LIFE RIGHT HERE & EVERYWHERE

Student Notebook

Summer 2023

Name: _____

Life Right Here and Everywhere

What Animals Live Near Me?

This week, you will become field biologists and engineers. Field biologists study plants and animals in nature. They collect data to learn about what plants and animals do, what foods they eat, and where they live. Engineers design and make things to solve problems.

A letter just arrived for you from the Natural History Museum of Utah.

Natural History Museum of Utah
301 Wakara Way
Salt Lake City, UT 84108

Dear Field Biologists,

Over the past several years, Utah has had a big problem with the insects shown here:

Boxelder Bug

Brown Marmorated Stink Bug

Velvet Longhorned Beetle

Japanese Beetle

Common Silverfish

These insects are very annoying and may eat or destroy many of the plants and animals in Utah. Because of this, we need your help in studying these animals and in finding out how to remove or reduce them so that the plants and animals that live here, including us, can do well. Over the next few days, your task is to create a solution to decrease the number of these insects in your community.

What is a solution? Good question! A **solution** is a plan to solve a problem**.** In this case, your solution will involve designing and building a trap to reduce the number of one of these insects in your area.

Your teacher will be giving you more information to help you learn about your insect and other animals that live in your area so you can create your solution to share with others.

Thank you for your help!

Natural History Museum of Utah

Step 1: In the letter, you were told about a problem happening in Utah. Underline the part of the letter that talks about the problem.

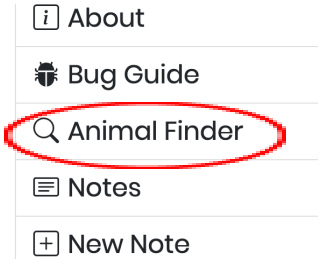
Step 2: Look at the insects pictured in the letter. Circle the ones you've seen before.

As a Field Biologist, your job is to observe and collect information on as many different Utah animals and signs of animals that you see in a location near you. First, we'll practice inside.

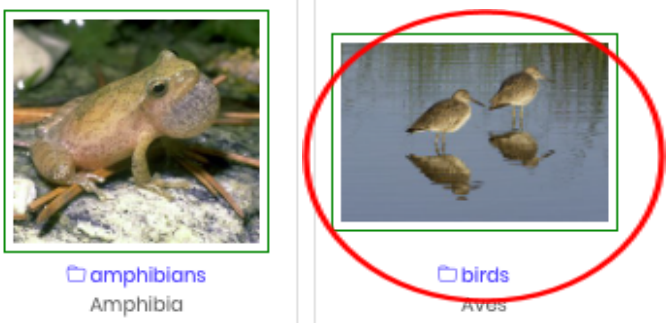
Step 3: You will use ADW Pocket Guide to identify animals. Follow the steps below to practice looking up animals.

Using Animal Diversity Web (ADW) Pocket Guide

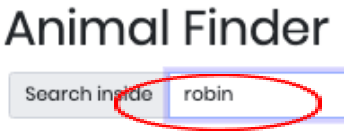
A. Pick up an iPad and turn it on. Go to the ADW Pocket Guide: https://pocketguides.animaldiversity.org. If you have any trouble accessing ADW, please ask your instructor for help.
B. Use this login: Username: **science1** Password: **mortensen1**.
C. Click the Animal Finder button.



D. Method 1: **Explore categories** - One way to find the animal is to click on the type of animal it is. Click on "birds" to open the list of birds.



E. Method 2: **Search inside** - You may type in a specific animal or category. Try typing in “robin”.



You should see information for the American Robin. Click on the image to view the robin’s profile.

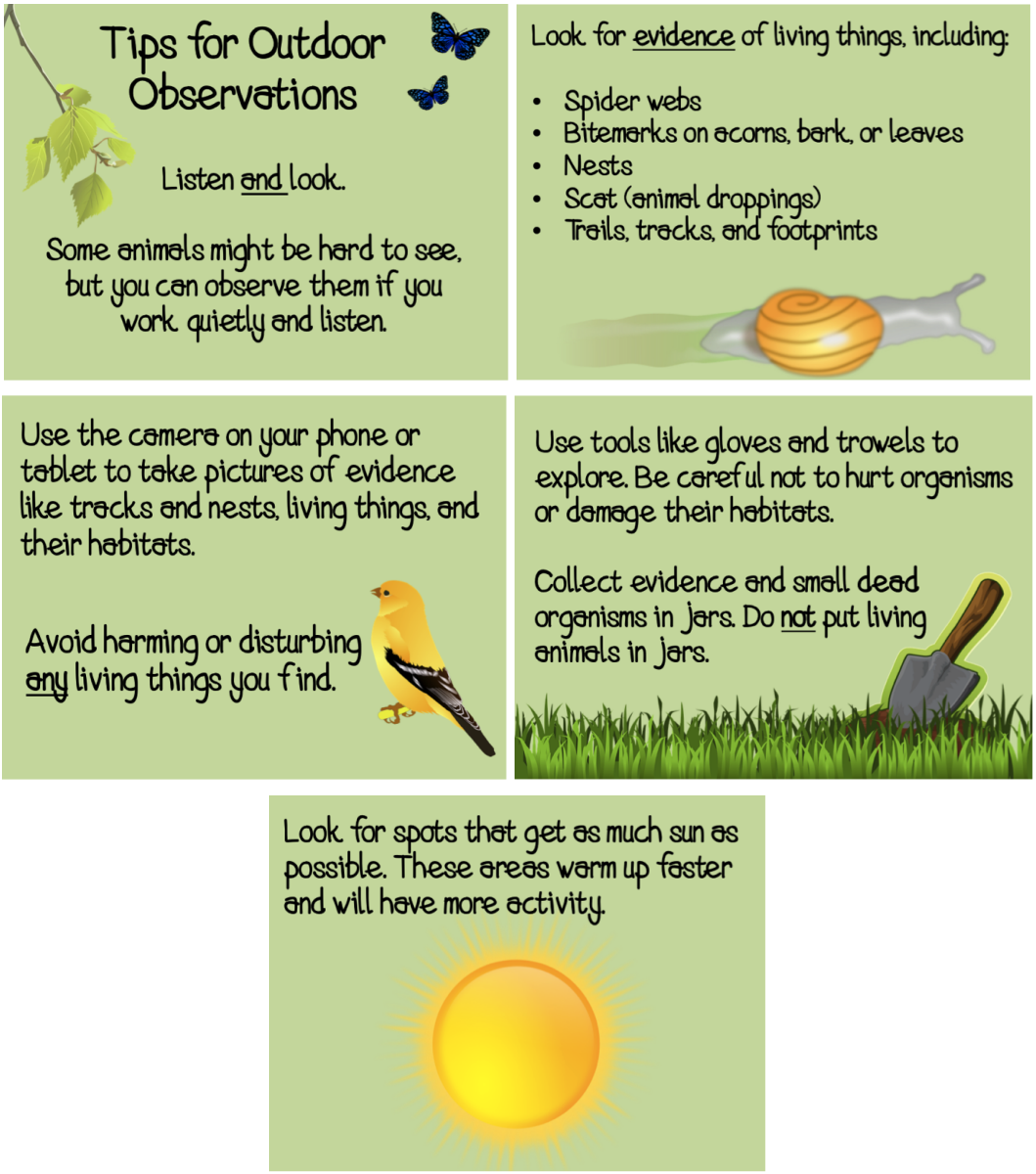
Step 4: You will be given an animal in plastic. Find it in ADW using Method 1 or 2. If you need help, there is a key word attached to the bottom of your animal. Try using this keyword to help guide your search.

Step 5: A good observation means taking detailed notes about what you saw. Complete the table below with notes on your animal.

Number of animals seen	**What does it look like?** (How big is it? What colors(s) is it? Does it have fur or scales? How many body sections? How many legs? Does it have wings?)	**What is it doing?** (eating, flying, climbing, etc.)	**Where did you find it?** (under a rock, in a tree, etc.)	**Describe the weather** (hot, sunny, rainy, etc.)	**Animal name** (best guess)

Step 6: You’re almost ready to move to the next level! Your teacher will place you into groups.

Step 7: With your group, read the Tips for Outdoor Observations.



Remember, you can observe **any** sign of an animal, such as a nest, a bird singing, an insect near a flower, or an animal that moves away when you lift a stick or rock. You may use binoculars or a magnifying glass to look at animals that are small or far away.

Observation

Step 8: Let's practice making Field Biologist notes before you go outside.
Imagine you hear a bird singing in a tree up the trail.

Fill in the first row of the table below with everything you know about the bird you heard in the tree. You can use ADW for help by selecting a bird that you think lives in Utah.

Number of animals seen	**What does it look like?** (How big is it? What colors(s) is it? Does it have fur or scales? How many body sections? How many legs? Does it have wings?)	**What is it doing?** (eating, flying, climbing, etc.)	**Where did you find it?** (under a rock, in a tree, etc.)	**Describe the weather** (hot, sunny, rainy, etc.)	**Animal name** (if you can't find it, guess)

Step 9: Review the list below to make sure you are ready to go outside. Your teacher will dismiss you when it's time.

1. Check that your group has all the supplies you need (1 iPad, 1 set of binoculars, 1 notebook for each scientist).
2. Make sure one person in your group is logged in to the ADW Pocket Guide website (https://pocketguides.animaldiversity.org/) on your iPad (see the instructions on the previous page if needed).
3. Listen to your teacher to get your assignment of where to go.

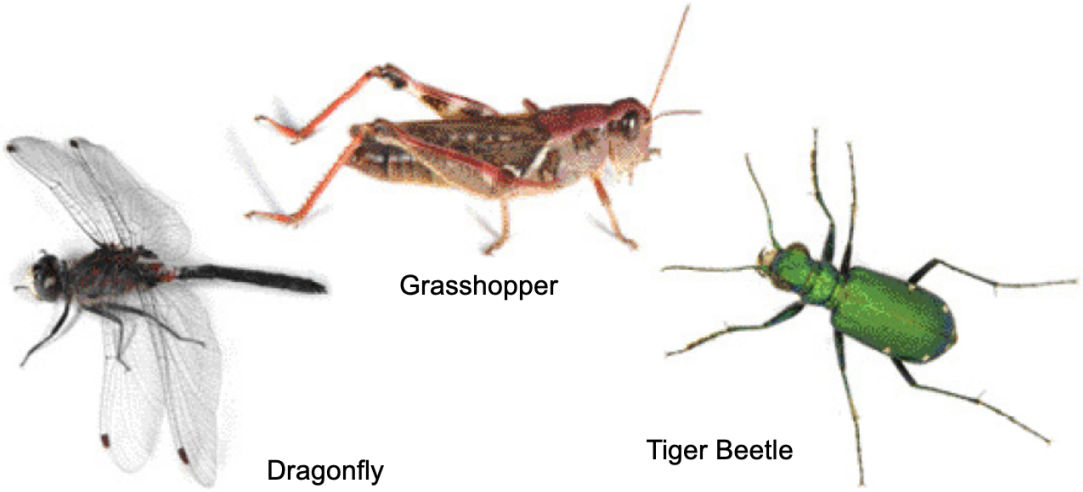
Step 10: Now go outside and observe live animals and signs of live animals. As you see an animal or sign of animal, complete one row of the table. Fill in as many details as you can.

When your instructor says that time is up, everyone will return to the museum. Make sure that you have all of your supplies!

Step 11: Class discussion - How many total animals did your group see? How many different kinds of animals did your group see? What was the most interesting animal or sign of animals that you saw?

Step 12: On the following pages are different types of animals.
Circle the types of animals you saw during your observation. It doesn't have to be the exact animal you saw.

INSECTS



ARACHNIDS

MYRIAPODS

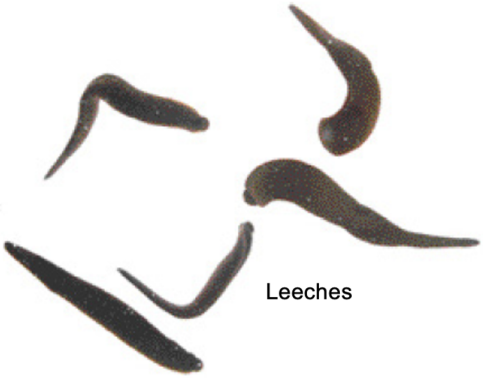
House centipede

Garden centipede

Large millipede

ANNELIDS

Earthworm



Leeches

MOLLUSKS

Pillar Snail

Little-neck clam

Spotted slug

CRUSTACEANS

Fiddler crab

Crayfish

Pill Bug

AMPHIBIANS

Tree frog

Red-spotted newt

Bullfrog

FISH

Longear sunfish

Smallmouth bass

Grass pickerel

MAMMALS

Grizzly or brown bear

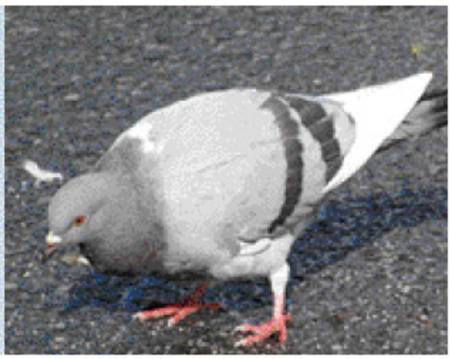
Gray squirrel

Elk

BIRDS

Mallard duck

Sparrow



Pigeon

REPTILES

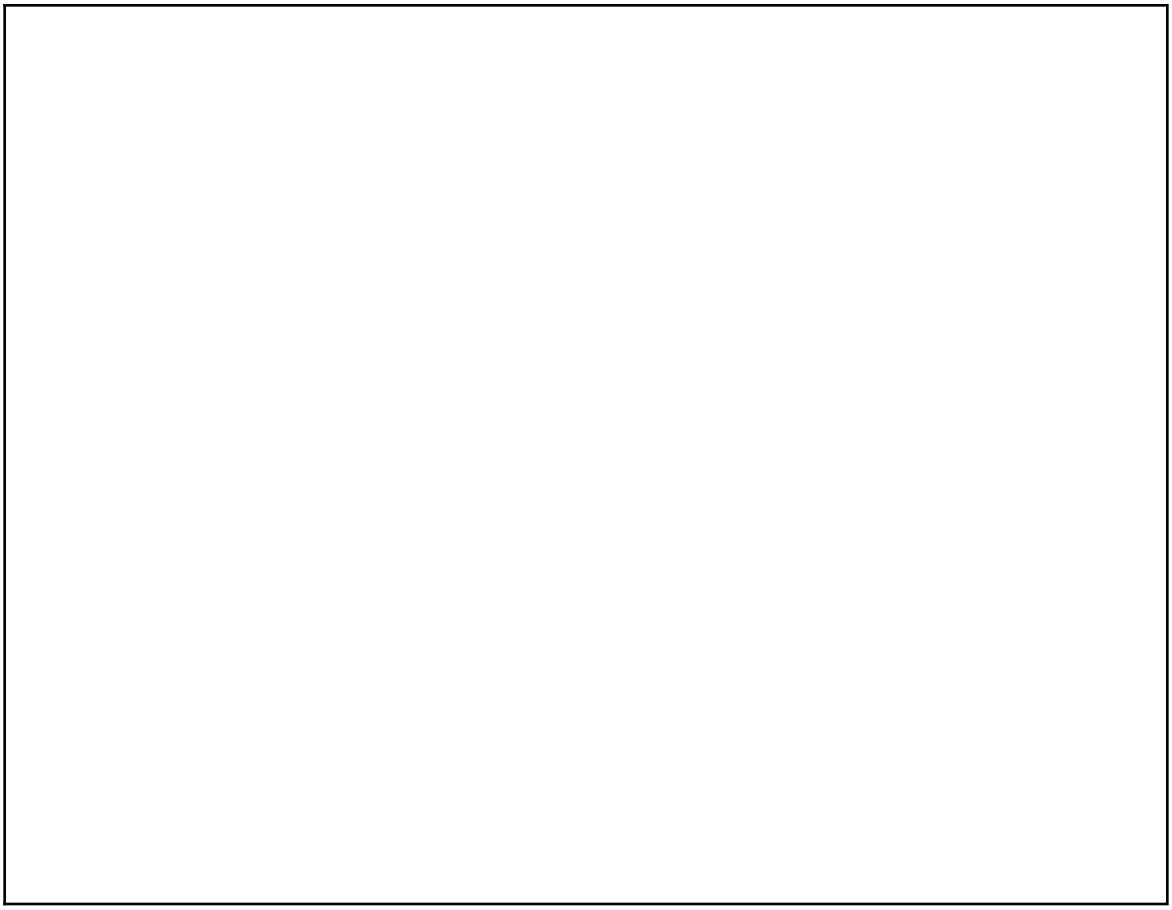
Five-lined skink

Green snake

Blanding's turtle

Step 13: Class discussion - Which types of animals did you see (insects, arachnids, annelids, etc)? What different animals of each type did you see (dragonfly, grasshopper, etc)?

Step 14: Draw an animal that you saw outside. Label as many parts as you can.



Step 15: Answer the following questions about the animal you drew in Step 14.

- How many legs does it have? _____
- How many “sections” (head, middle, etc.) does it have? _____
- How many antennae? (Antennae look sort of like big hairs.) _____
- Based on the information and photos given on the previous pages, what type of animal (insect, arachnid, mammal, etc.) do you think this is? _____

Research an Insect

Learn about an insect through research.

About Insects

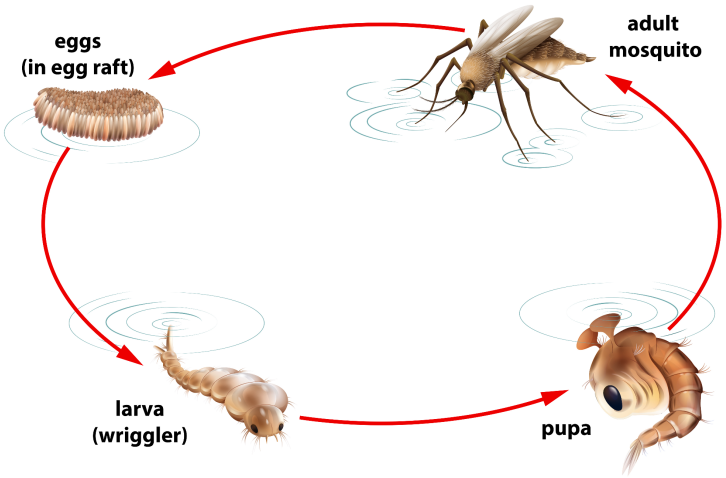
Step 1: Review the following information about insects:

There are many kinds of insects. Here are some ways to tell if an animal is an insect:

- **Legs:** If an animal has 6 legs, it is an insect. Some animals look like insects, but they have more legs.
- **Body sections:** All insects have 3 body sections.
    - The front section is the head - it has eyes, a mouth, and antennae.
    - The middle section is the thorax - the legs and wings attach here.
    - The last section is the abdomen - it contains the insect's stomach.
- **Other insect characteristics:**
    - Insects have 2 antennae on their heads. If you see an animal with antennae, it might be an insect, but some other animals have antennae also.
    - Many, but not all, insects have wings. If your animal has wings, but it is not a bird or a bat, then it is definitely an insect.

Insect Life Cycles

There are four life stages insects may go through, though not all insects have four stages. For example, here is a diagram of the mosquito's life cycle:



Step 2: Complete the tasks on insects below:

1. Did you see any insects during your observation? If so, how do you know what you saw was an insect?

2. Is a spider an insect? How do you know?

Step 3: Your group will be assigned one of the insects that is a problem for Utah.

Below are some resources for each insect. Using your iPad, read each resource for your assigned insect. Use the information to complete a field Biologist Insect Report and drawing on the following pages.

Research Links

Boxelder Bug

- University of Minnesota Extension: https://tinyurl.com/UMN-boxelder
- USU Extension: https://tinyurl.com/USU-boxelder
- Natural Boxelder Bug Repellent: https://tinyurl.com/natural-boxelder
- Animal Diversity Web (ADW): https://tinyurl.com/ADW-boxelder

Brown Marmorated Stink Bug

- PennState Extension: https://tinyurl.com/Penn-BMSB
- Stop BMSB: http://www.stopbmsb.org
- University of Florida: https://tinyurl.com/UF-BMSB
- Animal Diversity Web (ADW): https://tinyurl.com/ADW-BMSB

Common Silverfish

- USU Extension: https://tinyurl.com/USU-silverfish
- University of Florida: https://tinyurl.com/UF-silverfish
- Texas A&M University: https://tinyurl.com/TAM-silverfish
- Animal Diversity Web (ADW): https://tinyurl.com/ADW-silverfish

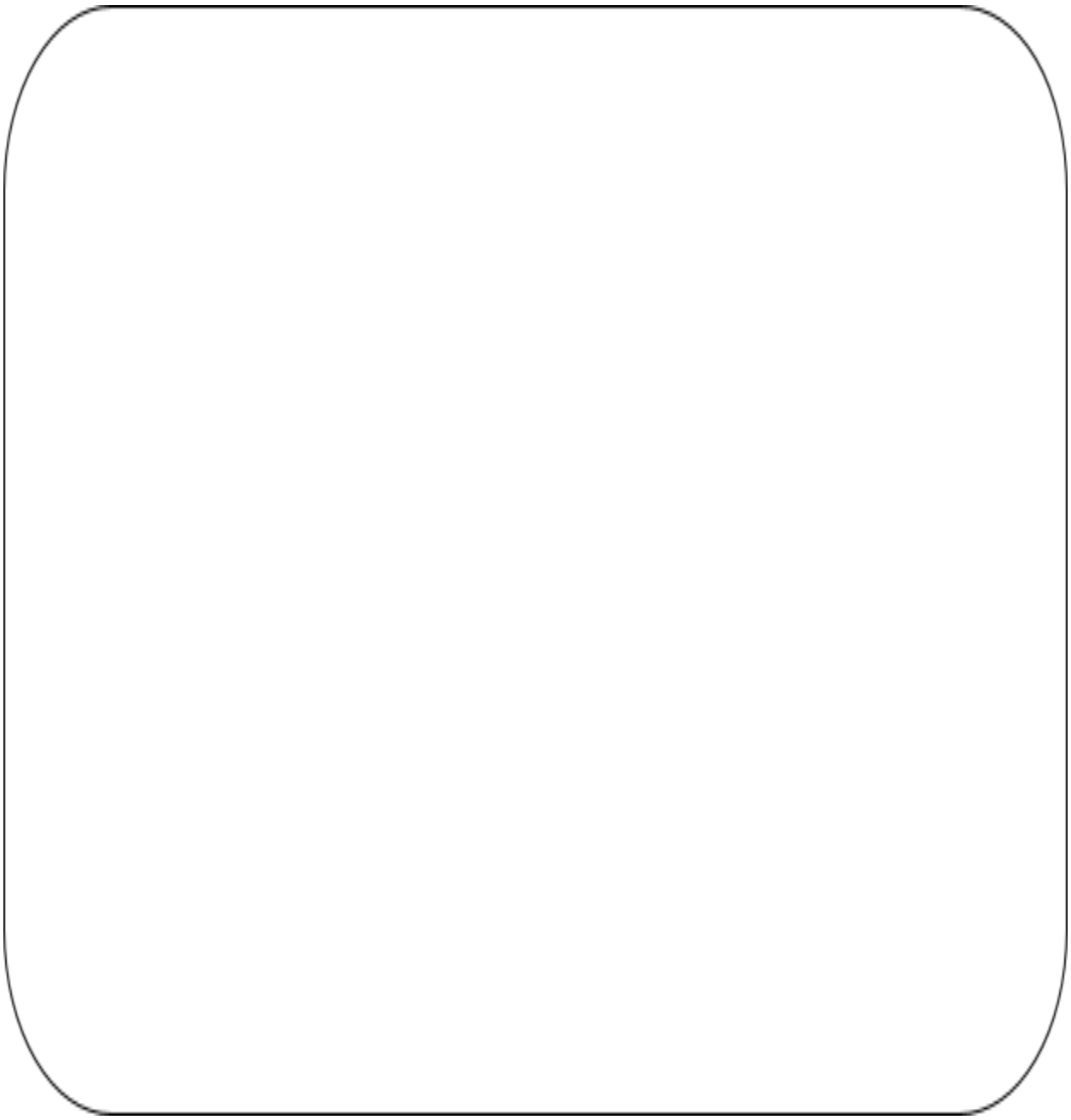
Japanese Beetle

- CA.gov: https://tinyurl.com/CA-jbeetle
- Wisconsin Horticulture: https://tinyurl.com/Wisc-jbeetle
- University of Minnesota Extension: https://tinyurl.com/beetle-trap
- Animal Diversity Web (ADW): https://tinyurl.com/ADW-jbeetle

Velvet Longhorned Beetle

- USU Extension: https://tinyurl.com/USU-velvet-longhorned
- University of Minnesota Extension: https://tinyurl.com/UoM-vlb
- Minnesota Department of Agriculture: https://tinyurl.com/MNDOA-vlb
- Cornell University (PDF): https://tinyurl.com/cornell-vlb

Step 4: Use the resources on the previous page to learn about what your insect looks like. Draw a **sketch** of the insect. Label at least **three parts** of the insect.



Step 5: Answer the questions below about your insect.

Field Biologist's Insect Report

Name of your insect: _____

1. Where did your insect come from (country or part of the world)?

2. Draw and label the lifecycle of your insect.

3. Where does your insect live? (i.e. Does it live in trees? Does it live in the dirt?)

4. What does your insect eat?

5. Describe what your insect does (i.e., Does it fly? Is it active in warm weather or cold weather?)

6. **How** did your insect get to Utah, and **when** did it come to Utah?

7. What have other people done to trap the insects?

Step 6: Engineers want to know how and why things work. An engineer is a person who does research, designs, and builds things to solve problems. Anything that is built must be engineered, or planned out. Engineers go through multiple designs before choosing the best one.

With your group, think of 3 types of engineers and what they do.

1._____ What they do _____

2._____ What they do _____

3._____ What they do _____

Building Paper Airplanes

Step 7: Now you will become engineers. You and your partner will get two pieces of paper. Make one paper airplane.

Step 8: When your teacher says you can, test how far it can fly.

Step 9: Brainstorming is an important part of engineering. Brainstorming is coming up with a lot of ideas in order to find the best idea. With your group, review the tips for brainstorming below.

Tips for Brainstorming

Step 10: Using the tips above, brainstorm with your group how to make your airplane better. Make a second paper airplane and see if it flies further.

Trap Design

Now that we know about the problem, we can work to solve it.

Step 1: Class Discussion: What types of insect traps have you seen? How do they work?

Most insect traps have two important parts:

- Something that draws the insect to the trap. This is called a **lure**. Lures can be food, light, colors, smells, or anything else the insect likes. Some traps use more than one lure.
- Something that keeps the insect in, on, or around the trap. There are many ways that insect trap engineers use to keep insects from escaping.

Step 2: By yourself, brainstorm **one** insect trap design. Draw it below. Look at your research. (HINT: Look at their life cycle and what they eat.)

Step 3: Get together with your group and take turns sharing your ideas and your trap designs.

Step 4: With your group, draw one trap design with the materials list on page 24. These materials will be available for you when you begin building. Use any ideas that you liked from your individual drawings.

Step 5: Think about your group design.

1. What makes your group design creative?

2. How do you know your group design will catch your insect?

Materials

Paint	Dish soap	Japanese beetle pheromones
Soda bottles/soda cans	Aluminum baking pans	Twine
Cardboard boxes	Push pins	Glue
Large fruit (apples, etc.)	Duct tape	Screen mesh
Small fruit (raspberries, etc.)	Toothpicks	Sugar
Wooden dowels	Funnels	Battery-powered lights
Paper	Vinegar	Twigs and leaves
Essential oils	Baking soda	

Step 6: Trade one notebook from your team with one other team. Complete the Feedback Form below for their trap. Remember that we are providing feedback on the trap, not the person.

Feedback Form

Completed by _____

Name of the group members providing feedback

Did the other group…?	Yes/No
Tell the name of they insect they are studying	
Tell you what stage of the insect's life cycle is good for catching	
Create a trap within budget	
Make a creative trap (colors, interesting design details, original ideas)	
Explain how their trap works (lure, etc.)	
Explain how they will keep their trap working (such as when to add more lure)	

Feedback Form

After the presentation, what suggestions do you have to improve the other group's trap?

1)

2)

Step 7: Return the notebook to the other team.

Step 8: Make at least one change to your design and draw your final trap below.

Drawing with Labels and Arrows

Name of your insect _____

Name of your trap _____

Step 9: Label the parts of the trap, and draw arrows to show how it works.

Budgeting for and Building a Trap

Bring your solution to life by “buying” materials and building an insect trap.

Step 1: Use the table to plan what you'll buy with **$20.**

Fill in **How many** and the **Cost** for each thing you want to buy.

Make sure you do not spend more than **$20 for all your supplies!**

Materials	Cost of item	How many?	Cost
Cardboard boxes	$1 per box		
Soda bottles OR soda cans	$1.00 each		
Small fruit (cherries, raspberries, etc.)	$1 per 1 fruit		
Large fruit (apples, apricots, etc.)	$1 per 1 fruit		
Twigs and leaves	$1 per bundle		
Japanese beetle pheromones	$1.00 per unit		
Battery-powered lights	$1.00 each		
Wooden dowels	$1 for 5 dowels		
Dish soap	$1 per ounce		
Aluminum baking pans	$1.00 each		
Push pins	$1 per 5 pins		
Duct tape	$1 per 3 feet		
Toothpicks	$1 for 10 toothpicks		
Funnels	$1.00 each		
Twine	$1 per 3 feet		
Screen mesh	$1 per square foot		
Glue	$1 per ounce		
Sugar	$1 per tablespoon		
Paper	$1 per 10 sheets		
Paint	$1 per ounce		
Vinegar	$1 per ounce		
Essential oils	$1 per 5 drops		
Baking soda	$1 per tablespoon		
		TOTAL COST	

Step 2: If the total cost of one trap is more than $20, you'll need to change your plan. In this case, talk with your group members to decide what you can do to save money, and list your changes below.

Changes:

_____

_____

Step 3: Buy the supplies you need from your teacher.

Step 4: Now it's time to **build your trap**! Make sure each member of your group is included in the building process.

Use your supplies carefully! If you need more supplies than you planned for, you'll have to go back to your teacher to buy more with any money left over from your $20. If you run out of supplies *and* money, you can trade with other groups.

After Building Your Trap

Step 5: Does the trap you built look like your final trap design? Yes / No (Circle one)
Why?

_____

_____

What about your trap are you most proud of?

_____

_____

Place Your Trap

Find the best location for your trap.

Step 1: As Engineers, your next job is to think about a good PLACE for your trap.

Look back at the research notes about your insect and answer the following questions.

What does your insect eat?

-
-

What smells, colors, sounds, etc. does your insect like?

-
-

Where does your insect live? (In trees, on the ground, under rocks)

-
-

Does your insect prefer inside or outside?

-

What weather does your insect like? (Hot, cool, rainy)

-
-

Step 2: With your group, think about places where you have seen insects around the museum over the past few days. Fill in the table with at least 2 places.

PLACE	**Why is this a good place? (Do you think your insect would be here? Is it near something they like to eat?)**	**Why might this not be a good place? (Is it too noisy? Is it the wrong temperature?)**

Step 3: In the table above, **circle** the place you think is best.

Step 4: When your teacher says you can, PLACE your trap in the place your group chose.

Educate Others

Engineers share their work with others. You and your group will create a presentation to tell people about the problem and how you're solving it.

Step 1: Let's see if your trap worked! When your teacher says you can, go to your trap and see if anything is missing or collected. If you didn't catch anything today, it may still be a great trap, but there was not enough time for your trap to work!

Here are some things to look for:

1. Is there anything in the trap (yes/no)? _____

   If so, what? _____

2. Is the lure still there or is it missing? _____

3. Are there any other signs that something visited your trap? If so, describe them.

   _____

   _____

Step 2: Class discussion - How many groups captured something in their trap? How many groups captured their insect? How many groups noticed that **something** had visited their trap? What signs did your group see?

Creating Presentations

Step 3: The staff at the Natural History Museum of Utah asked you to help with the problem of invasive insects. You and your group will create a short presentation (about 5 minutes) to tell them how you solved this problem.

With your group, decide which format you want to use for this presentation:

- Slideshow
- Poster

Below is a list of information that should be included in your presentation. Feel free to take notes on this page before making the presentation.

- **The title of your presentation and the name of your trap**

- **The name of your insect and why it is a problem**

- **How the trap works**
    - You can show and demonstrate the trap you built through pictures or in person. You may also want to include a sketch or a diagram.

- **Why is your trap a good solution?**

- **How is your trap creative?**

- **Pictures and other elements** that help make your presentation look good.

Step 4: Create your presentation.

Step 5: Group presentations - Each group will share with the rest of the class and the museum staff about their insect and trap design.

During your presentation remember to speak **loudly** and **slowly** so everyone can hear and understand.

During other presentations, be respectful of the group presenting.
Be sure to listen to their presentation - you may see their insects around Utah, too!

Bonus Activity: Animal Treasure Hunt

The Natural History Museum of Utah has a beautiful collection of animals. Your Treasure Hunt Task is to find at least one animal of every type.

Step 1: Make sure one person in your group is logged in to the ADW Pocket Guide website (https://pocketguides.animaldiversity.org/) on your iPad.

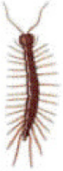
Step 2: Make sure everyone has their own notebooks, though you will be hunting as a group.

Step 3: Review the **Treasure Hunt Rules:**

1. Stay with your group. No one should be hunting alone.
2. Hunt respectfully - Other people may be browsing the museum. There should be no running. Talking is encouraged, but volume should be low.

Step 4: Your teacher will lead you to the museum collection. You may explore this area during your treasure hunt.

Step 5: When you find a new type of animal, circle the group in the table below. Then make a note of what specific animal you saw. If you're not sure, it's okay to guess which type of animal you have.

Type	Examples		Animal(s) Found
Insects		Grasshopper	
Arachnids		Wolf Spider	
Myriapods		Garden centipede	

Annelids		Earthworm	
Mollusks		Pillar snail	
Crustaceans		Pill Bug	
Amphibians		Red-spotted newt	
Fish		Smallmouth bass	
Mammals		Gray squirrel	
Birds		Sparrow	
Reptiles		Blanding's turtle	