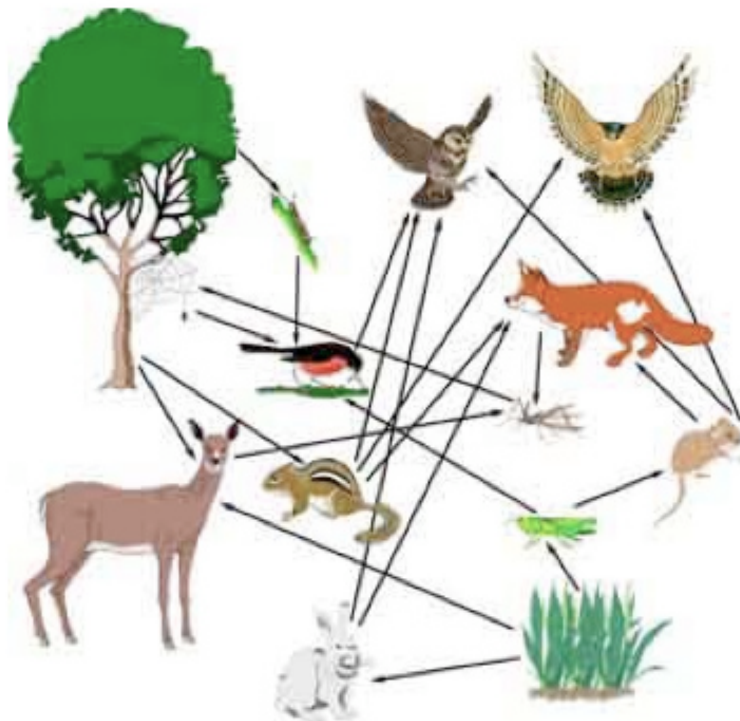
Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

Food Web Data Sheet 4

Food Webs: The food web you have made shows many examples of both the predators and the prey of the different animals you observed in your schoolyard. Looking closely at your food web, you might notice that it contains some animals that you do not actually find in your schoolyard. Think back to our lesson on habitats. Animals need more than just a food source to be able to live in a place. For example, there might be a lot of fish in a little fresh water pond. Sharks eat fish, but you probably won't ever find any sharks in a little pond. Why not? Well, for one thing, a shark won't fit in a little pond, even though there's food there! For another, sharks live in the salty ocean; they would die in a fresh water pond.



Food Web from: www.bigelow.org/edhab/fitting_algae.html

Select an animal from your food web who is not found in your schoolyard, even though its food is found there:



Food Web Data Sheet 5

Name: _____ Team Name: _____

Scientific question:

Even though there is _____ 's food in
(your animal)

your schoolyard, why is the animal NOT
living there?

← **What is the main science concept covered in
this question?** _____

Scientific Explan:

Claim:

Hint:

A claim is a complete
sentence that answers
the question.

Evidence:

Hint:

Evidence is
observations, data,
or information that
support the claim.
Explanations need
two or more pieces of
evidence.

Reasoning:

Hint:

Reasoning tells why
your particular
evidence supports
your claim.

Concluding Sentence:

Therefore,

Hint:

Restate your claim
in the Concluding
Sentence.

Put it all together in a paragraph!



Lesson 1:

How Can We Measure Animal Biodiversity?

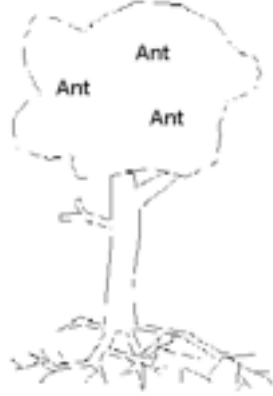
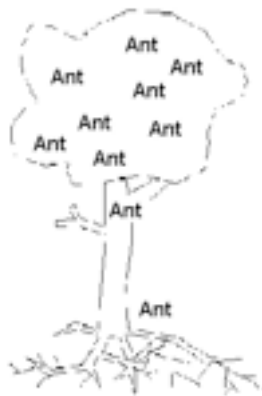
Name: _____ Team Name: _____

Measuring animal abundance and animal richness allows scientists to compare the biodiversity of different areas.

Animal Abundance The total number of animals in an area.

For example: If you have 3 blue jays and 10 worms in your yard (13 animals total), and 2 blue jays and 2 worms in your neighbor's yard (4 animals total), your yard has a higher abundance of animals.

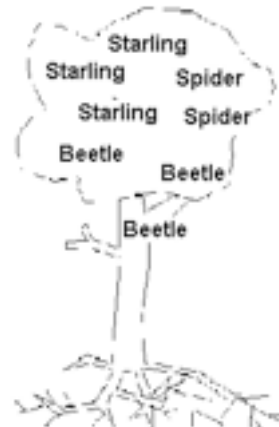
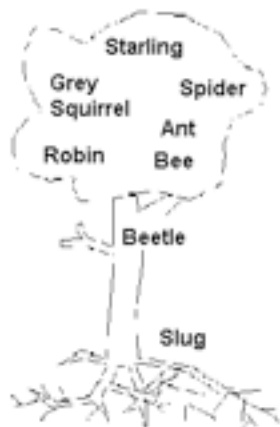
Circle the drawing that has the higher animal abundance.



Animal Richness The number of kinds of animals in an area.

For example: If you have 3 rabbits, 1 butterfly, and 1 sparrow in your yard (3 different kinds of animals), and 1 rabbit and 100 ants in your neighbor's yard (2 different kinds of animals), your yard has a higher richness of animals.

Circle the drawing that has the higher animal richness.





Abundance and Richness Photo Comparison 1

Name: _____ Team Name: _____

1. Photos A, B, and C each show a community of animals. Examine the **abundance** of animals in each photo and complete the sentences below:

I think that photo _____ has the **highest abundance** because

I think that photo _____ has the **lowest abundance** because

2. Examine the **richness** of animals in each photo and complete the sentences below:

I think that photo _____ has the **highest richness** because

I think that photo _____ has the **lowest richness** because



Abundance and Richness Photo Comparison 2

Name: _____ Team Name: _____

Biologists use abundance and richness as two measures of the biodiversity of a region.

Biodiversity: An area is considered biodiverse if it has BOTH a high abundance of animals AND a high richness of animals.

Examine three photos labeled A, B or C.

Scientific question:

Which photo shows the highest biodiversity? *What is the main science concept covered in this question?* _____

Scientific Explanation: _____

Claim:

Hint:

A claim is a complete sentence that answers the question.

Evidence:

Hint:

*Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.*

Reasoning:

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence:

Therefore,

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

Lesson 2:

Which Schoolyard Zone has the Greatest Biodiversity?

Sample CyberTracker Zone Summary Table

Biologists often determine the biodiversity of an area by measuring the animal richness and abundance. You will now analyze the schoolyard data that you collected to determine which schoolyard zone has the highest biodiversity.

A summary table is a chart that organizes the data so that it is easy to make calculations and see patterns in the data. Your team will get a copy of the CyberTracker Zone Summary Table with data from the whole class. A sample summary table is shown below.

CyberTracker Zone Summary		Zone A	Zone C	Zone E	Micro Habitat	Total
Animal Name						
 30 LEGS	Earthworms	2	0	2	- In dirt	4
 6 LEGS	Ants	2	229	75	- On something hard - On grass	306
 6 LEGS	Other insects	0	0	2	- On grass - Other microhabitat	2
 6 LEGS	Unknown beetle	0	3	0	- On plant	3
 6 LEGS	Unknown insect	0	2	0	- On dirt	2
 10+ LEGS	Other leggy inverteb	1	0	0	- In dirt	1
 2	American robin	6	1	3	- On tree - In the sky	10
 2	Black tern	200	0	0	- On plant - On something hard	200
 2	House sparrow	0	0	1	- On tree	1
 2	Mourning dove	3	0	0	- On tree	3
 2	Unknown bird	7	5	2	- On tree - In the sky	14
 2	other birds	0	1	2	- In water - On grass	3
 4	E. fox squirrel	1	1	0	- On something hard	2
 2	Human	10	21	1	- On grass - On something hard - Other microhabitat	32
 4	Other mammal	3	0	16	- Other microhabitat - On something hard	19
 4	Red squirrel	2	0	0	- On tree	2
Number of Animals (Abundance)		237	263	104		604
Number of Kinds of Animals (Richness)		11	8	9		16



Biodiversity Data Sheet 1

Name: _____ Team Name: _____

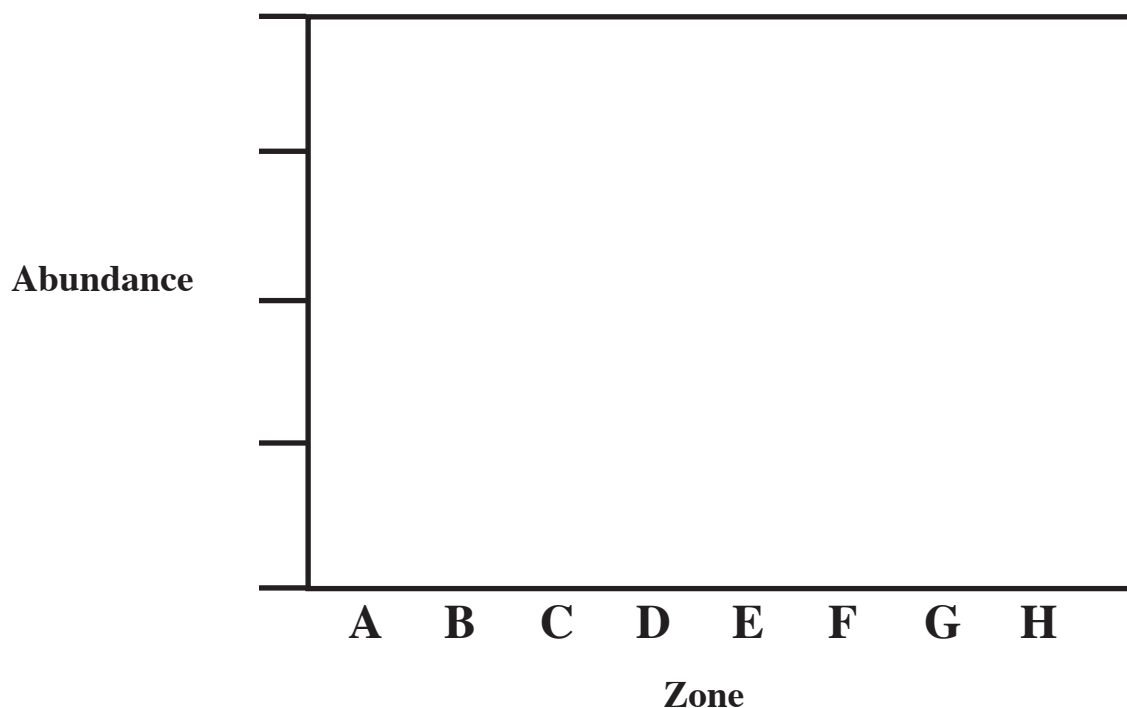
After biologists have collected data, they look at it closely to make sure they don't have any obvious errors. These are called “**outliers.**” **An outlier is a questionable data point, one that is bigger or smaller than would be expected.**

1. Look at the CyberTracker Zone Summary Table. Circle any possible outliers on the summary table. Discuss as a whole class to determine whether they are errors or not.
2. As a team, fill in the abundance and richness data for each zone below (your class may not have this many zones):

	Abundance	Richness
Zone A		
Zone B		
Zone C		
Zone D		
Zone E		
Zone F		
Zone G		

Biodiversity Data Sheet 2

3. As a team, make a bar graph of the abundance data below.



Result: According to the graph above, zone _____ has the highest abundance.

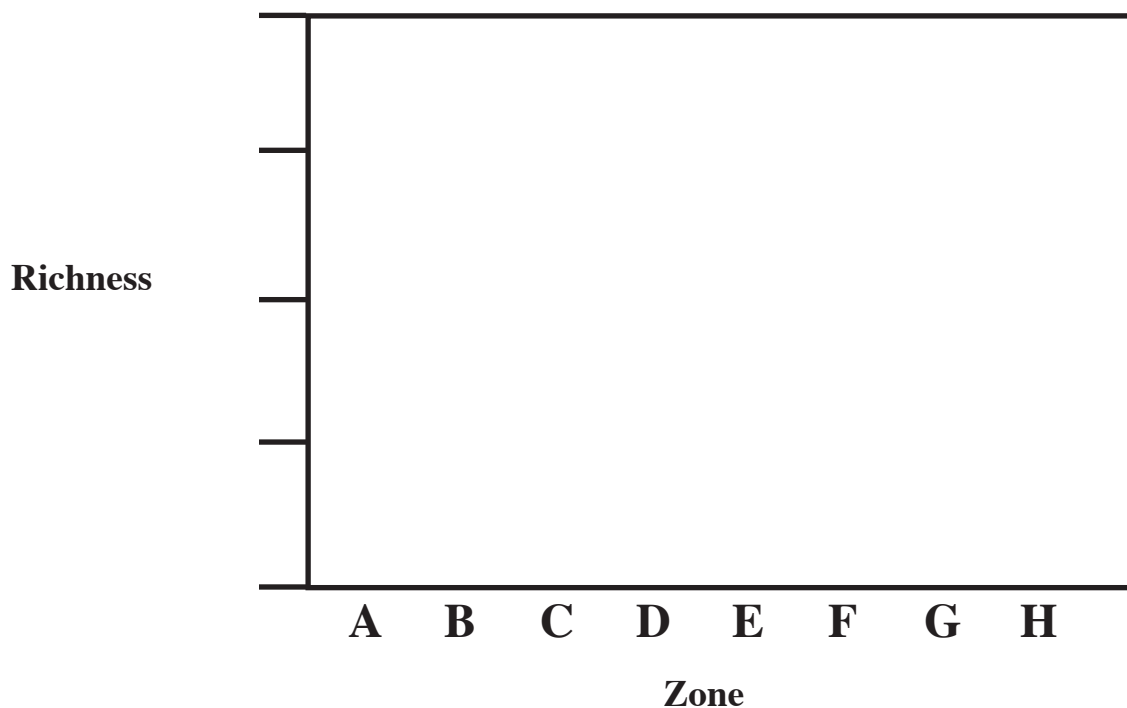
Name two characteristics of the zone that attracted the large number of animals.

(1) _____

(2) _____

Biodiversity Data Sheet 3

4. As a team, make a bar graph of the richness data below.



Result: According to the graph above, zone _____ has the highest richness.

Name two characteristics of the zone that attracted a large number of different kinds of animals.

(1) _____

(2) _____



Biodiversity Data Sheet 4

Name: _____ Team Name: _____

5. Looking at the two results you obtained from the data analysis, discuss as a class which zone in your schoolyard has the highest biodiversity.

Example scientific question:

Which zone in the schoolyard has the highest biodiversity?

← **What is the main science concept covered in this question?** _____

Scientific Explanation:

Claim:

Hint:

A claim is a complete sentence that answers the question.

Evidence:

Hint:

*Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.*

Reasoning:

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence:

Therefore,

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

Biodiversity Data Sheet 5

7. Using your knowledge about animal needs, your schoolyard habitat and schoolyard animal biodiversity, give three suggestions for changes to your schoolyard to improve the animal biodiversity.

(1)

(2)

(3)
