Carmen and Ernie, Citizen Science: Frog and Toad Watch!

Grades 3-5

Vocabulary

life cycle
egg
embryo
frogspawn
tadpole
froglet
gills
metamorphosis
brumate
estivate
niche
adaptation
invasive species
indicator species
citizen scientist

Overview

In this lesson plan students will:

- Research information about a frog or a toad
- Compare the life cycles of 4 frog/toad species from the Chihuahuan Desert
- Understand the adaptations frogs and toads may have to survive their environments
- Understand the role of Citizen Scientists to the Scientific Community

TEKS Alignment

3.10C The student is expected to investigate and compare how animals and plants undergo a series of orderly changes in their diverse life cycles such as tomato plants, frogs, and lady beetles.

4.10C The student is expected to explore, illustrate, and compare life cycles in living organisms such as beetles, crickets, radishes, or lima beans.

5.9A The student is expected to observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components

5.9C The student is expected to predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways

5.10A The student is expected to compare the structures and functions of different species that help them live and survive in a specific environment such as hooves on prairie animals or webbed feet in aquatic animals.

THE SCIENCE BEHIND IT

In 3rd and 4th grade the knowledge and skills statements for life science address how organisms go through processes and structures that help them to survive in their environments. One such process is metamorphosis which is addressed in the following standards:

> 3.10 C the student will investigate and compare how animals and plants undergo a series of orderly changes in their diverse life cycles such as tomato plants, frogs and lady bugs
>
> 4.10 C the student will explore, illustrate and compare life cycles in living organisms such as butterflies, beetles, radishes or lima beans

In this unit students will be learning about frog metamorphosis and the adaptations that our local species (both native and invasive) have made to survive the Chihuahuan Desert. Students will find that our native species of frogs have developed adaptations to help them survive as they go through metamorphosis in an arid environment.

The word metamorphosis when broken down means, meta: changing, morph: shape. This word is used to describe animals that go through a physical structure change during its lifetime. This could be a complete structure change, like larvae to adult creature, or a partial change like gaining body parts such as wings as an adult. The majority of the animals on earth go through some type of metamorphosis during their life cycle. This is because the majority of the animals on this earth are insects. However, insects are not the only animals that can go through a metamorphosis, other animals such as fish, crustaceans, jellyfish and in this unit, amphibians, go through metamorphosis as well. Biologists believe these animals have evolved to experience metamorphosis as an aid to survival. When these animals are in their different stages of metamorphosis, they do not compete for the same food source and fulfil a different niche in their environment. For example, caterpillars do not compete for nectar with butterflies because their food source is the leaf of plants, tadpoles live in water and feed on water plants and microscopic animals at the beginning of their life cycle, which doesn't compete with their adult carnivore parents and so on.

Amphibians in the Desert?

An amphibian is a creature that lives part of its life in water and part on land. It may be strange to think that these creatures would be found in an arid place such as a desert, but amphibians are found in all environments with the exception of antarctica and they do so through adaptations.

If you are a native El Pasoan, then you may remember the bleeting of desert toads in an arroyo or reservoir after the summer rains. If you lived in the valley you may have seen frogs in the river, levees or irrigation ditches. You may have had an opportunity to collect tadpoles or small toads or frogs during the rainy season. However, when the rains dried up or the river stopped flowing, what happened to those toads and frogs when our desert became dry again?

Adaptations will be another focus for this lesson as we will be studying the adaptations that amphibians have made to survive in arid environments. In standard 5.10A students are asked to compare the structures and behaviors that help them survive within their environments. The student passages provided in this lesson will allow students to compare several species of frogs and toads not only through metamorphosis but also through adaptations in behavior, structures and functions.

El Paso Frogs and Toads

El Paso is home to several species of frogs and toads that are especially prominent during the rainy season and seem to disappear thereafter, however, just because a species isn’t easy to see doesn’t mean that it isn’t there. For some of our local species, especially the toads, adaptations in behavior and structure have allowed them to flourish in our mountains and deserts without the need for a steady water source.

In this lesson students will be researching different species of frogs and toads from this area, and may have questions regarding where the animals go when there isn't a rain or water in the rivers and arroyo streams. They may have noticed that the river doesn't contain water for parts of the year, so in that time, where do the frogs go? Both frogs and toads have the ability to slow down their metabolism in times of both severe cold temperatures as well as during hot temperatures. The act of slowing down metabolism to adapt to cold temperatures is called **brumation**. Reptiles and amphibians (cold blooded creatures) brumate by slowing down their metabolism. They may only come up for air or water but can go for months without food. They can either do this by burrowing into the ground, into mud or sinking down to the bottom of ponds. Frogs will travel distances in search of water sources once the river runs dry. They have been known to frequent water troughs for cattle and other water sources in the desert. Toads will brumate in burrows during the winter but can also estivate during hot weather. **Estivation** is when animals will burrow into the ground and slow down their metabolism so that they can handle hot temperatures. Some species of toad such as spadefoot, may only come out during the rainy season and can remain in torpor (slowed metabolism) during most of the year. Tadpoles also have the ability to slow down metabolism encapsulated in mud until the next rain or release of water from local dams. The Red Spotted Toad, a small toad that lives in rocky or mountainous areas, will live in cool damp crevices in the rocks during the day and will come out at night to feed. Only estivating, when necessary, these small toads have the ability to absorb water through their skin from the tiniest drops of dew or dampness of sand in order to become hydrated. They also can lose up to 40% of their water weight during extreme drought.

Even with these adaptations and life-saving behaviors, frogs and toads can have a hard time of it in their environment, thus the reason for the amount of spawn they lay per individual. It is not unusual for communities of frogs or toads to die off once the river has dried up or through years of drought. It is the few that can survive the harsh changes of nature that can have the ability to replenish the population once the rains or river water has returned. For frogs and toads in the Chihuahuan Desert, water is life!

This research-based lesson will involve articles that students will use to study species from four different El Paso environments: Spadefoot Toads in the desert arroyos, American Bullfrogs in the Rio Bosque Wetlands Park, Red Spotted Toads from the Franklin Mountains and Rio Grande Leopard Frogs from the Rio Grande River. Students will be researching their assigned species, writing a report on their assigned animal and create a metamorphosis diorama. They will also be encouraged to take part in a Frog Watch on iNaturalist.

Safety in the waterways: It is important for students to make sure that if they explore the desert, mountains or waterways that they bring an adult with them, especially during the rainy season. Flash flooding can occur in arroyos from rain that is happening miles away. Many arroyo paths look like hiking paths in the desert and can fill with rushing water quickly.

It is also important to note that this unit is encouraging students to take pictures of frogs and tadpoles **and NOT COLLECT** frogs or tadpoles from their natural environments. Amphibians can carry salmonella which is a bacterium that can cause intestinal tract infections. Toads also secrete poisons, that although are not deadly to humans, can also cause allergic reactions or intestinal problems. Always wash your hands after a nature walk or hike.

Engage: Carmen and Ernie Frog Watch Booklet and Question Generator

The Carmen and Ernie Frog Watch! booklet is to be used so that students can be introduced to the four main species of frog that will be studied in this research unit.

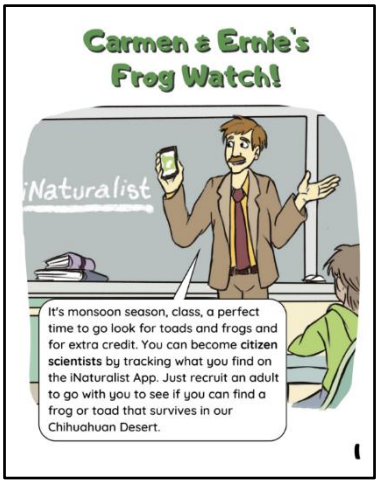
Guiding questions:

- What types of frogs and Toads are found in the Chihuahuan Desert?
- What types of environments meet the needs of desert frogs and toads?
- How can questioning skills help writers to create content for informational texts?

Materials

- Carmen and Ernie's Frog Watch Booklet (online or printed version)
- Carmen and Ernie's Question Generator Worksheet (one set of sheets per group of four students
- Video: Chihuahuan Desert Frogs and Toads Diorama
- Chart paper, marker
- Video Screen picture of a Green Tree Frog (image search through google or other search engine)

Procedure: Carmen and Ernie Frog Watch Booklet



1. **Distribute the booklets or share on student device the slideshow version of the booklet "Carmen and Ernie's Frog Watch!"** Before reading pose the following questions for discussion

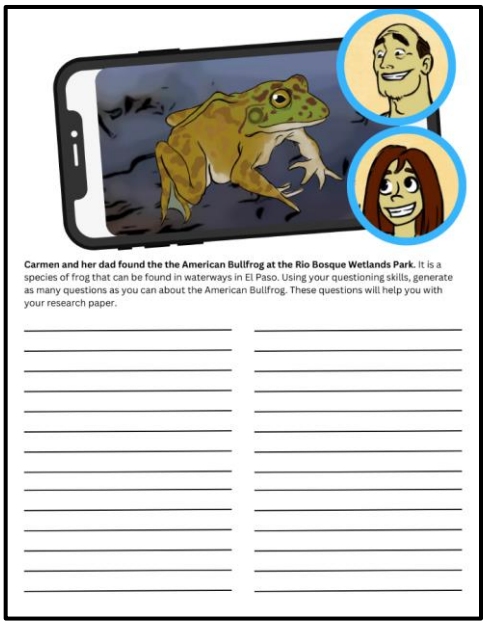
   - **What is a monsoon season?** If the students are unaware of the monsoon season, take some time to research the internet to discuss rainy seasons that happen in the southwest. Wikipedia describes the North American monsoon season occurring in late June and early July to September in the Southwestern United States.
   - **What type of frogs or toads have you experienced here in our environment?** Allow the students to share stories about frogs or toads that they have encountered while living in this area. Some students may not have stories to share depending on their neighborhood's location but as most neighborhoods are near some sort of drainage ditch, canal or arroyo, most students should have experiences to share with the class.
2. **Begin reading the booklet together in class. On page 2, Carmen and Ernie say that they will explore the area with a parent and an older brother. Pose the following question:**

- **Why do you think that it was important for Carmen and Ernie to go exploring with an adult?** Take this opportunity to discuss safety precautions while going out to the desert, mountains or near waterways.

3. **On pages 3, 4 and 5, Carmen and Ernie explore different locations such as the Rio Bosque Wetlands, the Franklin Mountains and desert arroyos to find toad and frog species from this area.** Take some time to allow students to share any experiences that they have had in these locations of the El Paso area**.**
4. **On page 8 of the booklet the students will read about the research assignment Have the students watch the video, "Chihuahuan Desert Frogs and Toads Diorama."** Explain to the students that they will be working in groups of four to create a diorama about their assigned frog or toad, however, they cannot get started on the diorama until after they have completed their research paper.

Procedure: Carmen and Ernie Research Question Generator

1. Once the students have been divided into groups of four, assign a frog species to each person of the group to research (Spadefoot Toad, Red-Spotted Toad, American Bullfrog and Rio Grande Leopard Frog.)
2. Show the class a picture of a Green Tree Frog. Tell them that this species of frog is not from this area, but that we are using this species to discuss the types of questions that can be used to research an animal.
3. Using a chart paper and marker, have the students brainstorm as many questions as they can generate that they would like to know about the green tree frog. (questions will vary but may include: How large does it grow? Where does it live? What is it's environment like? What does it eat? etc. Try to have them generate at least 20-30 questions.
4. If the class get's stuck, go over question words like Who, What, Where, When, Why and How, to see if they can construct more questions. Go over these questions with the class and ask the students if they see any questions that might be hard to answer through research.
5. Now that the students have had the experience of generating questions, have the students look at the picture of the frog that they have been assigned. You will give them 10 minutes to jot down as many questions that they can think of that they would like to know about their frog. If they have more questions than there are lines on the paper, have them use the back of the sheet to write down the rest of their questions.
6. Put the questions aside to refer to later in the lesson. After each reading, the students will revisit their questions to see if their questions were answered.



Carmen and her dad found the the American Bullfrog at the Rio Bosque Wetlands Park. It is a species of frog that can be found in waterways in El Paso. Using your questioning skills, generate as many questions as you can about the American Bullfrog. These questions will help you with your research paper.

EXPLORE: The Difference Between Frogs and Toads

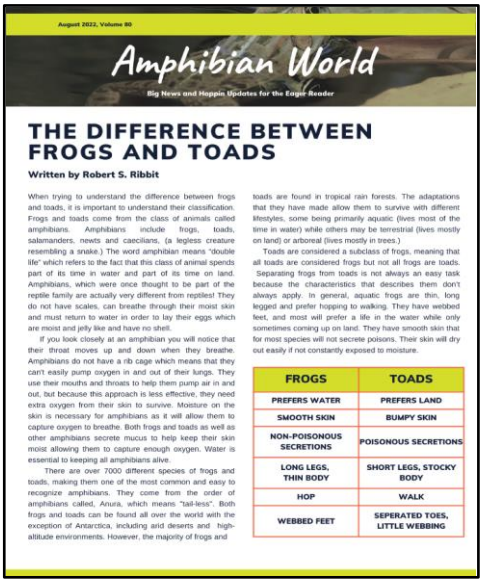
This article will be used to build content knowledge for the students on the topics of frogs and toads.

Guiding questions:

- What is an amphibian?
- What is the difference between frogs and toads?
- What problems might a scientist encounter when describing frogs and toads?

Materials

- The Difference Between Frogs and Toads Article



August 2022, Volume 80

Amphibian World

Big News and Hoppin Updates for the Eager Reader

THE DIFFERENCE BETWEEN FROGS AND TOADS

Written by Robert S. Ribbit

When trying to understand the difference between frogs and toads, it is important to understand their classification. Frogs and toads come from the class of animals called amphibians. Amphibians include frogs, toads, salamanders, newts and caecilians, (a legless creature resembling a snake.) The word amphibian means "double life" which refers to the fact that this class of animal spends part of its time in water and part of its time on land. Amphibians, which were once thought to be part of the reptile family are actually very different from reptiles! They do not have scales, can breathe through their moist skin and must return to water in order to lay their eggs which are moist and jelly like and have no shell.

If you look closely at an amphibian you will notice that their throat moves up and down when they breathe. Amphibians do not have a rib cage which means that they can't easily pump oxygen in and out of their lungs. They use their mouths and throats to help them pump air in and out, but because this approach is less effective, they need extra oxygen from their skin to survive. Moisture on the skin is necessary for amphibians as it will allow them to capture oxygen to breathe. Both frogs and toads as well as other amphibians secrete mucus to help keep their skin moist allowing them to capture enough oxygen. Water is essential to keeping all amphibians alive.

There are over 7000 different species of frogs and toads, making them one of the most common and easy to recognize amphibians. They come from the order of amphibians called, Anura, which means "tail-less". Both frogs and toads can be found all over the world with the exception of Antarctica, including arid deserts and high-altitude environments. However, the majority of frogs and toads are found in tropical rain forests. The adaptations that they have made allow them to survive with different lifestyles, some being primarily aquatic (lives most of the time in water) while others may be terrestrial (lives mostly on land) or arboreal (lives mostly in trees.)

Toads are considered a subclass of frogs, meaning that all toads are considered frogs but not all frogs are toads. Separating frogs from toads is not always an easy task because the characteristics that describes them don't always apply. In general, aquatic frogs are thin, long legged and prefer hopping to walking. They have webbed feet, and most will prefer a life in the water while only sometimes coming up on land. They have smooth skin that for most species will not secrete poisons. Their skin will dry out easily if not constantly exposed to moisture.

FROGS	TOADS
PREFERS WATER	PREFERS LAND
SMOOTH SKIN	BUMPY SKIN
NON-POISONOUS SECRETIONS	POISONOUS SECRETIONS
LONG LEGS, THIN BODY	SHORT LEGS, STOCKY BODY
HOP	WALK
WEBBED FEET	SEPERATED TOES, LITTLE WEBBING

Procedure: Amphibian World Article, "The Difference Between Frogs and Toads"

Before reading the article, the teacher may want to have the students look over the article and discuss the title, pictures, tables and other text features. Discuss what type of text this is (informational) and what type of informational text structure that it has (comparative.)

The students may read the article alone, in groups or as a class and discuss it's content. The graphic organizer in the next activity will serve as a note taker for this article so that students can collect and remember information.

EXPLAIN: Informational Text: Compare and Contrast Venn Diagram

Guiding questions:

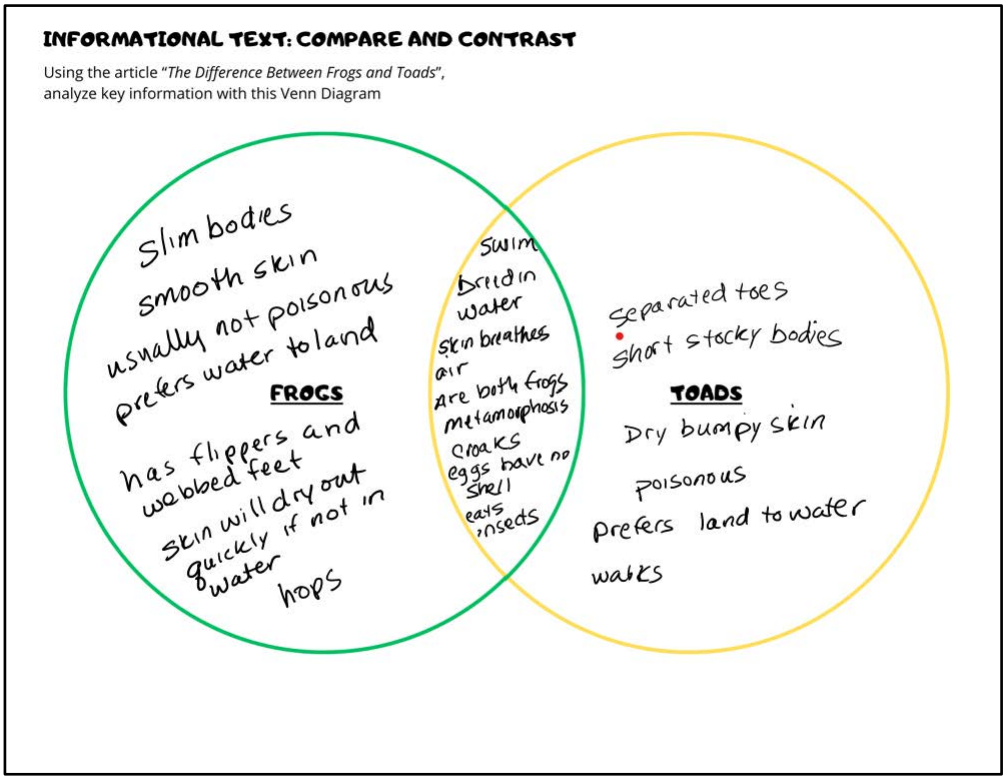
- How do comparative text structures help with author's purpose?
- What type of graphic organizers help us to organize comparative texts?

Materials

- The Difference Between Frogs and Toads Article
- Informational Text Compare and Contrast Venn Diagram
- Research Question Generator list of questions
- Pencil

Procedure: Informational Text: Compare and Contrast Venn Diagram

1. Students will work in pairs using facts from the article to determine characteristics of frogs and toads, noting where the circles overlap is what both frogs and toads have in common. Possible answers are represented in the example below:

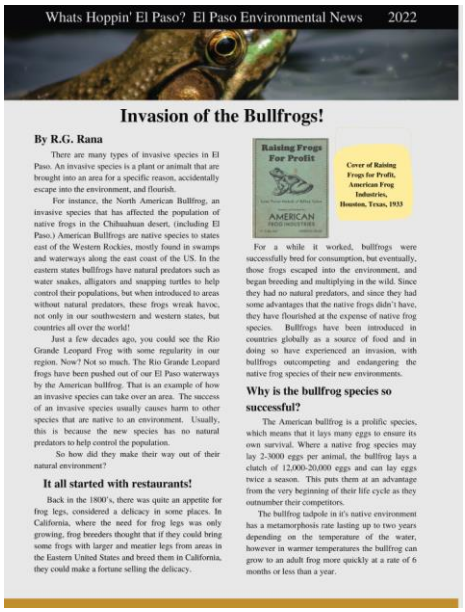


2. Have student groups share out their answers with the class. Students may add information to their Venn Diagrams if they hear information that they hadn't considered for their Venn.
3. Have the students get out their **Question Generator List** and review their questions. Students will place a circle symbol O next to any question that was answered by the information given in the article about frogs and toads. Example:

EXPLORE: What's Hoppin' El Paso? Invasion of the Bullfrogs!

Guiding questions:

- What is an invasive species?
- What are the effects of changes in ecosystems caused by living organisms, including humans?
- How can we compare the structures and functions of different species that help them live, survive and compete in a specific environment?



Whats Hoppin' El Paso? El Paso Environmental News 2022

Invasion of the Bullfrogs!

By R.G. Rana

There are many types of invasive species in El Paso. An invasive species is a plant or animalt that are brought into an area for a specific reason, accidentally escape into the environment, and flourish.

For instance, the North American Bullfrog, an invasive species that has affected the population of native frogs in the Chihuahuan desert, (including El Paso.) American Bullfrogs are native species to states east of the Western Rockies, mostly found in swamps and waterways along the east coast of the US. In the eastern states bullfrogs have natural predators such as water snakes, alligators and snapping turtles to help control their populations, but when introduced to areas without natural predators, these frogs wreak havoc, not only in our southwestern and western states, but countries all over the world!

Just a few decades ago, you could see the Rio Grande Leopard Frog with some regularity in our region. Now? Not so much. The Rio Grande Leopard frogs have been pushed out of our El Paso waterways by the American bullfrog. That is an example of how an invasive species can take over an area. The success of an invasive species usually causes harm to other species that are native to an environment. Usually, this is because the new species has no natural predators to help control the population.

So how did they make their way out of their natural environment?

It all started with restaurants!

Back in the 1800's, there was quite an appetite for frog legs, considered a delicacy in some places. In California, where the need for frog legs was only growing, frog breeders thought that if they could bring some frogs with larger and meatier legs from areas in the Eastern United States and breed them in California, they could make a fortune selling the delicacy.

Cover of Raising Frogs for Profit, American Frog Industries, Houston, Texas, 1933

For a while it worked. bullfrogs were successfully bred for consumption, but eventually, those frogs escaped into the environment, and began breeding and multiplying in the wild. Since they had no natural predators, and since they had some advantages that the native frogs didn't have, they have flourished at the expense of native frog species. Bullfrogs have been introduced in countries globally as a source of food and in doing so have experienced an invasion, with bullfrogs outcompeting and endangering the native frog species of their new environments.

Why is the bullfrog species so successful?

The American bullfrog is a prolific species, which means that it lays many eggs to ensure its own survival. Where a native frog species may lay 2-3000 eggs per animal, the bullfrog lays a clutch of 12,000-20,000 eggs and can lay eggs twice a season. This puts them at an advantage from the very beginning of their life cycle as they outnumber their competitors.

The bullfrog tadpole in it's native environment has a metamorphosis rate lasting up to two years depending on the temperature of the water, however in warmer temperatures the bullfrog can grow to an adult frog more quickly at a rate of 6 months or less than a year.

Materials

What's Hoppin' El Paso? Article, "Invasion of the Bullfrogs!"

Procedure: What's Hoppin' El Paso? Article, "Invasion of the Bullfrogs!"

Before reading the article, the teacher may want to have the students look over the article and discuss the title, pictures, tables and other text features. Discuss what type of text this is (informational) and what type of informational text structure that it has (cause and effect.)

The students may read the article alone, in groups or as a class and discuss its content. The graphic organizer in the next activity will serve as a note taker for this article so that students can collect and remember information.

EXPLAIN: Informational Text: Cause and Effect Graphic Organizer

Guiding questions:

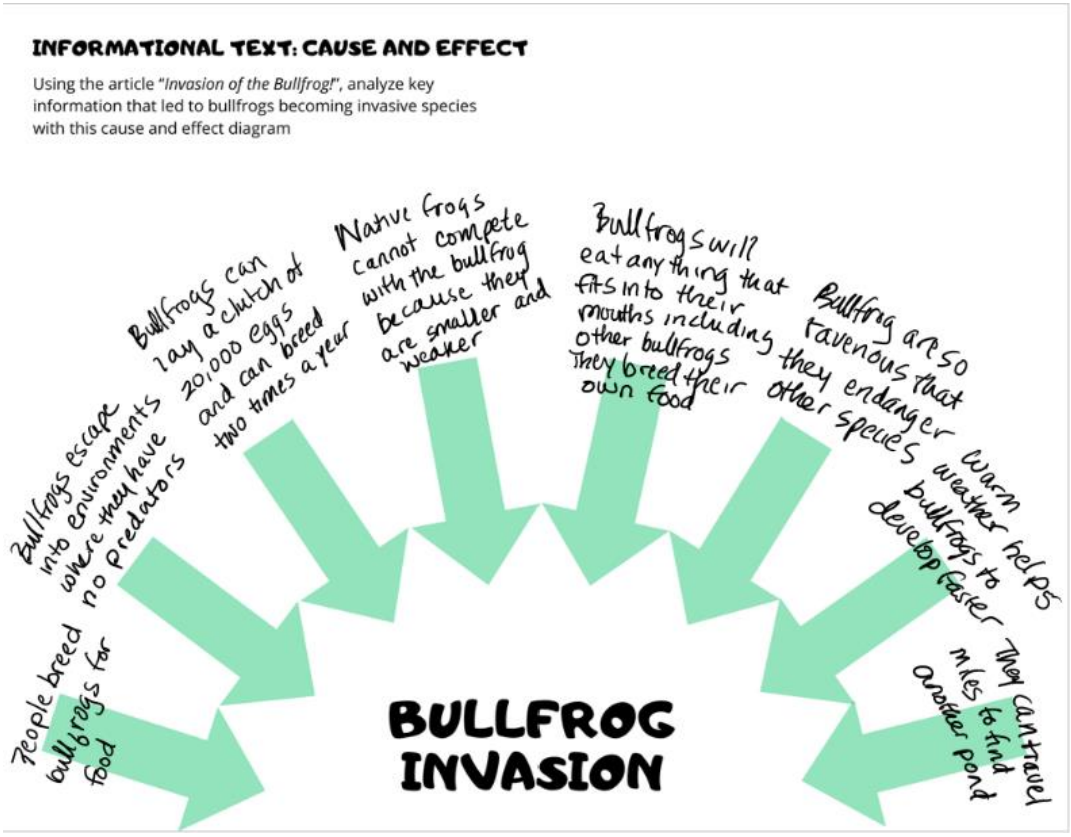
- How do cause and effect text structures help with author's purpose?
- What type of graphic organizers help us to organize cause and effect texts?

Materials

- Informational Text: Cause and Effect Graphic Organizer
- Carmen and Ernie's Question Generator Worksheet
- Pencil

Procedure: Informational Text: Cause and Effect Graphic Organizer

1. Students will work in pairs using facts from the article to determine the causes that led to a bullfrog invasion. Possible answers are represented in the example below:



2. Have student groups share out their answers with the class. Students may add information to their Cause-and-Effect Diagram if they hear information that they hadn't considered.

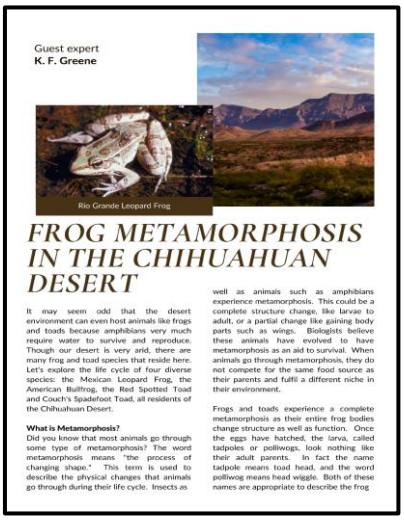
3. Have the students get out their **Question Generator List** and review their questions. Students will place an arrow symbol ➔ next to any question that was answered by the information given in the article "Invasion of the Bullfrogs!" Example:

➔What do Bullfrogs eat?

EXPLORE: Metamorphosis of Frogs in the Chihuahuan Desert

Guiding questions:

- What types of frogs and Toads are found in the Chihuahuan Desert?
- What types of environments meet the needs of desert frogs and toads?
- How do we compare how animals undergo a series of orderly changes in their diverse life cycles?


Guest expert
K. F. Greene

Rio Grande Leopard Frog

FROG METAMORPHOSIS IN THE CHIHUAHUAN DESERT

It may seem odd that the desert environment can even host animals like frogs and toads because amphibians very much require water to survive and reproduce. Though our desert is very arid, there are many frog and toad species that reside here. Let's explore the life cycle of four diverse species: the Mexican Leopard Frog, the American Bullfrog, the Red Spotted Toad and Couch's Spadefoot Toad, all residents of the Chihuahuan Desert.

What is Metamorphosis?

Did you know that most animals go through some type of metamorphosis? The word metamorphosis means "the process of changing shape." This term is used to describe the physical changes that animals go through during their life cycle. Insects as well as animals such as amphibians experience metamorphosis. This could be a complete structure change, like larvae to adult, or a partial change like gaining body parts such as wings. Biologists believe these animals have evolved to have metamorphosis as an aid to survival. When animals go through metamorphosis, they do not compete for the same food source as their parents and fulfil a different niche in their environment.

Frogs and toads experience a complete metamorphosis as their entire frog bodies change structure as well as function. Once the eggs have hatched, the larva, called tadpoles or polliwogs, look nothing like their adult parents. In fact the name tadpole means toad head, and the word polliwog means head wiggle. Both of these names are appropriate to describe the frog

Materials

- Metamorphosis of Frogs in the Chihuahuan Desert Article
- Highlighters, pencils

Procedure: Metamorphosis of Frogs in the Chihuahuan Desert Jigsaw Activity

This is a multi-page article that will be used to provide information for their research paper writing activity. For this reason, it is not recommended that the students read the entire article. Instead, students will use a jigsaw activity to report out to their home group what they learned about their frog's metamorphosis.

1. Together as a class all students will read the article introduction up to the Rio Grande Leopard Frog sub header.
2. Using the same assigned groups that did the Question Generator activity, each student will be assigned a reading passage from the article based on their assigned frog. For example, if a student is assigned the Rio Grande Leopard Frog, he will only read the section about the Rio Grande Leopard Frog, the student assigned the American Bullfrog will read the section on the American bullfrog, and so on.
3. Jigsaw: In this activity, the students who have the same animal will meet in the four corners of the room to read and discuss their section (one frog per corner.) Their job will be to explain the four parts of their frog's life cycle to their home group. They must bring back information about the egg, tadpole, froglet and adult parts of the cycle. They can read the article passage together, out loud, take turns by paragraph, etc. Once they have finished reading, they will discuss the parts of the cycle with their home group. This activity will last 15-20 minutes.

EXPLAIN: Informational Text: Sequential Order Graphic Organizer

Guiding questions:

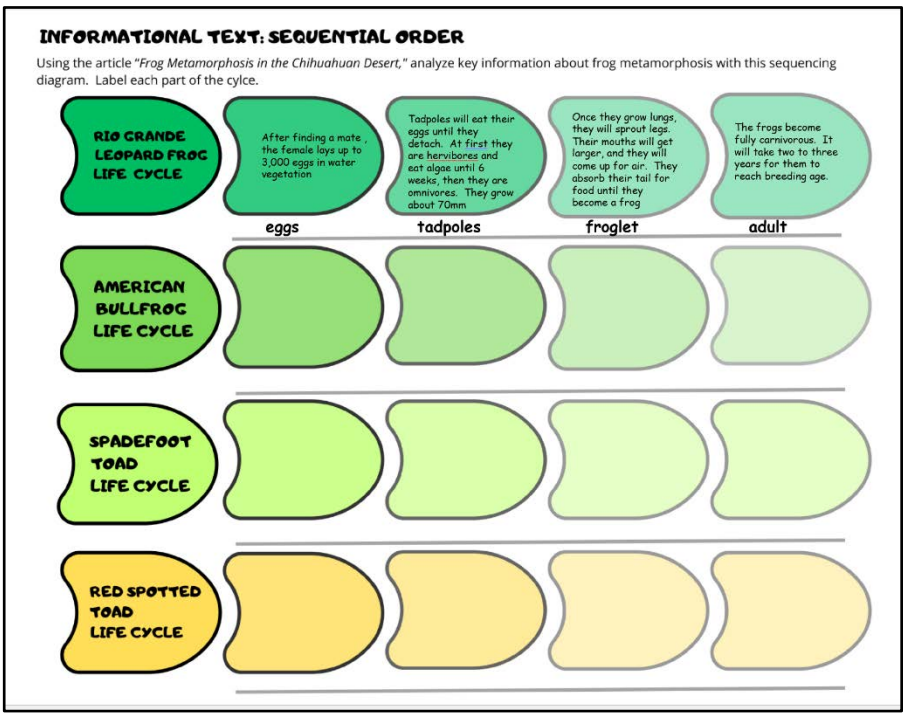
- How do sequencing text structures help with author's purpose?
- What type of graphic organizers help us in sequencing texts?

Materials

- Informational Text Sequential Order Graphic Organizer
- Metamorphosis of Frogs in the Chihuahuan Desert Article
- Pencil
- Carmen and Ernie's Question Generator Worksheet

Procedure: Informational Text: Sequential Order Graphic Organizer

1. Students will share out what they learned in the Jigsaw activity and as they share out they will take notes on each frog species metamorphosis by filling out the graphic organizer. Possible answers are represented in the example below:



2. Have student groups share out their answers with the class. Students may add information to their Sequencing Diagram if they hear information that they hadn't considered.

3. Have the students get out their Question Generator List and review their questions. Students will place an **M** symbol next to any question that was answered by the information given in the article "Metamorphosis of Frogs in the Chihuahuan Desert." Example:

M What sounds does it make?

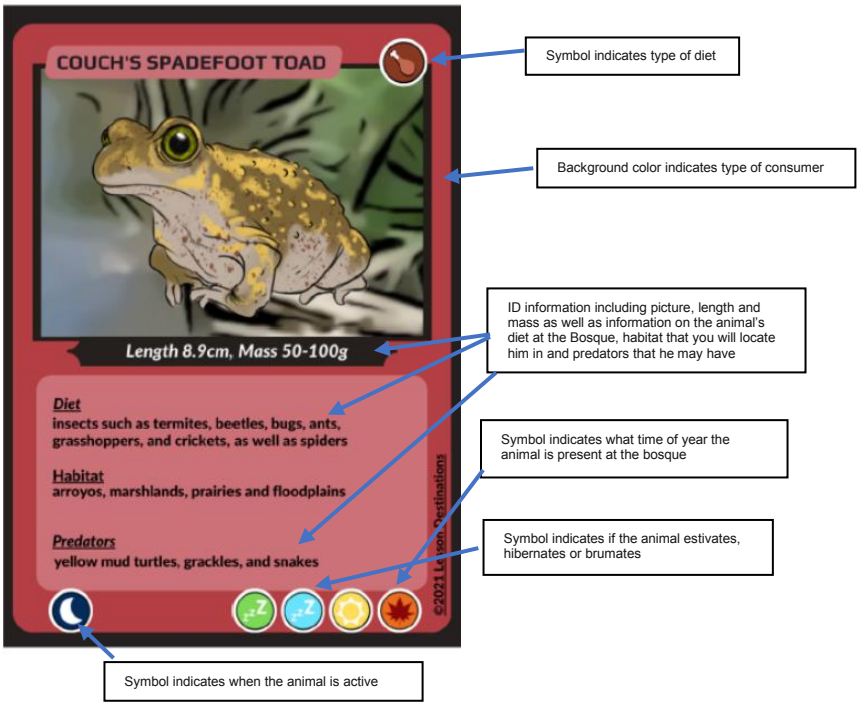
EXPORE: Web Deck Cards

Guiding questions:

- What types of environments meet the needs of desert frogs and toads?
- How do desert frogs fit into the Chihuahuan Desert food web?
- How can symbols and colors help the author to convey meaning?

Materials

- Frog Web Deck Cards
- Rio Bosque Web Deck Cards (optional)
- Cardstock



Procedure: Informational Text Resource: Web Deck Cards

In the "Migration Station" unit, students were given a 72 card web deck card set to build food chains and food webs from the Rio Bosque Wetlands. The web deck provides information on animals in a food web, giving such information as diet, habitat and predators as well as average size and mass. In the booklet, "Carmen and Ernie's Frog Watch", Ernie is using web deck cards that he has collected to help him to identify native frogs. In this explore activity, each student will be given a web deck card depicting the animal that they are researching, and they will investigate them to determine what the information on the card means.

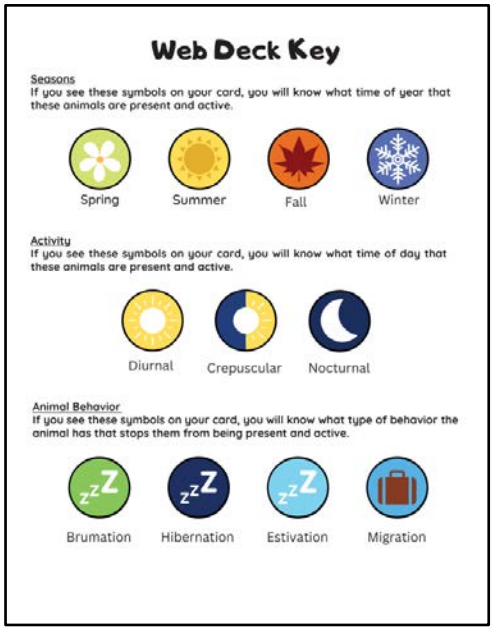
1. Make copies of the web deck cards on cardstock and have the cards cut out before distributing to students.
2. Pose questions to the class, such as "What type of information do you think that we can gather from the information on these cards?" Possible *answers may be: diet, habitat, predators, what their environment looks like, their name.*
3. Ask the question, "There are different symbols on these cards, what do you think that the symbols might mean?" *Possible answers may be: season, when they are active, if they are carnivores.*
4. Once the students have predicted what the card symbols might mean, it is time to introduce the Web Deck Card Key and Guide to the students.

Extension: Students can investigate the Rio Bosque Web Deck Cards to gather further evidence from the cards.

EXPLAIN: Web Deck Card Key and Guide

Guiding questions:

- What other types of resources other than written articles can be used to gather information about animals?
- What is the purpose of using symbols and colors to represent information?
- How can questioning skills help writers to create content for informational texts?



Materials

- Frog Web Deck Cards
- Web Deck Key and Web Deck Card Guide
- Rio Bosque Web Deck Cards (optional)
- Carmen and Ernie's Question Generator Worksheet

Procedure: Informational Text Resource: Web Deck Cards Key and Guide

1. Have the students look at the Rio Bosque Web Deck Key to decode the cards and what they mean.
2. Pose the following questions to each group and have them answer each question regarding their frog:
    - What time of day is your frog most active?
    - What happens to your frog during the winter?
    - Does your frog brumate or estivate? What do these terms mean?
    - Is your frog an herbivore, carnivore or omnivore?

    Discuss what they found out about each species of frog with the whole class
3. Have the students get out their **Question Generator List** and review their questions. Students will place the symbol **W** next to any question that was answered by the information given by the Web Deck Cards. Example:

ELABORATE: Chihuahuan Desert Frog and Toad Diorama

Guiding questions:

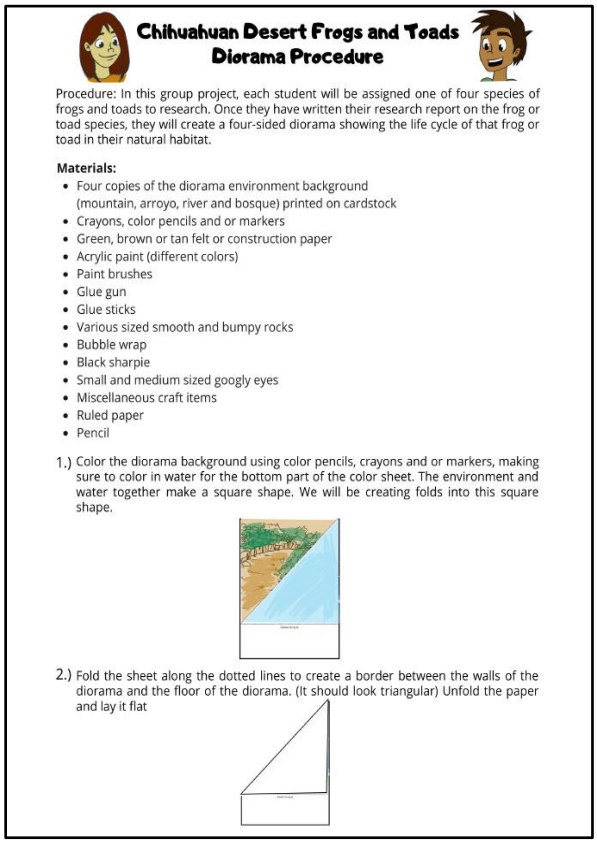
- In what ways do frogs change and go through their life cycles?
- How are the life cycles of different species of frog alike and different?
- What environmental factors have an influence on the frog life cycle?

Materials

- "Metamorphosis of Frogs in the Chihuahuan Desert" Article
- Sequential Order Graphic Organizer
- Frogs and Toads Diorama Procedure pages
- Chihuahuan Desert Frogs and Toads Diorama How To VIDEO
- Four copies of the diorama environment background (mountain, arroyo, river and bosque) printed on cardstock for each group
- Crayons, color pencils and or markers
- Green, brown or tan felt or construction paper
- Acrylic paint (different colors)
- Paint brushes
- Glue gun
- Glue sticks
- Various sized smooth and bumpy rocks
- Bubble wrap
- Black sharpie
- Small and medium sized googly eyes
- Miscellaneous craft items
- Ruled paper
- Pencil

Procedure: Chihuahuan Desert Frog and Toad Diorama

This activity can be done before or after writing the research paper on desert frogs, however, the students should do this activity after they have read the article about their frog's metamorphose cycle. This article is titled: "Metamorphosis of Frogs in the Chihuahuan Desert". In this article each species life cycle is described in detail, so if your students have not read this article or completed the graphic organizer used with the activity, it would help to do this prior to making the diorama as the information in this article will help your students to create their frog's life cycle model.



Chihuahuan Desert Frogs and Toads Diorama Procedure

Procedure: In this group project, each student will be assigned one of four species of frogs and toads to research. Once they have written their research report on the frog or toad species, they will create a four-sided diorama showing the life cycle of that frog or toad in their natural habitat.

Materials:

- Four copies of the diorama environment background (mountain, arroyo, river and bosque) printed on cardstock
- Crayons, color pencils and or markers
- Green, brown or tan felt or construction paper
- Acrylic paint (different colors)
- Paint brushes
- Glue gun
- Glue sticks
- Various sized smooth and bumpy rocks
- Bubble wrap
- Black sharpie
- Small and medium sized googly eyes
- Miscellaneous craft items
- Ruled paper
- Pencil

1.) Color the diorama background using color pencils, crayons and or markers, making sure to color in water for the bottom part of the color sheet. The environment and water together make a square shape. We will be creating folds into this square shape.

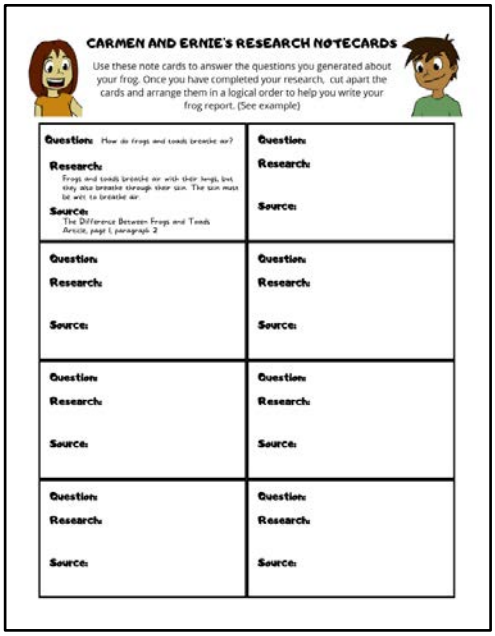
2.) Fold the sheet along the dotted lines to create a border between the walls of the diorama and the floor of the diorama. (It should look triangular) Unfold the paper and lay it flat

1. Gather materials for creating the diorama for the groups. Each group will need the procedures for creating the model as well as the environment for each frog printed on card stock so that the background will be able to stand on its own.
2. After reading through the procedure with the class it is a good idea to watch the accompanying video so that the students get an idea of how to construct their model.
3. Materials for building the frogs, eggs and tadpoles can be given to each group or a table can be set up with materials to construct the model so that students can choose which materials they would like to use to construct the life cycle.
4. Cool temperature glue guns work best for this project, but students will still need to be monitored while using this type of equipment.
5. Be sure to provide an area in the classroom dedicated to drying the painted rocks. Newspaper or plastic table coverings (like those used for parties) are great to use during this project so that the acrylic paints do not spill onto desks or tables.
6. Be sure to use acrylic paints and not tempera paints. Tempera will dry and flake off of the rock. Acrylic paints are more adhesive to the rock surface.
7. Each environment is a fourth of the diorama. When all four environments are back against each other they create a complete diorama. Each report can then be attached to the diorama and these projects can be shown during parent nights or in the school library.

EVALUATE: Frog/Toad Research Paper

Guiding questions:

- How can I collect, record and analyze research information using tools?
- Why is it important to find multiple sources of information when doing research?
- How can questioning skills help writers to create content for informational texts?

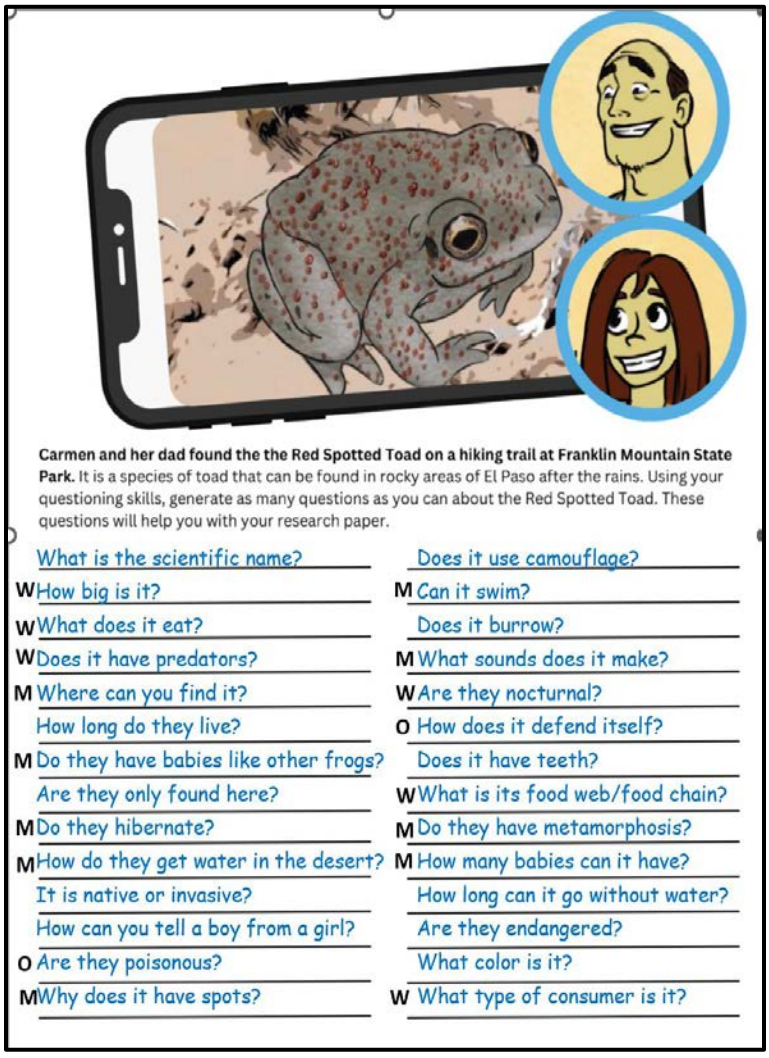


Materials

- Carmen and Ernie's Question Generator Worksheet
- Carmen and Ernie's Research Notecards (2 sheets per student) (or index cards)
- Frog Articles:
    - The Difference Between Frogs and Toads
    - The Invasion of the Bullfrogs
    - Metamorphosis of Frogs in the Chihuahuan Desert
- Web Deck Cards and Key Guide
- Graphic organizers for the articles
- Internet and computer
- Books on frogs or nature guides
- Scissors
- Pencils
- highlighters

Procedure: Carmen and Ernie's Research Notecards

In this activity students will be taking notes to answer questions that they generated on their Question Generator Worksheet. Throughout the lesson students will have indicated next to each question where they may have found the answer to the question through the resources given in this unit. Their Question Generator Sheet may look something like this:



Carmen and her dad found the the Red Spotted Toad on a hiking trail at Franklin Mountain State Park. It is a species of toad that can be found in rocky areas of El Paso after the rains. Using your questioning skills, generate as many questions as you can about the Red Spotted Toad. These questions will help you with your research paper.

What is the scientific name?	Does it use camouflage?
W How big is it?	M Can it swim?
W What does it eat?	Does it burrow?
W Does it have predators?	M What sounds does it make?
M Where can you find it?	W Are they nocturnal?
How long do they live?	O How does it defend itself?
M Do they have babies like other frogs?	Does it have teeth?
Are they only found here?	W What is its food web/food chain?
M Do they hibernate?	M Do they have metamorphosis?
M How do they get water in the desert?	M How many babies can it have?
It is native or invasive?	How long can it go without water?
How can you tell a boy from a girl?	Are they endangered?
O Are they poisonous?	What color is it?
M Why does it have spots?	W What type of consumer is it?

By writing a symbol next to the question indicating which article or resource gave the answer to the question, the student is now able to go back to the article and find the information.

Some of the questions may not be able to be answered through the articles. In this case the student may have to do their own research in order to answer the question.

1. Students will use the Question Generator Sheet questions to fill in each of the research question cards that they would most like to use for their research paper on their frog.
2. The symbols that they have made next to their questions will give them an idea of which resource that they will use to answer the question.
3. The students must site their source of information including title of article or card, page number and paragraph
4. If the question cannot be answered by the provided resources they can search for the answer on the internet, however, they must site their sources of information when they reach an answer
5. Students should be directed to answer the questions by putting the answer in their own words and to NOT copy down the answer verbatim so that they are not plagiarizing the information they have collected.

Once the questions have been answered it may look something like this:

CARMEN AND ERNIE'S RESEARCH NOTECARDS

Use these note cards to answer the questions you generated about your frog. Once you have completed your research, cut apart the cards and arrange them in a logical order to help you write your frog report. (See example)

Question: How do frogs and toads breathe air?

Research:
Frogs and toads breathe air with their lungs, but they also breathe through their skin. The skin must be wet to breathe air.

Source:
The Difference Between Frogs and Toads Article, page 1, paragraph 2

Question: How big is it?

Research:
Red Spotted Toads average size is 3.7-7.5 cm and can weigh from 50-100 g

Source:
Red Spotted Toad Web Deck Card

Question: What does it eat?

Research:
As tadpoles they eat algae and but as toads they eat small amphibians, spiders and insects such as beetles, ants and bees

Source:
Red Spotted Toad Web Deck Card
Metamorphosis of Desert Frogs Pg 5 paragraph 4

Question: Does it have predators?

Research:
Red Spotted Toads can be eaten by raccoons, foxes, coyotes, owls, hawks, salamanders and snakes.

Source:
Red Spotted Toad Web Deck Card

Question: Where can you find them?

Research:
These small toads can be found in mountain areas and rocky arroyos.

Source:
Metamorphosis of Desert Frogs Pg 5 paragraph 1

Question: Can it swim?

Research:
Toads can swim and will lay their eggs in water. Their babies are tadpoles and they swim in water.

Source:
The Difference Between Frogs and Toads Article, page 2, paragraph 2 and 3

Question: Are they nocturnal?

Research:
Red Spotted Toads are nocturnal.

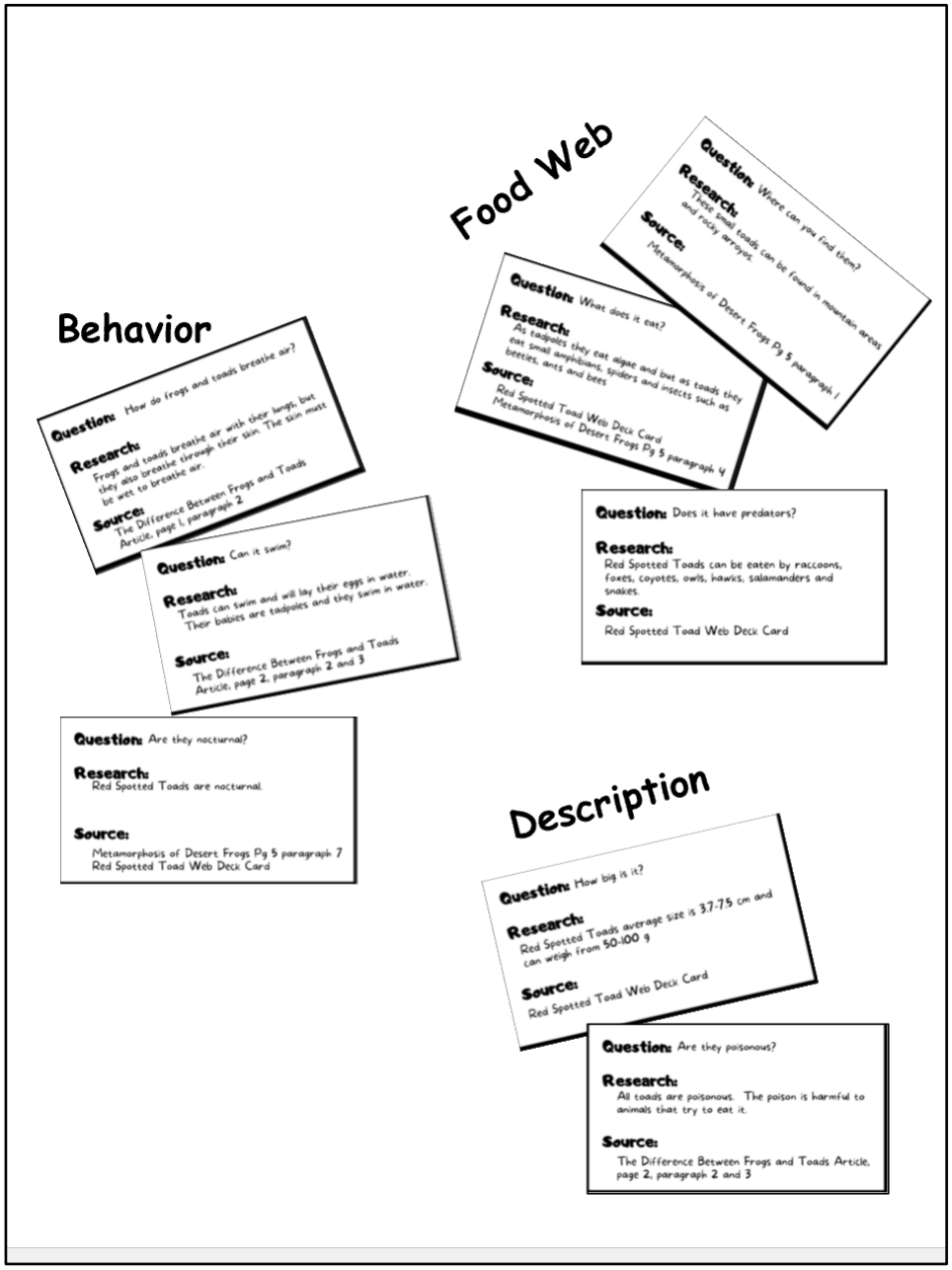
Source:
Metamorphosis of Desert Frogs Pg 5 paragraph 7
Red Spotted Toad Web Deck Card

Question: Are they poisonous?

Research:
All toads are poisonous. The poison is harmful to animals that try to eat it.

Source:
The Difference Between Frogs and Toads Article, page 2, paragraph 2 and 3

6. Students will cut apart the question cards and do a card sort. Students will sort the question cards based on how the information is related. This will provide topics to write their paragraphs for their research paper. Possible topics may include Animal Description, Life in the Food Web, Life Cycle, Behavior, Interesting facts, etc. The card sort may look like this:



7. Once the students have sorted their research cards, they can begin to start writing the first draft of their research paper.
8. Each group of cards will be a paragraph in the research paper, being careful not to plagiarize information drawn from the articles. Students should write an introductory paragraph for their paper as well as closing paragraph. The

Research paper should be 3-5 paragraphs in length or perhaps longer depending on the writer.

9. Peer Editing: Students will trade their first draft with group members to help edit their papers, find misspellings, grammar and other mistakes. They must have at least two group members give them feedback on their report before writing their final draft.

Final draft should be in their best handwriting with as little writing errors as possible. This final draft will be used to display with their frog diorama.

EXTEND: Carmen and Ernie's Frog Watch on iNaturalist

Guiding questions:

- What is an indicator species?
- What is a citizen scientist?
- How does iNaturalist help scientists to track species in an environment?

Materials

- Carmen and Ernie's Frog Watch Booklet
- Carmen and Ernie's Frog Watch Video
- Smart phone with camera
- Tablet or computer
- iNaturalist App (free download)

Procedure: Carmen and Ernie Frog Watch using iNaturalist

iNaturalist is a free app used by nature enthusiasts to track sightings of species around the world. When using iNaturalist with students for projects there are different angles of managing the project to consider before sending kids out to collect data. For example:

- If the teacher is asking students to use iNaturalist as part of a nature project or nature walk and all of the students will be together as a class, it may be a good idea to set up a class account for iNaturalist and have the students record their findings there. A generic student account would allow students to upload their sightings to one single account that the teacher can monitor and delete entries for, however it may be hard to figure out which student submitted if it is only going to one place. Once the project is finished the teacher can change the password to stop students from using this account.
- If the teacher is interested in just having the students use the app to help them identify living species in their surroundings, it may be a good idea to use Seek. Seek is an iNaturalist application that does not record the photos taken for research. This app just

helps people to identify species by picture. Great for beginner students to use without the need for adults to monitor their submissions.

- Another way to do this project is to set it up like it is modeled in this lesson plan, where the teacher has set up a Frog Watch project and students are going out with their parents to find species together. Some ground rules for this type of project may be:
    - Parents sign up for the iNaturalist account with the student to monitor submissions.
    - Only native animals and plants can be captured, no pictures of humans or domestic animals and plants should be reported.
    - Verification of the species cannot come from students in the classroom. All entries made must be verified from someone in the iNaturalist community that is NOT a member of the class.
    - Don't disturb wildlife, don't touch the organism and stay a safe distance. Be aware of your surroundings.
    - Only upload authentic pictures
    - Take multiple pictures at different angles if possible, to get a good identification.
    - Provide as much information as possible about the location of the species.

Carmen and Ernie's Frog Watch Using iNaturalist Booklet Procedure:

1. **Distribute the booklets or share on student device the slideshow version of the booklet "Carmen and Ernie's Frog Watch using iNaturalist"** Before reading pose the following questions for discussion:

    - **Now that we have completed our study on frogs and toads in the Chihuahuan Desert, look at the illustration on the cover of this booklet. What are Carmen and Ernie doing and what details in the picture give us information about the animal?** The frog that Carmen and Ernie are looking at are nocturnal, so they are finding it at night. It may be rainy season because they are wearing coats with hoodies, The area is grassy so it could be either a toad or a frog. Carmen is taking a picture so she might be sending this picture to the iNaturalist app.

2. **Begin reading the booklet together in class. On pages 2 and 3, there is a picture of a Spadefoot Toad and a Rio Grande Leopard Frog.**
    - **Since frogs and toads are indicator species, how can they be affected by the environment ?** Students may say that the leopard frog is being endangered by the American Bullfrog. People may pollute the river, waterways or desert arroyos which could affect the frogs. People are building in the desert and taking the toad environment.
3. **On pages 4 through 8, Ernie demonstrates the iNaturalist App and how it works.** Have the students brainstorm safety precautions when using the iNaturalist app

For more information about iNaturalist and how to use it in the classroom, please visit the iNaturalist website:
https://www.inaturalist.org/login?return_to=https://www.inaturalist.org/posts/20655-observing-wildlife-for-inaturalist

Carmen & Ernie's Frog Watch!

- Each person in a group of four will research a native frog from the Chihuahuan Desert: Spadefoot Toad, Red Spotted Toad, Rio Grande Leopard Frog, or American Bullfrog
- Use the articles that your teacher provides you to do your research, or research your species on the internet.
- Once you have done your research you will write a report and create a diorama about it's life cycle and metamorphosis! Good Luck!

When I was a kid growing up in the lower valley, we use to find **bullfrogs** in levees and canals near the river. We would find them at night. Sometimes you can find them here under the bridge in the Rio Bosque Wetlands Park.

Hear that sound, Ernie?

Yeah! It sounds like goats!

That means it's mating season in the ponds at the bottom of the arroyo. This is a great place to find **Spadefoot** and Woodhouse Toads! These guys come out during the rains and gorge themselves on insects until the sun dries up their pond. Then they dig themselves into a burrow and wait for the next rain. They can wait up to 2 years!

Sometimes if you hike in the mountains after the rain you can find small toads with red spots. I bet you can't guess their name?

Red spotted toads?

How'd you guess? These guys eat ants and insects and can keep moist by laying in damp sand under rocks and in crevices. They mostly hunt at night.

What are we looking for now?

We are looking for **Rio Grande Leopard Frogs**. They are hard to find around here because bullfrogs have invaded their environment!

According to my app, you might be able to find them along the river on the outskirts of town, maybe at Hueco Tanks, but they are very rare...

Some of the most interesting creatures to study in the Chihuahuan Desert are frogs and toads. A lot of people don't know this, but frogs are an essential animal in the environment because they are an **indicator species**.

A submission to iNaturalist become "research grade" when the submission is verified by someone in the community.

You can even join our study to track frogs and toads in the El Paso Area

Look for the following species:

- Spadefoot Toads
- Red Spotted Toads
- Woodhouse Toads
- American Bullfrogs
- Rio Grande (Mexican) Leopard frogs

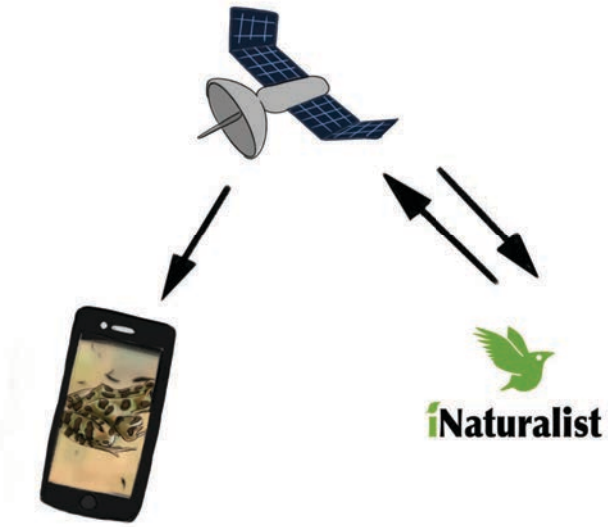
An **indicator species** is one that lets scientists know if an environment is healthy. Frogs and toads have special skin that can be affected by pollutants. If you have a healthy frog population that means that the environment is healthy for animals and plants to live in.

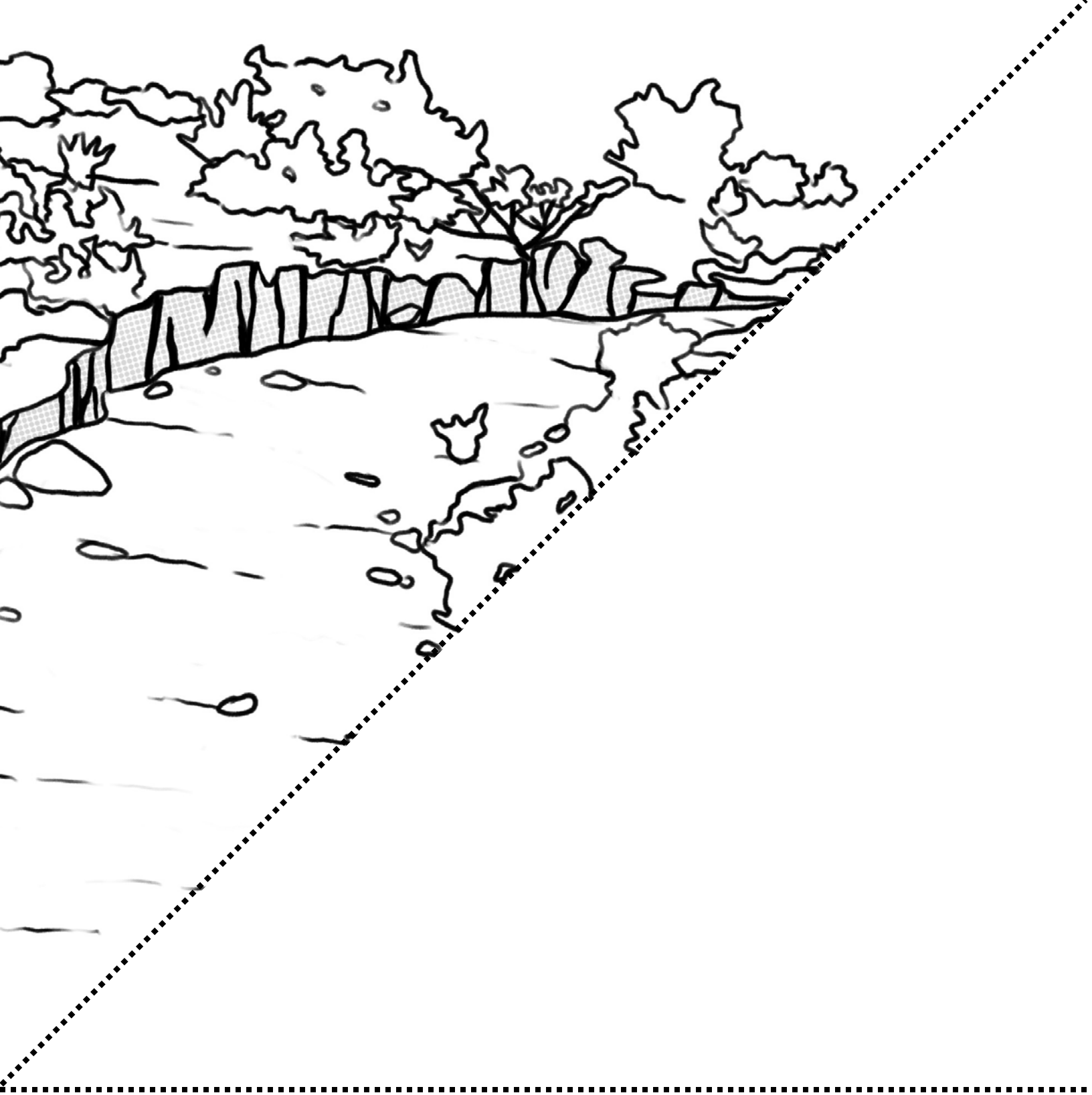
Frog and toad populations can be affected by pesticide pollution, habitat loss, competition from invasive species and changes in climate.

One way we can help scientists track the populations of indicator species like frogs is to report their sightings on citizen scientist apps like iNaturalist.

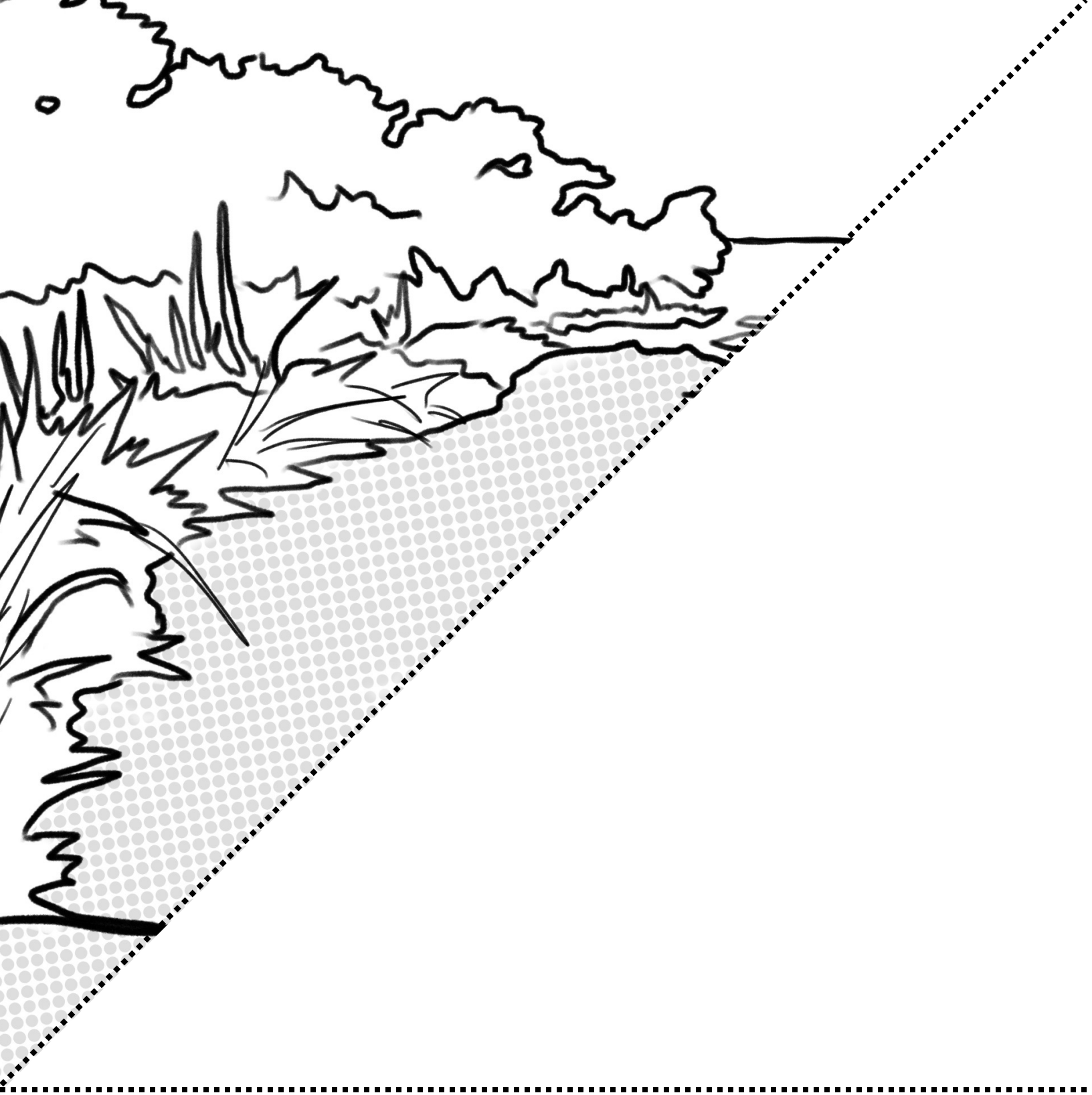
A **citizen scientist** is a volunteer that helps scientist to collect data on a science topic. **iNaturalist** is a free app that can be loaded onto your cell phone. It allows everyday people to take pictures of animals and plants that they find in an area. This is great information that can be accessed by scientist to track animal and plant populations all over the world.

iNaturalist uses GPS in your phone to tell the exact location of where you saw the animal and allows you to upload pictures of the animal or plant that you found.

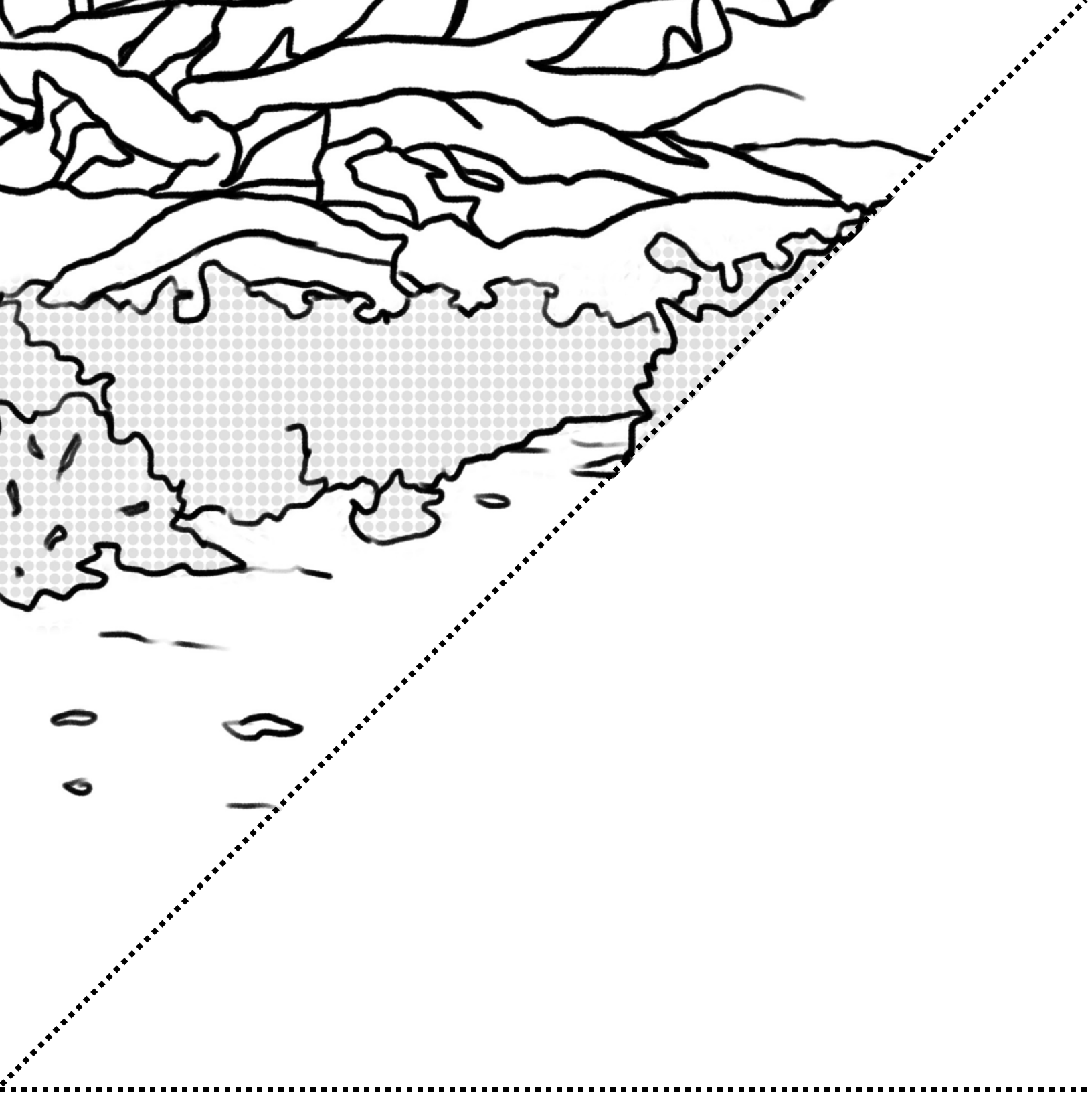




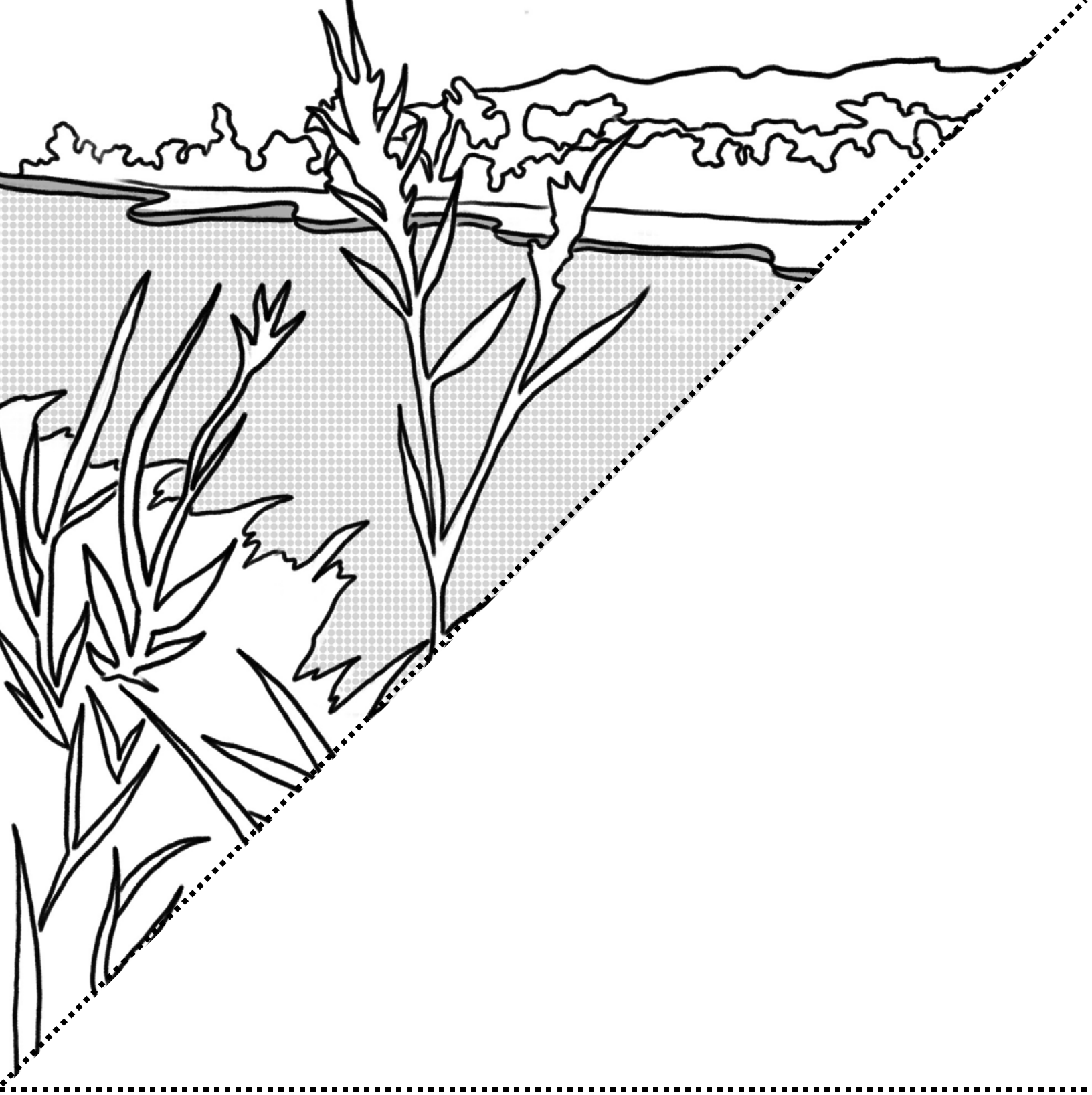
[Desert Arroyo]



[Bosque]



[Mountain]



[River Bank]

Chihuahuan Desert Frogs and Toads Diorama Procedure

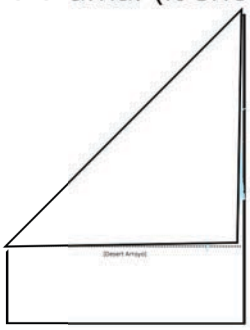
Procedure: In this group project, each student will be assigned one of four species of frogs and toads to research. Once they have written their research report on the frog or toad species, they will create a four-sided diorama showing the life cycle of that frog or toad in their natural habitat.

Materials:

- Four copies of the diorama environment background (mountain, arroyo, river and bosque) printed on cardstock
- Crayons, color pencils and or markers
- Green, brown or tan felt or construction paper
- Acrylic paint (different colors)
- Paint brushes
- Glue gun
- Glue sticks
- Various sized smooth and bumpy rocks
- Bubble wrap
- Black sharpie
- Small and medium sized googly eyes
- Miscellaneous craft items
- Ruled paper
- Pencil

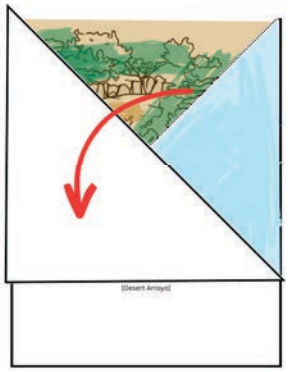
1.) Color the diorama background using color pencils, crayons and or markers, making sure to color in water for the bottom part of the color sheet. The environment and water together make a square shape. We will be creating folds into this square shape.

2.) Fold the sheet along the dotted lines to create a border between the walls of the diorama and the floor of the diorama. (It should look triangular) Unfold the paper and lay it flat



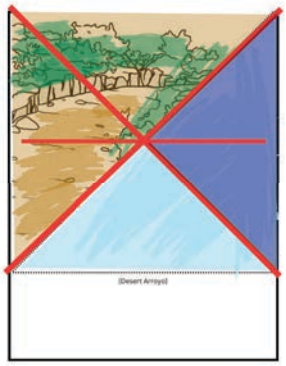
Chihuahuan Desert Frogs and Toads Diorama Procedure Pt.2

3.) Taking the top right corner of the page, fold the paper in the opposite direction creating a crisscross of folds. (The folds should form an X shape within the square.) Unfold the paper and lay it flat



4.) Fold the top of the sheet to the bottom border of the square shape, so that it is folded in half. The square should have 6 triangular pieces divided by these three folds.

5.) The two triangles on the right half of the page will fold into each other so that the diorama is triangular



Chihuahuan Desert Frogs and Toads Diorama Procedure Pt.3

6.) Glue the folded triangles under the floor of the diorama so that the diorama can stand on its own.

7.) Paint the rocks (if needed) to show the coloring and markings of your frog or toad using acrylic paint.

8.) To create the shape of the frog or toad you can hot glue found objects such as felt, construction paper, small pebbles and googly eyes to make its legs and body parts

9.) Create the life cycle of the frog or toad by using objects such as bubble wrap, googly eyes or black eye peas to make the eggs. Pebbles or round small objects can be used to make the tadpoles and froglets.

10.) Label the stages of the frog or toad metamorphosis. You can even label the time it takes to go from one stage to another.

11.) Glue or tape your frog report to your diorama

August 2022, Volume 80

Amphibian World

Big News and Hoppin Updates for the Eager Reader

THE DIFFERENCE BETWEEN FROGS AND TOADS

Written by Robert S. Ribbit

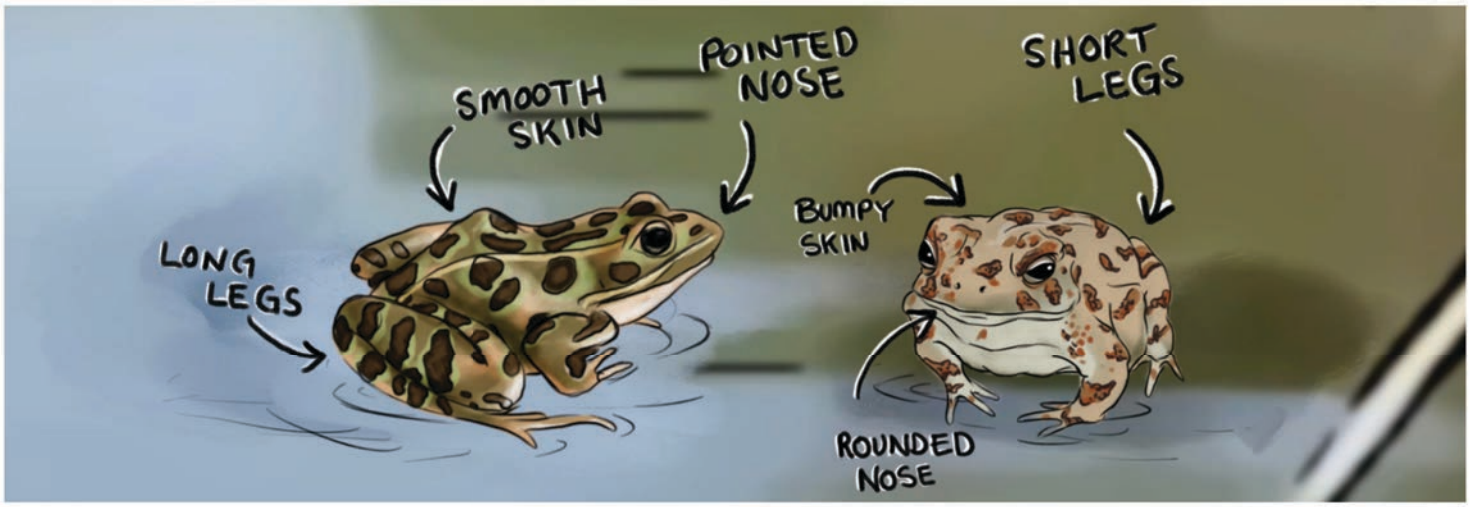
When trying to understand the difference between frogs and toads, it is important to understand their classification. Frogs and toads come from the class of animals called amphibians. Amphibians include frogs, toads, salamanders, newts and caecilians, (a legless creature resembling a snake.) The word amphibian means “double life” which refers to the fact that this class of animal spends part of its time in water and part of its time on land. Amphibians, which were once thought to be part of the reptile family are actually very different from reptiles! They do not have scales, can breathe through their moist skin and must return to water in order to lay their eggs which are moist and jelly like and have no shell.

If you look closely at an amphibian you will notice that their throat moves up and down when they breathe. Amphibians do not have a rib cage which means that they can't easily pump oxygen in and out of their lungs. They use their mouths and throats to help them pump air in and out, but because this approach is less effective, they need extra oxygen from their skin to survive. Moisture on the skin is necessary for amphibians as it will allow them to capture oxygen to breathe. Both frogs and toads as well as other amphibians secrete mucus to help keep their skin moist allowing them to capture enough oxygen. Water is essential to keeping all amphibians alive.

There are over 7000 different species of frogs and toads, making them one of the most common and easy to recognize amphibians. They come from the order of amphibians called, Anura, which means "tail-less". Both frogs and toads can be found all over the world with the exception of Antarctica, including arid deserts and high-altitude environments. However, the majority of frogs and toads are found in tropical rain forests. The adaptations that they have made allow them to survive with different lifestyles, some being primarily aquatic (lives most of the time in water) while others may be terrestrial (lives mostly on land) or arboreal (lives mostly in trees.)

Toads are considered a subclass of frogs, meaning that all toads are considered frogs but not all frogs are toads. Separating frogs from toads is not always an easy task because the characteristics that describes them don’t always apply. In general, aquatic frogs are thin, long legged and prefer hopping to walking. They have webbed feet, and most will prefer a life in the water while only sometimes coming up on land. They have smooth skin that for most species will not secrete poisons. Their skin will dry out easily if not constantly exposed to moisture.

FROGS	TOADS
PREFERS WATER	PREFERS LAND
SMOOTH SKIN	BUMPY SKIN
NON-POISONOUS SECRETIONS	POISONOUS SECRETIONS
LONG LEGS, THIN BODY	SHORT LEGS, STOCKY BODY
HOP	WALK
WEBBED FEET	SEPERATED TOES, LITTLE WEBBING



Most toads on the other hand, live on land and are less reliant on large water sources such as rivers, lakes and ponds. Their top outer skin is leathery, dry and bumpy and often described as "warty," although the bumps on their skin are not warts but glands. Some of the glands secrete mucus to keep the toad moist and others secrete a poison that is harmful to animals that try to eat them. All toads secrete poison. Bufonidae toads, also known as "true toads" have a parotid gland located behind the eyes. Toads with this type of gland will swell up when attacked, pushing their gland to the top of their head pointing toward the attacker so that the poison will squirt out when bit, either blinding the attacker or causing vomiting.

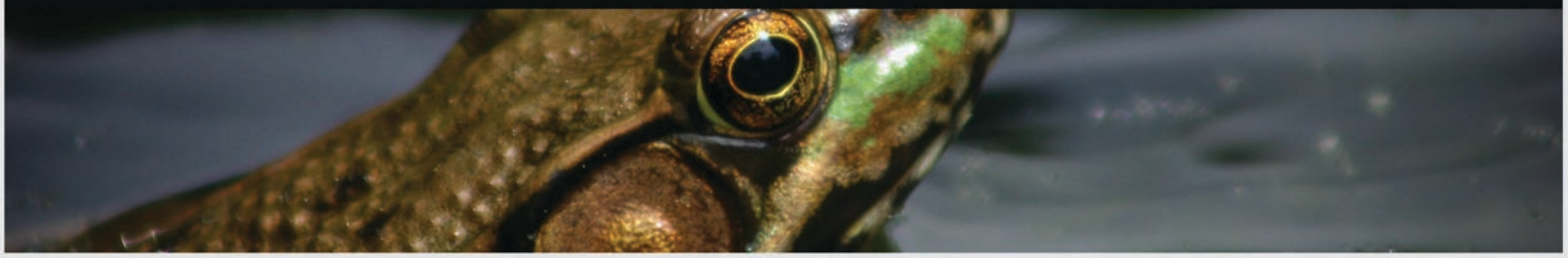
Toad bodies are shorter and stockier than a frog's, their hind legs are not as long as a frog's and they prefer walking instead of hopping. They have little if any webbing on their feet. Because their top skin is leathery they are less reliant on soaking in water and can survive in moist cool soil, but they will return to a water source to look for mates and lay their eggs. Toads can swim, just like frogs, but prefer land to water.

Most frogs and toads go through a growing cycle called metamorphosis in which the egg hatches larvae called tadpoles or polliwogs that look similar to a fish, it even has gills and swims. Tadpoles are primarily herbivores in their gill state but when the tadpole becomes more omnivorous it will sprout legs and develop lungs. When it is a froglet (mostly frog but still having a tale) it becomes a carnivore or insectivore.

So how does identifying frogs and toads get tricky? A frog or toad may evolve with an adaptation that gives them a special niche in their ecosystem. For example, many frogs compete for the same type of food and may end up competing for the same water source. Some frogs, such as arboreal frogs, do not spend most of their lives in water, but in trees. This way they can hunt insects that their water loving counterparts cannot reach. Arboreal frogs do not have webbed feet but toes with cupped suction that help them to climb. Like water frogs, they are reliant on water to keep their smooth skin wet, but it is the humidity in the air that keeps them moist, which is why you will find tree frogs in humid environments such as rain forests. Frogs are not the only amphibian found in trees. There are also species of arboreal toads and salamanders. Adaptations and changes in behavior help an animal to find their unique place in an environment.

Some species of toads have less bumpy skin and are smooth much like a frog, such as spadefoot toads. These toads do not have a parotid gland, but can secrete poisons through their skin and can be quite toxic. They have the ability to encase themselves in mucus and bury themselves in the ground for up to two years waiting for a desert rain. Fire bellied toads are bumpy and have poisonous skin but are considered an aquatic toad because they prefer water more than land.

Scientists find exceptions to the classification of frogs and toads often. In biology, there are exceptions for every rule, including the classifications of toads and frogs. Scientists often argue as to whether a species is truly a frog or a toad. One thing is for certain, the characteristics that cause the confusion are the adaptations that help the creature better survive in their environment.



Invasion of the Bullfrogs!

By R.G. Rana

There are many types of invasive species in El Paso. Invasive species are plants or animals that have been introduced to a new environment and flourish as they take over at the expense of the native species. For instance, the North American Bullfrog, an invasive species that has affected the population of native frogs in the Chihuahuan desert, (including El Paso.)

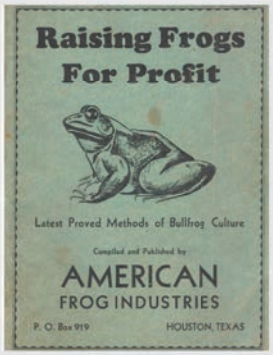
American Bullfrogs are native species to states east of the Western Rockies, mostly found in swamps and waterways along the east coast of the US. In the eastern states bullfrogs have natural predators such as water snakes, alligators and snapping turtles to help control their populations, but when introduced to areas without natural predators, these frogs wreak havoc, not only in our southwestern and western states, but countries all over the world!

Just a few decades ago, you could see the Rio Grande Leopard Frog with some regularity in our region. Now? not so much. The Rio Grande Leopard frogs have been pushed out of our El Paso waterways by the American Bullfrog. That is an example of how an invasive species can take over an area. The success of an invasive species usually causes harm to other species that are native to an environment. Often times this is because the new species has no natural predators to help control the population.

So how did they make their way out of their natural environment?

It all started with restaurants!

Back in the 1800's, there was quite an appetite for frog legs, considered a delicacy in some places. In California, where the need for frog legs was only growing, frog breeders thought that if they could bring some frogs with larger and meatier legs from areas in the Eastern United States and breed them in California, they could make a fortune selling the delicacy.



Cover of Raising Frogs for Profit, American Frog Industries, Houston, Texas, 1933

For a while it worked, bullfrogs were successfully bred for consumption, but eventually, those frogs escaped into the environment, and began breeding and multiplying in the wild. Since they had no natural predators, and since they had some advantages that the native frogs didn't have, they have flourished at the expense of native frog species. Bullfrogs have been introduced in countries globally as a source of food and in doing so have experienced an invasion, with bullfrogs outcompeting and endangering the native frog species of their new environments.

Why is the bullfrog species so successful?

The American bullfrog is one of the largest species of frog in the US and one of the most prolific, which means that it lays many eggs to ensure its own survival. Where a native frog species may lay 2-3000 eggs per animal, the bullfrog lays a clutch of 12,000-20,000 eggs and can lay eggs twice a season. This puts them at an advantage from the very beginning of their life cycle as they outnumber their competitors.

The bullfrog tadpole in it's native environment has a metamorphosis rate lasting up to two years depending on the temperature of the water, however in warmer temperatures the bullfrog can grow to an adult frog more quickly at a rate of 6 months or less than a year.

Bullfrogs can lay up to 20,000 eggs

The adult bullfrog is also a voracious eater. It eats anything that moves and can fit into its mouth. Studies done on the contents of bullfrog intestines reveal that bullfrogs eat anything; from small birds, snakes, rats, turtles, fish, lizards, or other frogs. Surprisingly, the most common animal found was OTHER BULLFROGS. That's right, the bullfrog is cannibalistic and may be laying a large numbers of eggs in order to help itself survive. It will eat its own young or the young of other bullfrogs! Because they have a constant food source, they can grow very large which also puts pressure on the ecosystems that they invade. Bullfrogs can hop miles away from their ponds and environments to seek a new environment, mostly to escape from their own species which may prey upon them. Bullfrogs are one of the most aggressive frog species in North America.

Once bullfrogs invade an ecosystem it is very hard to get rid of them. Bullfrogs are responsible for endangering the Mexican Garter Snake and the Chiricahua Leopard Frog in Arizona. Several failed efforts to remove bullfrogs from Arizona have resulted in bullfrogs repopulating. Draining ponds and removal of adults seem to be the only way to control their populations.

Bullfrogs will eat anything that fits into their mouths, including other bullfrogs!

How did American Bullfrogs get into the El Paso waterways?

There are many speculations as to how an Eastern frog came into our El Paso waterways, but the earliest of records from the USGS cites bullfrogs spotted between El Paso and Smelter Town in the year 1942 and list the potential pathway as "stocked for food", which means that people may have brought bullfrogs to the El Paso area for food and they have been in our waterways ever since.

How Can El Pasoans Help Track Frog Populations?

One of the best ways to help scientists track native frog populations is to become citizen scientists and report their sightings to nature applications like iNaturalist or become a volunteer for "Frog and Toad Watch Research." By sharing your sightings, scientists can get a better idea of the populations that inhabit the local environment and can monitor the health of not only the species but the environment as a whole.

Want to see an interactive map of where the invading American Bullfrogs are now? Go to the US Government Invasive Species website map for Bullfrogs and zoom in on El Paso!
https://www.invasivespeciesinfo.gov/aquatic/fish-and-other-vertebrates/bullfrog
or go to
https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=71

Guest expert
K. F. Greene

Rio Grande Leopard Frog

FROG METAMORPHOSIS IN THE CHIHUAHUAN DESERT

It may seem odd that the desert environment can even host animals like frogs and toads because amphibians very much require water to survive and reproduce. Though our desert is very arid, there are many frog and toad species that reside here. Let's explore the life cycle of four diverse species: the Mexican Leopard Frog, the American Bullfrog, the Red Spotted Toad and Couch's Spadefoot Toad, all residents of the Chihuahuan Desert.

What is Metamorphosis?

Did you know that most animals go through some type of metamorphosis? The word metamorphosis means "the process of changing shape." This term is used to describe the physical changes that animals go through during their life cycle. Insects as well as animals such as amphibians experience metamorphosis. This could be a complete structure change, like larvae to adult, or a partial change like gaining body parts such as wings. Biologists believe these animals have evolved to have metamorphosis as an aid to survival. When animals go through metamorphosis, they do not compete for the same food source as their parents and fulfil a different niche in their environment.

Frogs and toads experience a complete metamorphosis as their entire frog bodies change structure as well as function. Once the eggs have hatched, the larva, called tadpoles or polliwogs, look nothing like their adult parents. In fact the name tadpole means toad head, and the word polliwog means head wiggle. Both of these names are appropriate to describe the frog

larva that have gills to breathe underwater just like a fish. As tadpoles they will eat different food than their parents, they usually feed on algae, detritus and plant plankton. As the tadpoles become froglets they will begin to eat insect larvae and become more omnivorous. They will develop lungs to breathe air and grow limbs to walk on land as they absorb their tale to take their adult form.

The Metamorphosis of Desert Water Frogs

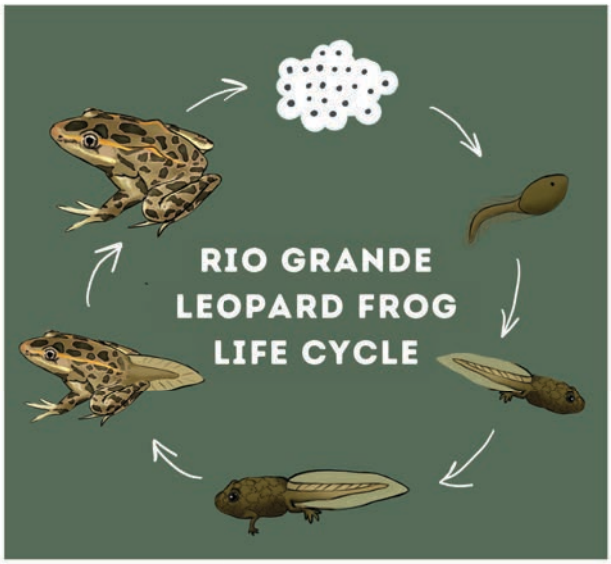
To find aquatic frogs in the desert you will need a steady water source such as river, levee, pond or wetland. You will also need to look for them at night, because desert water frogs are nocturnal. Snowpacks from the local mountain ranges will replenish rivers in the spring and the running of the river water provides the right environment for frogs.

The Rio Grande Leopard Frog

If you have ever walked in the evening along the Rio Grande River or other waterways, you may have heard the croaking of water frogs wading on the surface of the water. The **Rio Grande Leopard Frog** has a distinct croaking sound that sounds like a low purr or growl. Although this frog usually prefers to hunt alone, during the mating season after spring or summer rains, male leopard frogs will congregate on the water surface making these sounds to attract a mate. When their vocal sacs fill with air, their croaking sound amplifies and can be heard as far away as a quarter of a mile. Once the frogs have found their mate the female lays a clutch of eggs in the watery vegetation.

Eggs: The egg mass is clear and jelly like with a black embryo at the center of each egg. A clutch of eggs can range between a few hundred to three thousand! Once the eggs have been laid and fertilized, the clutch is left alone until the eggs hatch tadpoles. It takes from one and a half to three weeks for the eggs to hatch. They will stay in the egg jelly until they have detached (they eat the egg jelly).

Tadpoles: At this stage the tadpoles eat algae and phytoplankton and are primarily herbivorous. The



tadpoles are light brown and mottled and start at about 20 mm long and can grow to 70mm before turning into frogs. Although born with gills, around 6 weeks of age, they will sprout fringy gills on each side of their head and they will sprout legs (first the hindlegs are noticeable.) They become more omnivorous and will eat insect larva and zooplankton as well as algae. Once the tadpole has all four legs visible it is then considered a froglet.

Froglets: In the froglet stage it will have both lungs and gills simultaneously. Their tails begin to shrink, they grow a skin flap that covers the gills and their lungs become more developed. The mouth of the tadpole grows wider and the body sprouts legs. During this transformation the froglet will come up for air to breathe. Although it is carnivorous at this stage, it is not quite equipped to eat insects so during this stage it will get nourishment by absorbing it's tail. It takes an average of 90 days for the Rio Grande Leopard Frog tadpoles to turn to frogs.

Adults: The adult Rio Grande Leopard Frog will take two to three years for it to reach maturity to breed. In the Chihuahuan Desert they usually mate in spring or during the monsoon season. They will lay many eggs to ensure it's survival.

The American Bullfrog

The American Bullfrog is much larger than the Rio Grande Leopard Frog, so it takes a longer amount of time to develop. Bullfrogs are invasive to our desert. In their east coast native habitat they can take up to two years to grow into an adult frog, but because of warm temperatures in the Chihuahuan Desert, the bullfrog larva can develop into adults between 6 months to a year from hatching.

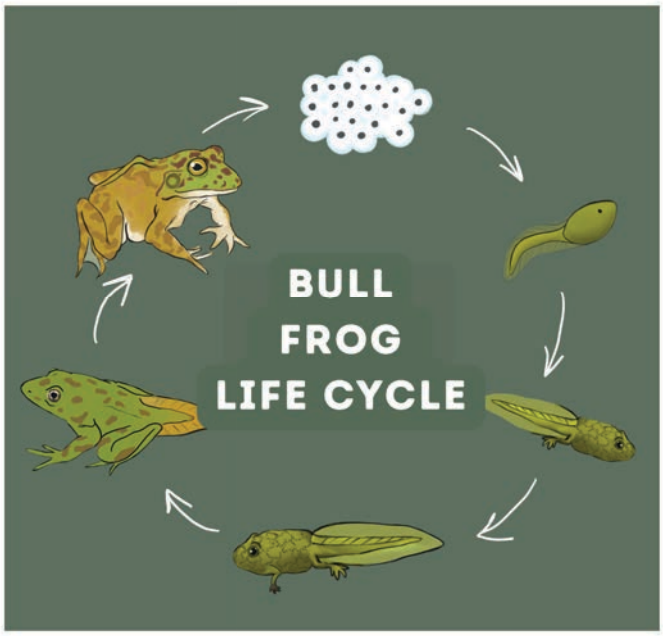
Like the leopard frog, male bullfrogs will congregate in rivers and wetlands during their mating season and croak loudly to attract a mate. Their croak is deep, similar to cattle mooing (thus the name bullfrog).

The male bullfrog is very territorial during mating season as he first seeks out the perfect place in the pond for his mate . He will defend this area if any males come within the area while he performs his mating call.

Eggs: Once a female answers the call, she will lay her clutch of up to 20,000 eggs that he will fertilize as she lays them. These eggs will drape the surface of the water and can sometimes be attached to vegetation in nests of up to 2 feet in diameter. The clutch at first floats in the water and will sink underwater right before hatching. The eggs will hatch within 3-5 days.

Tadpoles: Bullfrog tadpoles are speckled green and about the size of goldfish. They can grow up to 15 centimeters in length. They will be completely herbivorous for the beginning of their lives, eating algae and pond plants. Their speckled color allow them to camouflage against the muddy bottom of the pond and their long tails help them to swim quickly to evade predators. However, if a predator is able to bite at its tail, the tadpole has the ability to re-grow it. Since it takes 6 months to a year for the tadpole to metamorphosize, the tadpoles may have to spend the winter in the pond by sinking to the bottom of the pond and taking in oxygen through their gills and skin as the cold water slows down their body functions.

Froglets: Once the tadpoles grow all four limbs, it only takes about 10 days for the froglet to absorb it's tail and turn into an adult frog.



Adults: Small bullfrogs look very similar to other species of frogs, but grow quite quickly because of their ravenous appetite. They will eat anything that fits into their mouth, including other frogs, mammals, birds and snakes. They will even eat their bullfrog tadpoles and eggs, which is why the bullfrog lays so many eggs, since few will make it to adulthood. It takes 3-5 years for a bullfrog to reach breeding maturity.

The Metamorphosis of Desert Toads

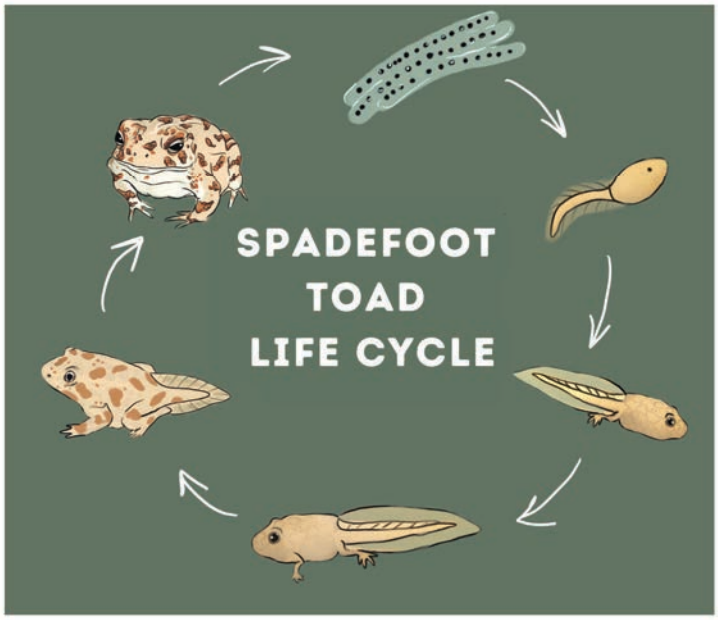
Like frogs, toads must lay their eggs in water in order to go through metamorphosis, however, because they have to adapt to live their lives primarily on land, desert toads have found other ways to go through their metamorphosis in temporary pools of water during the rainy season.

Couch's Spadefoot Toad

Scientists believe that it is the rumble of thunder during lightening storms rather than their burrows being effected by water, that will awaken the spadefoot toad from hibernation. During the rainy season male toads will wade in shallow pools of rainwater, calling for mates. Their cycle happens quickly because depending on the desert heat, their breeding pond may disappear within a matter of weeks. The croak of the spadefoot toad sounds like goats or sheep bleating. Much like their frog cousins, their vocal sacs will fill with air so that they can amplify their sound.

Eggs: Once they have found their mate the female will lay strings of eggs in the pools of water, which the male will fertilize. Like most toads, the spadefoot will lay their eggs in strings rather than large clumps like water frogs. She can lay up to 3,000 eggs at a time. Within a day these eggs will have hatched.

Tadoles: Couch's Spadefoot tadpoles are gray, black or bronze and often speckled. Like the tadpoles of water frogs, they are born herbivores and prefer algae and plankton rather than eat insect larva.



Ideally the Spadefoot toad will turn into a frog in just 14 days if enough water is present and the algae is plentiful.

Toadlets: Since the desert pools may dry up quickly, lack of food may cause these tadpoles to become carnivorous and if competing with other tadpoles, they can also become cannibalistic. Scientists believe that the change in diet may trigger their bodies to go into metamorphosis more quickly. They must turn into frogs before the pool dries up. If the pond is evaporating it can turn into a frog in as little as 7-8 days. Faster developing toads seem to be smaller than those that are allowed to fully develop.

Adults: The adult spadefoot is short and pudgy with large protruding eyes that have vertical rather than horizontal slits on their pupils. They are called spadefoot because they have a spade or scoop-like shape attached to the bottom of their hind feet to help them burrow and dig. They survive by burrowing in loose soil for 8-10 months of the year, coming out during the rainy season only to breed and eat. Once they have gorged themselves on insects, they will burrow and not emerge again until the following year's rainy season. It takes two to three years for a spadefoot toad to mature to a breeding adult.

Red Spotted Toads

The Red Spotted Toad can be found in rocky arroyos and mountainous areas of the desert. It is much smaller than the desert woodhouse and spadefoot toads, only growing to 3 inches in length. It is characterized by red or orange bumps on their skin that are actually glands.

Rocky desert arroyos and crevices that keep water in the mountainous rocks provide breeding pools for the little toads during the rainy season. The males congregate at the pools and croak their mating calls that is similar to a high pitched cricket chirping sound. This attracts the females to the pond.

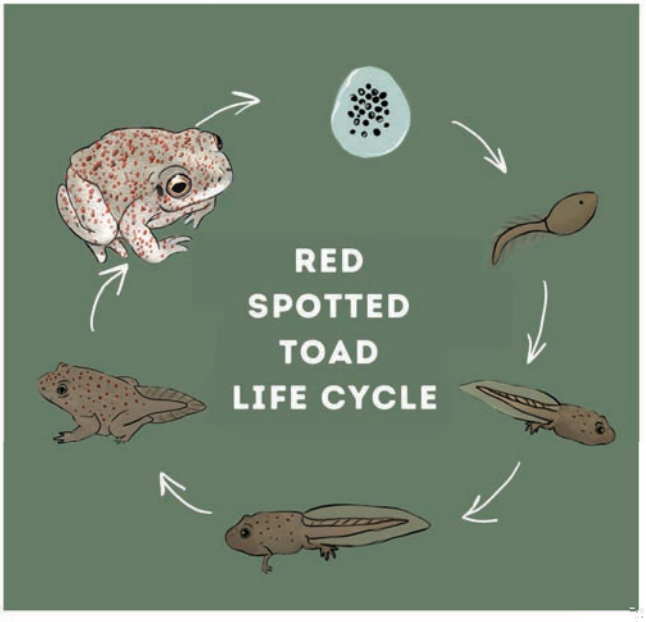
Eggs: Once the female has chosen her mate she will lay her eggs individually rather than in strings like most toads. She can lay up to 5000 eggs at a time and the male will fertilize each egg separately. It is one of the only desert toads that lays their eggs individually. The eggs will sink to the bottom of the pond and will hatch in a few hours.

Tadpoles: The Red Spotted Toad tadpoles are black or dark brown with metallic bronze flecks. They eat algae in their pools and if the pool has plenty of water that evaporates slowly. Their metamorphosis can take up to 40 days. However, much like the spadefoot toad environment, their pools may dry up, and as a result, they too can have a quick metamorphosis of about 13 to 14 days if the pools are evaporating quickly.

Similar to the spadefoot, the tadpoles can become carnivorous and cannibalistic as the pool evaporates.

Toadlets: Once the four legs of the tadpole appear, the toad will absorb it's tail quickly to become a frog.

Adults: Like the Woodhouse and Spadefoot toad, the Red Spotted Toad can burrow for long periods in order to survive dry desert months, however the Red Spotted Toad has an adaptation that allows them to absorb even the smallest amounts of water through their skin, which means that even damp sand and dew drops can give them the water that they need to survive. They can lose up to 40% of their water weight as they wait for the rainy season to begin. For this reason this little toad is the most able to survive away from water and can be found at night sometimes year round in rocky crevices hunting insects. It may take the toad 3 to 4 years to be able to reach breeding age.



Carmen and her dad found the the American Bullfrog at the Rio Bosque Wetlands Park. It is a species of frog that can be found in waterways in El Paso. Using your questioning skills, generate as many questions as you can about the American Bullfrog. These questions will help you with your research paper.

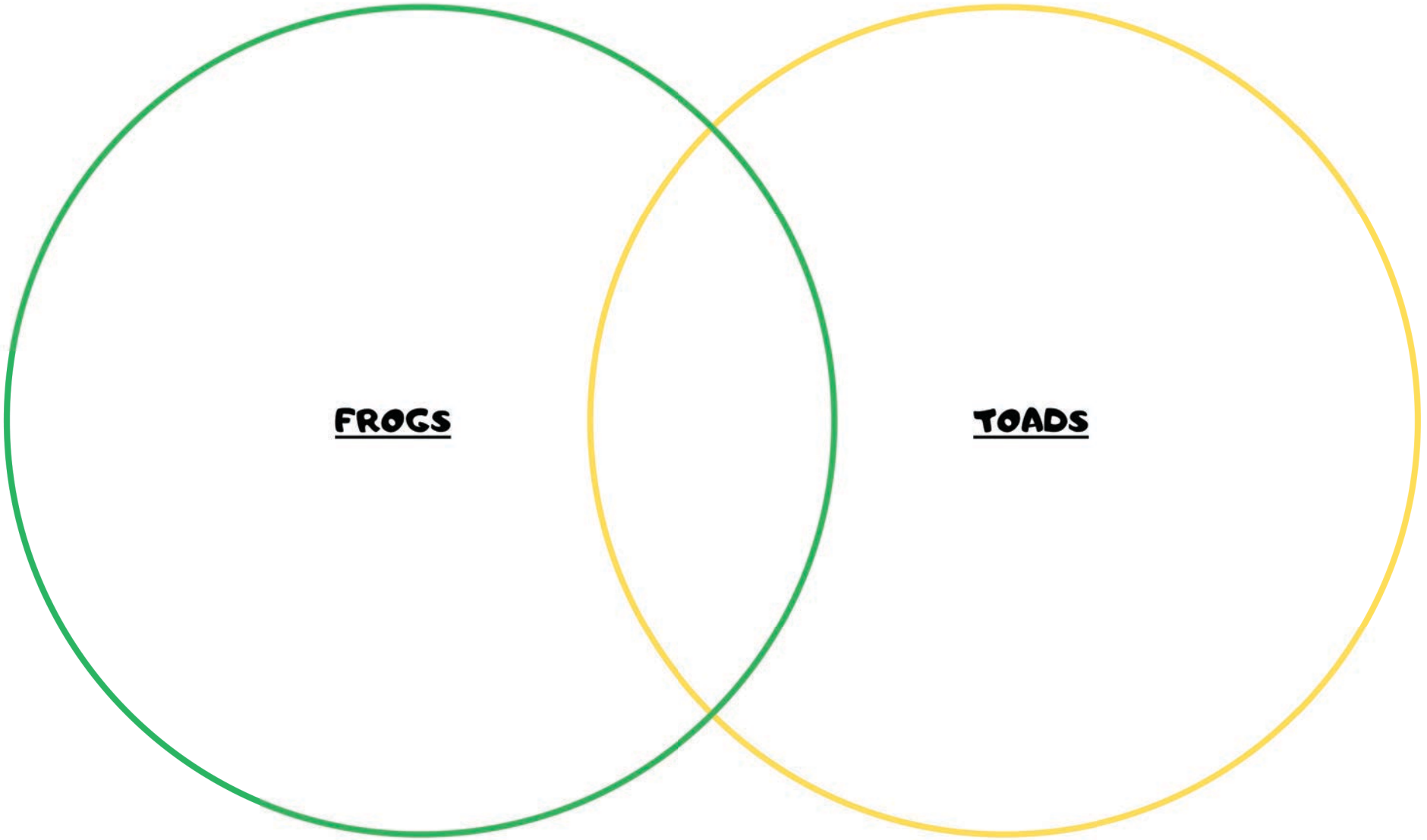
Ernie and Eduardo didn't find the Rio Grande Leopard Frog at the river. It is a species of frog that has been sighted in El Paso at one time. Using your questioning skills, generate as many questions as you can about the Rio Grande Leopard Frog. These questions will help you with your research paper.

Ernie and Eduardo found the Couch's Spadefoot in desert arroyos after a rain. It is a species of toad often seen in the El Paso area during the rainy season. Using your questioning skills, generate as many questions as you can about Couch's Spadefoot Toad. These questions will help you with your research paper.

Carmen and her dad found the the Red Spotted Toad on a hiking trail at Franklin Mountain State Park. It is a species of toad that can be found in rocky areas of El Paso after the rains. Using your questioning skills, generate as many questions as you can about the Red Spotted Toad. These questions will help you with your research paper.

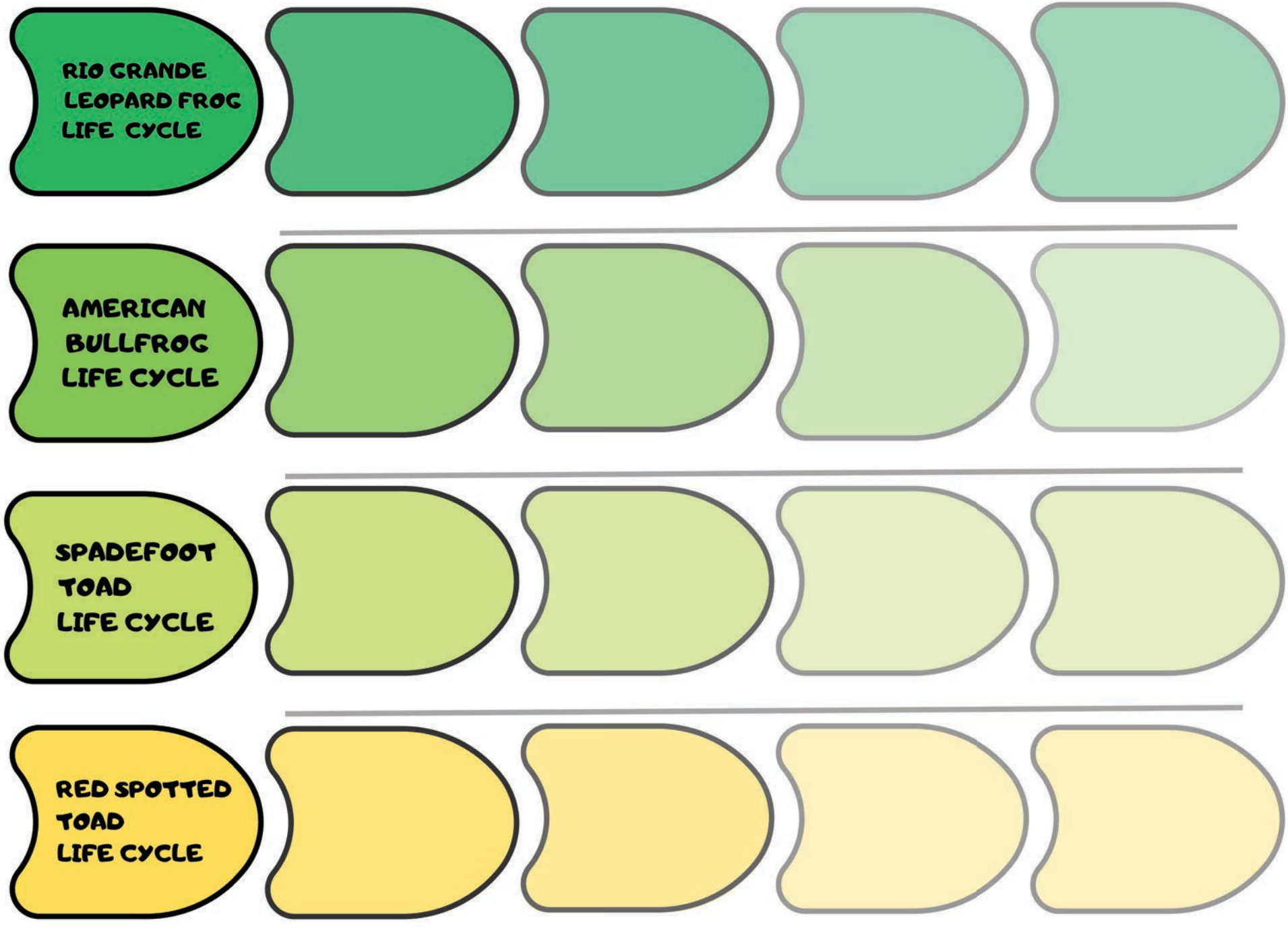
INFORMATIONAL TEXT: COMPARE AND CONTRAST

Using the article "*The Difference Between Frogs and Toads*", analyze key information with this Venn Diagram



INFORMATIONAL TEXT: SEQUENTIAL ORDER

Using the article "*Frog Metamorphosis in the Chihuahuan Desert,*" analyze key information about frog metamorphosis with this sequencing diagram. Label each part of the cylce.



INFORMATIONAL TEXT: CAUSE AND EFFECT

Using the article "*Invasion of the Bullfrog!*", analyze key information that led to bullfrogs becoming invasive species with this cause and effect diagram

WEB DECK CARDS

Gather information from the WEB DECK CARDS: Rio Grande Leopard Frog, American Bullfrog, Red Spotted Toad and Spadefoot Toad, using the key and guide to decode the card information.

COUCH'S SPADEFOOT TOAD

Length 8.9cm, Mass 50-100g

Diet
insects such as termites, beetles, bugs, ants, grasshoppers, and crickets, as well as spiders

Habitat
arroyos, marshlands, prairies and floodplains

Predators
yellow mud turtles, grackles, and snakes

RIO GRANDE LEOPARD FROG

Length 5.7-11.4 cmm, Mass 50-100g

Diet
smaller amphibians, spiders, and insects such as bees, ants, and beetles

Habitat
arroyo pools, canals, drainage ditches, streams, rivers, and temporary pools like puddles

Predators
great-tailed grackles, hawks, owls, garter snakes, turtles, crayfish, foxes, coyotes, and racoons

AMERICAN BULLFROG

Length 20.32cm, Mass .9-1.36kg

Diet
worms, insects, snails, crayfish, fish, frogs, tadpoles, aquatic eggs, rodents, birds, and small reptiles like snakes and turtles

Habitat
mostly woodland, but can be found in all types of habitats including deserts

Predators
aquatic insects, crayfish, frogs, aquatic turtles, snakes, fish, birds such as herons and great egrets, and mammals such as raccoons

WOODHOUSE TOAD

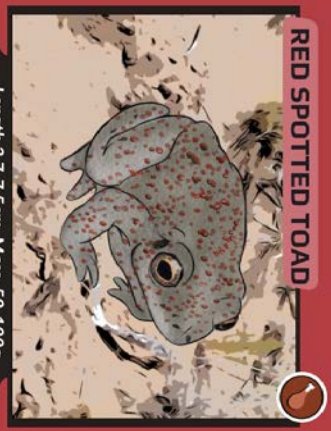
Length 6.4cm, Mass 50-100kg

Diet
bees, moths, scorpions, spiders, sowbugs, ants, insect larvae, and earthworms

Habitat
wetlands including canyons, marshes, riverbanks, irrigated farmlands, and gardens

Predators
fish, herons, turtles, snakes, skunks, and raccoons

RED SPOTTED TOAD



Length 3.7-7.5cm, Mass .50-100g

Diet
Smaller amphibians, spiders, and insects such as bees, ants, and beetles

Habitat
rocky areas near arroyos, ponds and streams where they can find shelter in crevices

Predators
Foxes, coyotes, racoons, owls, hawks, salamanders, and snakes

CARMEN AND ERNIE'S RESEARCH NOTECARDS

Use these note cards to answer the questions you generated about your frog. Once you have completed your research, cut apart the cards and arrange them in a logical order to help you write your frog report. (See example)

Question: How do frogs and toads breathe air? **Research:** Frogs and toads breathe air with their lungs, but they also breathe through their skin. The skin must be wet to breathe air. **Source:** The Difference Between Frogs and Toads Article, page 1, paragraph 2	**Question:** **Research:** **Source:**
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Web Deck Key

Seasons

If you see these symbols on your card, you will know what time of year that these animals are present and active.


Spring

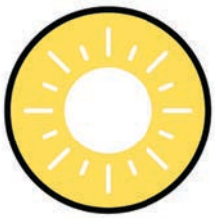

Summer


Fall


Winter

Activity

If you see these symbols on your card, you will know what time of day that these animals are present and active.


Diurnal


Crepuscular


Nocturnal

Animal Behavior

If you see these symbols on your card, you will know what type of behavior the animal has that stops them from being present and active.


Brumation


Hibernation


Estivation


Migration

WEB DECK CARD Guide

These symbols will tell you more about wildlife on the Web Deck Cards.

Seasons

If you see these symbols on your card, you will know what time of year that these animals are present and active.


Spring


Summer


Fall


Winter

Activity and Foraging

If you see these symbols on your card, you will know when a creature is most active.

Diurnal

Animals that show this symbol are most active during the daytime hours. Example: Harris's Hawk

Nocturnal

Animals that show this symbol are most active during the nighttime hours. Example: Coyotes

Crepuscular

Animals that show this symbol are most active in the morn- ing when the sun is dawning or in the afternoon as the sun is setting, "dusk" or "twilight". This is very common for desert animals that wait to become active when the temperatures are bearable. Example: Spotted Ground Squirrel

WEB DECK CARD Guide (CONT.)

Types of Consumers
If you see these symbols on your card, you will know what type of consumer your creature is.

Herbivore
Animals that show this symbol will forage and eat plant-based foods including seeds, leaves, bark, wood, stems, roots and bulbs. *Note: Some species of birds may be herbivores most of the time, however, all birds will eat insects during mating season so that they can produce eggs. Herbivore Example: Beavers

Carnivore
One who eats animals. Animals that show this symbol capture and eat other animals. Carnivore Example: Bobcats

Ominivore
Animals that show this symbol don't necessarily eat everything in a food web, but they are more versatile because they will eat both plants and animals. All animals in the dog family such as wolves, coyotes and foxes are considered omnivorous. There are many animals that do both, but usually they sway more towards one type of food than the other when food is plenty. Omnivore Example: Raccoons

Animal Behavior
If you see these symbols on your card, you will know what type of behavior the animal has that stops them from being present and active year round.

Brumation
Reptiles,amphibians and other cold-blooded animals may slow down their bodies during winter because of lack of heat. Brumation Example: King snake

Hibernation
Mammals may slow down their bodies during winter in a den and enter a sleeping state until spring. Since the we live in the desert, it is rare for mammals to completely go into hibernation and may only do so for very short periods. Hibernation Example: spotted ground squirrel

WEB DECK CARD Guide (CONT.)

Estivation

One way desert animals survive harsh summer heat is to burrow during hot temperatures and slow down their body activity. During estivation amphibians can stay alive during dry summer months until the next rain. Estivation examples: the Woodhouse and Spadefoot toads.

Migration

You may have noticed that there is a certain type of animal that has members that migrate in and out of the bosque areas and these are BIRDS. Our desert may seem cold to us in the wintertime, but to a northern bird, like a Heron or Egret, our winter temperatures may be paradise! However, our summer may be way too hot, so in the spring as temperatures begin to rise, many birds will pick up and go home. Migration Example: Great Egrets

Video links to accompany Frogs and Toad Watch! Lesson

Chihuahuan Desert Frogs and Toads Diorama: https://youtu.be/fvwvRcvHvKA

El Paso Frog Watch with iNaturalist: https://youtu.be/sN0ICTS0Xy0