

AN EDUCATOR'S GUIDE TO

THE HOUSTON

TOAD



TOADALLY TEXAN

RECOMMENDED FOR GRADES K-6

MADE POSSIBLE BY:



JACOB AND
TERESE HERSEY
FOUNDATION

HOUSTON TOAD EDUCATOR'S GUIDE

The Houston toad is one of the most endangered amphibians in North America. Adapted for a tough environment, unique to the Lone Star State, and willing to fight for survival, they are Toad-ally Texan!

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Photographs in this document provided courtesy of Paul Crump, Rachel Rommel, Dale Martin and Stephanie Adams. Illustrations in this document provided courtesy of Rachel Rommel, Danny Beckwith and the Houston Zoo.

Some activities were adapted from the Bastrop and Buescher State Parks “Loads of Toads” curriculum.

ALL ABOUT AMPHIBIANS

LESSON & ACTIVITIES

AMPHIBIAN SLIME WORKSHEET | 7

CUTANEOUS RESPIRATION WORKSHEET | 8

ALL ABOUT AMPHIBIANS WORKSHEET | 9



ALL ABOUT AMPHIBIANS

GRADES K – 5

TEKS STANDARDS MET: Science K–5th: 10.A | Science 5th: 9.C

OBJECTIVES:

Name the three main groups of amphibians.

Briefly explain the life cycle of amphibians.

Identify one unique feature of amphibian skin and how it serves as an adaptation.

Explain the importance of amphibians to the environment.

VOCABULARY:

Ectothermic – cold-blooded; relies on external sources of heat to maintain body temperature (cannot regulate body temperature by internal processes like humans)

Amphibian – bare-skinned vertebrate which typically has two stages of life; one gill-breathing in water and the other lung-breathing on land

Bio-indicator – organisms used to monitor the health of the environment

Metamorphosis – a change in form from one stage of life to another

BACKGROUND INFORMATION:

Amphibians are **ectothermic** (cold-blooded) vertebrates that generally live in or near water or moist environments. There are 7,000 known species of amphibians on the planet, and they can be found on every continent except Antarctica. The word amphibian means double life. Although there are many variations, amphibians typically hatch from eggs surrounded by a jelly-like substance and start life as a fish-like tadpole. As larvae, they do not look like their parents and are herbivores. As they mature, they change in body shape, size, diet and lifestyle. Once on land, they switch to a carnivorous diet consisting primarily of bugs. This process is called metamorphosis (i.e. egg-tadpole-frog). While most amphibians go through metamorphosis, some are direct developers, meaning they are born for life on land right out of the egg. Some frogs and salamanders are direct developers.


Even after an amphibian has completed metamorphosis, water is still very important to them. The skin of an amphibian must stay moist so the animal does not dry out. The skin is bare, not protected with feathers, fur or scales as in other vertebrates. Amphibians also have mucous and poison glands in their skin. Mucous glands help to protect their skin from drying out, and poison glands offer some protection against predators. Amphibian poison varies greatly between different species.

Amphibian skin is permeable, allowing oxygen and water to pass through it. This is why many amphibians can breathe on both land and in water. Breathing through the skin is also referred to as cutaneous respiration, which is an exchange of gases between the air and/or water. This adaptation allows amphibians to absorb water directly through their skin instead of drinking water like other animals. This also means that under hot and dry conditions they can also lose water through their skin. In addition to water and oxygen, other substances such as chemicals and pollutants can cross through their permeable skin and into their bodies. This adaptation makes them an excellent bio-indicator, as they can be very sensitive to changes or pollutants in their environment. Bio-indicators can be used to monitor the health of the environment and ecosystems. By studying the general overall health of species that are bio-indicators, like amphibians, you can learn a lot about the health of an environment or habitat.

Amphibians can be sorted into three main groups: frogs (includes toads), salamanders (includes newts), and caecilians. Frogs and toads are grouped together because all toads are a type of frog. However, there are some general differences between frogs and toads. Frogs have bulging eyes, long webbed hind feet adapted for leaping, climbing, and swimming, and lay eggs in clusters. They generally live closer to water. Toads have stubby bodies with short hind legs adapted for

ALL ABOUT AMPHIBIANS

GRADES K – 5



walking and short hopping, dry, warty skin, poison glands behind their eyes, and lay eggs in long strands. Because of their thicker skin, toads can live in drier habitats and may be found far from water.

Salamanders are amphibians that are sometimes mistaken for lizards. They have long bodies, at least two limbs, and a long tail. Salamanders can be found in moist habitats like mossy streams, forest floors, caves, and rainforest canopies. Some salamanders live on land for part of the year and return to water to lay their eggs. Others may spend their whole lives on land and lay their eggs under logs or in moss, hatching out directly into their adult form. Other salamanders never complete metamorphosis and stay in the water in their larval form breathing with external, feathery gills. Salamanders have a unique adaptation that other amphibians lack – they can regenerate their limbs if they lose one.

Caecilians resemble earthworms and mostly live hidden in the ground in tropical areas, although some are aquatic. They are covered in smooth skin like many other amphibians, but they have no limbs (like snakes), and have very poor sight and hearing. Bones in their skull are fused together and are used for burrowing underground. Caecilians have lungs, but also use their skin for oxygen absorption. They also have one of the strongest bites in the animal world! Little is known about caecilians due to their secret life underground.

The purpose of these activities is to introduce students to the special features of amphibian skin. Their permeable skin is a unique adaptation, but is also what makes these animals so vulnerable to changes in their environment. The first activity simulates the feel and physical characteristics of amphibian skin. The second activity demonstrates the permeability of amphibian skin and illustrates the process of cutaneous respiration.

ACTIVITY 1 – AMPHIBIAN SLIME



Materials

- Large mixing bowl
- Water
- White glue
- Borax
- Measuring cups and spoons
- Zip lock bags
- Food coloring
- *Amphibian Slime* worksheet or *All About Amphibians* worksheet

Instructions

1. Put students into small groups. Each group will create 1 batch of frog slime using the recipe on the student worksheet.
2. Mix 1 teaspoon borax in 1 cup of warm water. Stir until the borax is dissolved.
****Borax is harmful if swallowed. End product is NOT edible.****
3. In a separate container, mix ½ cup (4 oz) of white glue with ½ cup of water. Add food coloring, if desired.
4. After you have dissolved the borax and diluted the glue, you are ready to combine the two solutions. Stir. Your slime will begin to polymerize immediately. The slime will become hard to stir after you mix the borax and glue solutions.
5. Try to mix it up as much as you can, then remove it from the bowl and finish mixing it by hand. It's okay if there is some colored water remaining in the bowl.
6. Store your slime in a sealed Ziploc bag, preferably in the refrigerator. You'll want to chill the slime when you are not using it to prevent mold growth.
7. The main danger to your slime is evaporation, so keep it sealed when you're not using it.
8. Ask students how "frog slime" compares with a frog's actual skin.

ACTIVITY 2 – CUTANEOUS RESPIRATION



Materials

- 2 Plastic water bottles with holes poked all over them
- 2 large clear bowls
- Food coloring
- Black pepper
- *Cutaneous Respiration* worksheet or *All About Amphibians* worksheet

Instructions

1. Fill the water bottle (frog) with clear water.
2. Fill the large bowl (habitat) with colored water.
3. Ask the students what they think might happen to the “frog” in a clean habitat? In this case, the colored water represents a clean habitat. Will the frog absorb everything from its habitat?
4. Submerge the water bottle in the colored water and squeeze it multiple times.
 - a. What color did the water turn inside the frog?
 - b. Is it now the color of the water in its habitat? Why? (The frog absorbs oxygen and breathes through its skin.)
5. If time allows, have students squeeze the bottle. After a number of rounds, the bottle can be pulled out and should be the color of the water. Discuss frogs breathing and absorbing through their skin. In this example, the water bottle represents our frog.
6. Redo the experiment, this time adding black pepper to the colored water to represent chemicals and pollutants in the frog’s natural habitat.
 - a. Will the frog be able to only absorb the clean part of the water?
 - b. Will it be able to get rid of the pollutants or will the frog absorb everything?
7. Submerge the water bottle in the colored water with black pepper. The water bottle should be a mixture of colored water and black pepper, demonstrating that amphibians are excellent indicators of the cleanliness and health of water and the habitat.

AMPHIBIAN SLIME

MOST ANIMALS HAVE COVERINGS LIKE FUR, FEATHERS OR SCALES THAT HELP PROTECT THEIR BODIES. Amphibians are ectothermic animals that are covered with bare, smooth, and sticky skin. This group of animals includes frogs, salamanders, and caecilians. Many live in both water and on land. Most amphibians go through a process called metamorphosis where they change from egg to larvae to tadpole to adult. During this process, many amphibians start out breathing with gills and then develop lungs.

As adults, they have special, slimy skin that helps them breathe and absorb water. This skin also secretes mucous to keep the animal from drying out. Because amphibian skin has these special features, it is a great adaptation that helps them to survive in their habitat. But it also causes them to be more sensitive to changes in their environment, both in water and on land. Their skin can even be affected by natural oils, lotion or mosquito repellent on our hands. It is a good idea to not touch amphibians, like frogs, unless we are wearing special gloves or have very clean hands.

TO GET AN IDEA OF WHAT AMPHIBIAN SKIN MIGHT BE LIKE, FOLLOW THIS RECIPE WITH YOUR GROUP TO MAKE YOUR OWN FROG SLIME!

1. Mix in the large bowl: 1 cup of water and 1 teaspoon of borax
2. Mix in a second bowl: ½ cup of glue and ½ cup of water
3. Stir both bowls until glue and borax are dissolved
4. Add the glue mixture into the large bowl and stir
5. Add food coloring to your slime to make a special color for your group
6. Divide the slime into different containers to take home!

Draw or describe how your slime feels.

Name one way this slime could protect an amphibian.

What do you think can hurt the slime that protects an amphibian?



CUTANEOUS RESPIRATION



DURING THE TEACHER DEMONSTRATION OF CUTANEOUS RESPIRATION, RECORD THE FOLLOWING:

1. The water bottle filled with clear water represents a frog. What do you think the colored water represents?

2. After the frog is submerged in the water, what color did it turn?

3. Why did it change color?

4. What does the black pepper represent in the colored water?

5. What parts of the water did the frog absorb: the clean water, the polluted water, or both?

How do you know? _____

6. Do you think frogs and other amphibians that absorb oxygen and water through their skin are good indicators of whether water is clean or not?

Why? _____

ALL ABOUT AMPHIBIANS

ANIMAL COVERINGS HELP TO PROTECT THEIR BODIES.

Amphibians are a group of cold-blooded animals that are covered with a special type of skin. Many amphibians spend their lives in both the water and on land. Amphibians include three main groups: frogs, salamanders, and caecilians. Their skin has special features to help them survive in their environment. Amphibians need to keep their skin moist in order to stay protected. The picture below contains a variety of amphibians. Use this picture to help you answer the questions.



1. Circle the picture of the thing you think their skin feels like.

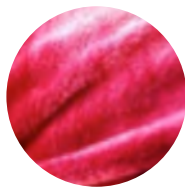
Rough like a rock

Soft like a blanket

Fluffy like feathers

Smooth like a marble

Slimy like goo



2. Watch as your teacher mixes up an example of amphibian skin. Using the words from above, describe what this mixture looks and feels like.

3. What kinds of things does their skin protect them from in their environment?

FROGS vs. TOADS

LESSON & ACTIVITIES

FROGS VS. TOADS WORKSHEET | 13

VENN DIAGRAM WORKSHEET | 14



FROGS VS. TOADS

GRADES K – 5

TEKS STANDARDS MET: Science K–5th: 4A | Science K–2nd, 5th: 10A | Science 1st: 10D
Science 2nd–4th: 10C

OBJECTIVES:

- Identify differences between frogs and toads
- Identify differences in stages of a frog and a toad life cycle

VOCABULARY:

Amphibian – bare-skinned vertebrate which typically has two stages of life; one gill-breathing in water and the other lung-breathing on land

Bio-indicator – organisms used to monitor the health of the environment

Metamorphosis – a change in form from one stage of life to another

BACKGROUND INFORMATION:

The three groups of amphibians are frogs (includes toads), salamanders (includes newts), and caecilians. Frogs and toads are grouped together because toads are a type of frog! However, there are some general differences between frogs and toads.

Frogs

- o large bulging eyes
- o strong, long hind feet adapted for leaping and swimming
- o webbing between toes or sticky pads for climbing on leaves
- o smooth, slimy skin
- o eggs are laid in clusters
- o live closer to water all year long

Toads

- o stubby bodies
- o short hind legs adapted for walking or short hopping
- o dry, thick skin
- o poison glands behind eyes
- o eggs are laid in long chains
- o less webbing between toes
- o often live further from water, returning to water only to breed

ACTIVITY 1 – IDENTIFYING DIFFERENCES

Materials

- Resources about frogs and toads (books or computer)
- Paper
- Pencils/pens
- *Frogs vs. Toads* worksheet

Instructions

1. Read the general differences between frogs and toads to the class. For older students, allow them to use various resources to research the differences on their own. Students should focus on physical characteristics as well as life cycle differences.
2. Students should record their findings using the Frogs vs. Toads worksheet or on their own paper.

ACTIVITY 2 – COMPARING AND CONTRASTING

Materials

- Venn Diagram worksheet
- Pictures of frogs and toads
- Pencil/Pen
- Information collected in Activity 1

Instructions

1. Organize students into pairs.
2. Give each pair a Venn Diagram worksheet, a picture of a frog, and a picture of a toad.
3. Instruct students to compare and contrast the pictures.
4. Students will write similarities and differences on the worksheet using their observations from the pictures as well as the information collected in Activity 1.
5. Discuss the similarities and differences as a class.

IDENTIFYING DIFFERENCES

AFTER DISCUSSING THE DIFFERENCES BETWEEN FROGS AND TOADS, SEE IF YOU CAN LABEL THE CORRECT AMPHIBIAN!

Match the words in the word bank to the correct picture! Is it a frog or a toad?

Short back legs
Smooth skin
Stubby body

Eggs are laid in clusters
Two huge eyes
Thick or bumpy skin

Strong, long back legs
Eggs are laid in strands
Webbed feet or sticky pads



Eggs are laid in: _____

Eggs are laid in: _____

COMPARING AND CONTRASTING

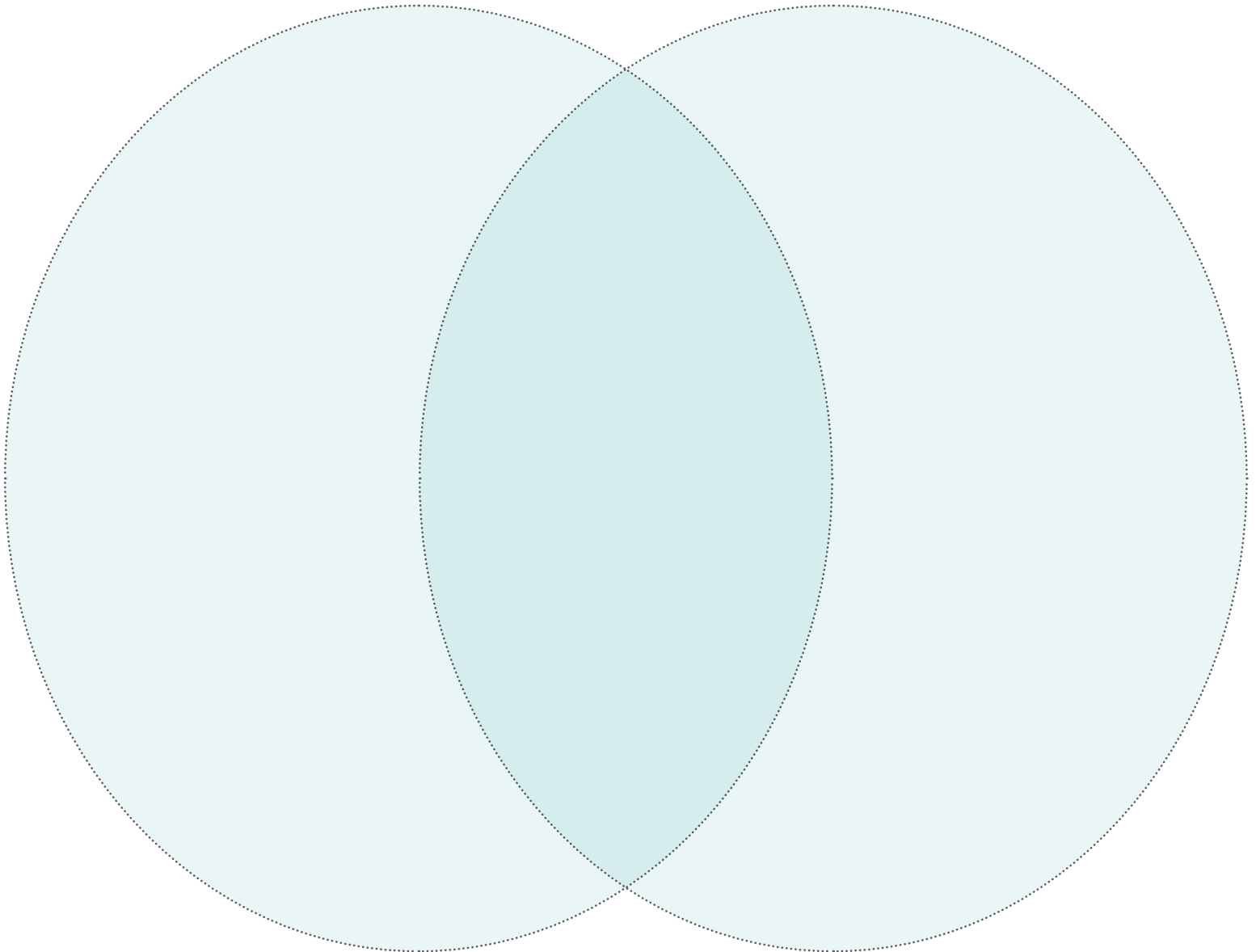


WRITE CHARACTERISTICS OF FROGS IN THE BIG CIRCLE LABELED FROGS. WRITE THE CHARACTERISTICS OF TOADS IN THE BIG CIRCLE LABELED TOADS. IN THE CENTER CIRCLE, WRITE WHAT FROGS AND TOADS HAVE IN COMMON



[FROGS]

[TOADS]



KNOW YOUR TOAD

LESSON & ACTIVITIES

KNOW YOUR TOAD DESCRIPTIONS | 19

KNOW YOUR TOAD WORKSHEET | 20 & 21



KNOW YOUR TOAD

GRADES 3 – 6

TEKS STANDARDS MET: Science 3rd–6th: 10A

OBJECTIVES:

Identify the Houston toad.

Identify other toads that live in the area.

VOCABULARY:

Adaptation – a physical or behavioral characteristic that helps an animal to survive and reproduce in its environment

Endangered – in danger of becoming extinct, not many individuals left in the wild

Endemic – limited in range, found only in one state or country

Predator – an animal that hunts other animals

Prey – an animal that is hunted by other animals

BACKGROUND INFORMATION:

Texas has more toad species than any other state. There are nine species of toad found in the state, occupying every known habitat type from forests and marshes, to prairies, deserts, and mountains. Toads can tolerate drier conditions than frogs, an adaptation that has allowed them to live in so many different habitats. The Houston toad is the only toad endemic to Texas, and it is highly endangered. Houston toads are 2-2.5 inches long and vary in color from mottled black or reddish brown to purple-gray in color. They sometimes have dark green patches as well. Their underside is usually speckled with numerous dark spots and a light stripe runs down the middle of their back. Males have a dark color throat. Many people often think this is a toad found in their yard or garden, but Houston toads are very secretive, coming out only during certain weather conditions. Oddly enough, the Houston toad is no longer found in Harris County, home to most of the city of Houston. The toad is located in only a few remaining counties in Texas (see map for current and historic range). So it's much more likely the toad in your yard or garden is a type of common toad found in Texas, not the endangered Houston toad.

Among some of the most mistaken for the Houston toad is the Woodhouse's toad and the Gulf Coast toad. The Gulf Coast toad's colors vary from almost black to brownish-yellow with a distinctive white or yellowish colored stripe down the center of their back. They are 2-4 inches in length and have a cream belly that may or may not have some dark spots. Males have a yellow throat. The Woodhouse's toad is 2-5 inches in length and ranges from yellow-brown or gray to yellow, green-brown, or green with a whitish stripe down the middle of their back. They have rough, warty skin, and males have a dark colored throat.

Another toad that can be found in the Houston toads western range is the Texas toad. It measures 2-3.5 inches in length and are gray with brown or yellow-green spots. Their bodies are round and covered with small green warts. The Texas toad also has two black tubercles (a small rounded projection) on each of the hind feet.

The coloration of these toads is an adaptation that will help them to survive in the habitats in which they are found by providing excellent camouflage. Although toads are predators to insects, they are also prey for many other, larger animals. However, even though there are some color differences in the different species, color and patterns can sometimes be less reliable ways to tell the difference between species because the colors can vary over seasons, time of day, and temperature.

KNOW YOUR TOAD

GRADES 3 – 6

Scientists often look at the shape of the parotoid glands (a large poison gland situation in an area on the side of the head), and the cranial crests (ridges on the head). But one of the easiest ways to tell the difference between toads is not based on physical characteristics, but on sound – the vocalizations of males. When weather conditions are good, the male toads will gather around a pond, lake, or puddle and call to attract females to the site they have chosen to mate. You can listen to these different calls by visiting the Houston Zoo’s website (www.houstonzoo.org/know-your-toads), on the Texas Parks and Wildlife Calls of Frogs and Toads CD, or by looking them up online.



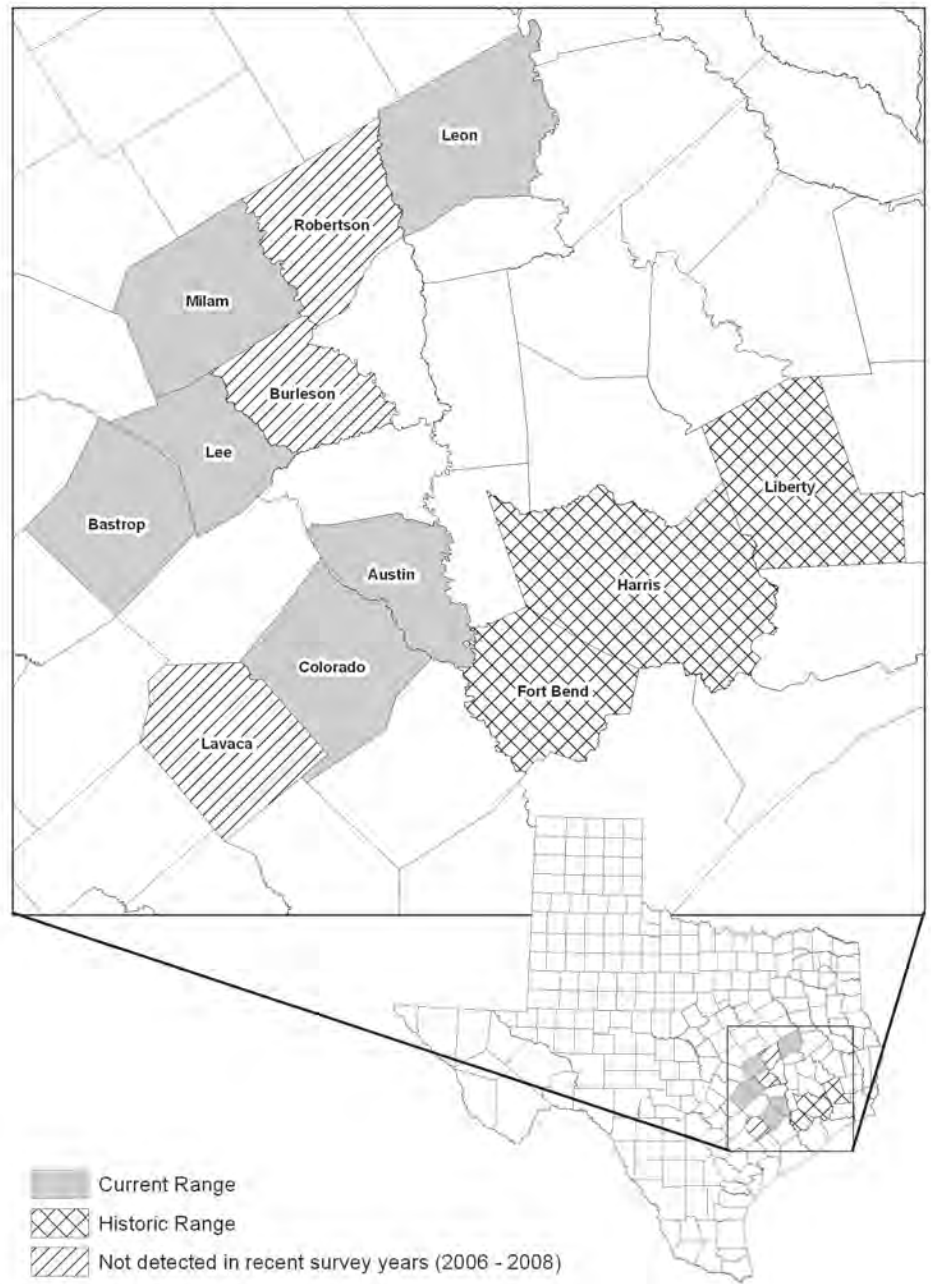
Houston toad (left) and Gulf coast toad (right)



Underside of Houston toad (left) and Gulf coast toad (right)



Male Houston Toad calling



ACTIVITY 1 – COLORING TOADS



The purpose of this activity is to introduce students to the identification of different types of toads. This will help them learn to identify them in the wild as well.

Materials

- *Know Your Toad Descriptions* worksheet
- *Know Your Toad* worksheet
- Pencil/pen
- Crayons, markers, or colored pencils

Instructions

1. Pass out a copy of the *Know Your Toad Descriptions* worksheet and the *Know Your Toad* worksheet to each student.
2. Using the descriptions, students should color each toad with the appropriate coloration and markings. Each toad should look similar to the others, but with slight differences.

KNOW YOUR TOAD DESCRIPTIONS

HOUSTON TOAD:

- Blackish-brown to a creamy purple/gray-purple
- Dark green patches over body (not always)
- Numerous dark spots on belly
- Males have dark colored throat



WOODHOUSE'S TOAD:

- Green to green-brown to yellowish-gray
- Whitish stripe down the middle of back
- Rough, warty skin
- Males have dark colored throat



GULF COAST TOAD:

- Black to brownish-yellow
- White or yellowish stripe down the center of back
- Cream belly, with or without some dark spots
- Males have yellow throat

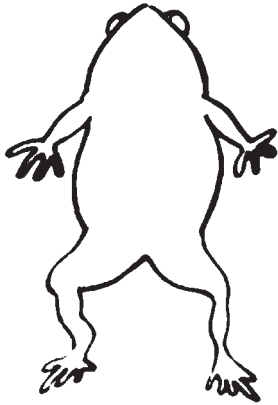
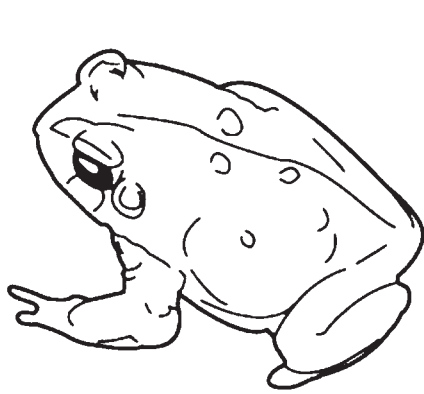


TEXAS TOAD:

- Gray with brown or yellow-green spots
- Small green warts
- Two black tubercles (a small rounded projection) on each of the hind feet

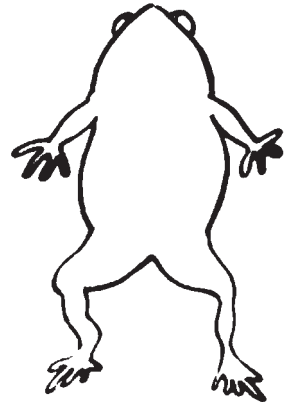
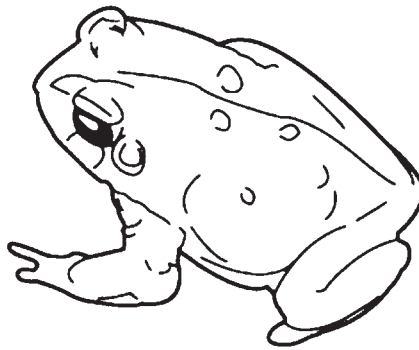


KNOW YOUR TOAD

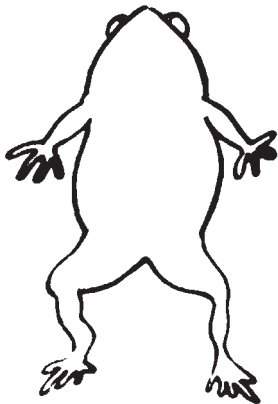
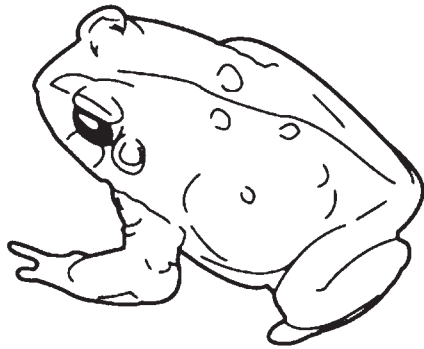


> HOUSTON TOAD

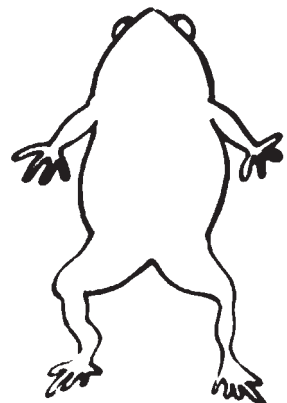
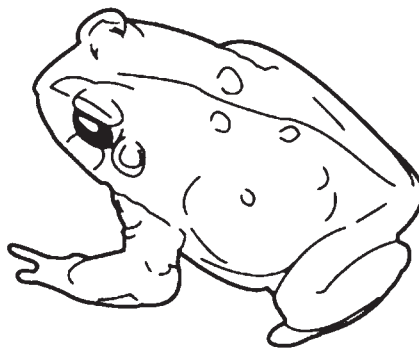
WOODHOUSE'S TOAD <



> GULF COAST TOAD



TEXAS TOAD <



KNOW YOUR TOAD QUESTIONS



1. What would be the easiest way to tell a Gulf coast toad from a Houston toad?

2. All of these toads have very similar coloring. How does this coloring help them survive in the wild?

3. What adaptations do toads have that help them survive in their environment?

4. Would these toads be considered a predator or prey? _____

How can you tell? _____

5. Name two threats toads living in the city would face.

TOAD HOME ON THE RANGE

LESSON & ACTIVITIES

TOAD HOME ON THE RANGE MAP SHEET, GRADES 1 & 2 | 25

TOAD HOME ON THE RANGE MAP SHEET, GRADES 3 & 4 | 26

TOAD HOME ON THE RANGE ACTIVITY SHEET | 27



TOAD HOME ON THE RANGE

GRADES 1 – 4



TEKS STANDARDS MET: Social Studies 1st: 5B | Social Studies 2nd: 6B, 6C
Social Studies 3rd: 5A, 5D | Social Studies 4th: 7B

OBJECTIVES:

Create a map of Texas identifying their local community and the regions of Texas.
Analyze and compare the regions of Texas as they relate to the habitat of the Houston Toad.

VOCABULARY:

Region – a geographic area that is defined by specific shared characteristics

Habitat – the environment in which an animal lives

Endemic – limited in range, found only in one state or country

BACKGROUND INFORMATION:

Texas can be divided into different regions, based on the geographic and vegetation characteristics of the state. One of the ways the state is divided is into seven geographic regions. Each region has very specific traits which are often similar to neighboring states but very different from the neighboring region. A good resource to learn more about these regions is http://www.tpwd.state.tx.us/kids/about_texas/regions/.

The Houston Toad is endemic to Texas. It requires a very specific habitat to survive, and so has a limited range. The Houston toad needs soil that is primarily made of sand and is loose and deep. They prefer to live in a woodland savannah, a habitat that looks like a mix of grassland and forest. During breeding season, the toads need shallow, still ponds to lay their eggs.

ACTIVITY 1 – MAPPING REGIONS OF TEXAS



Materials

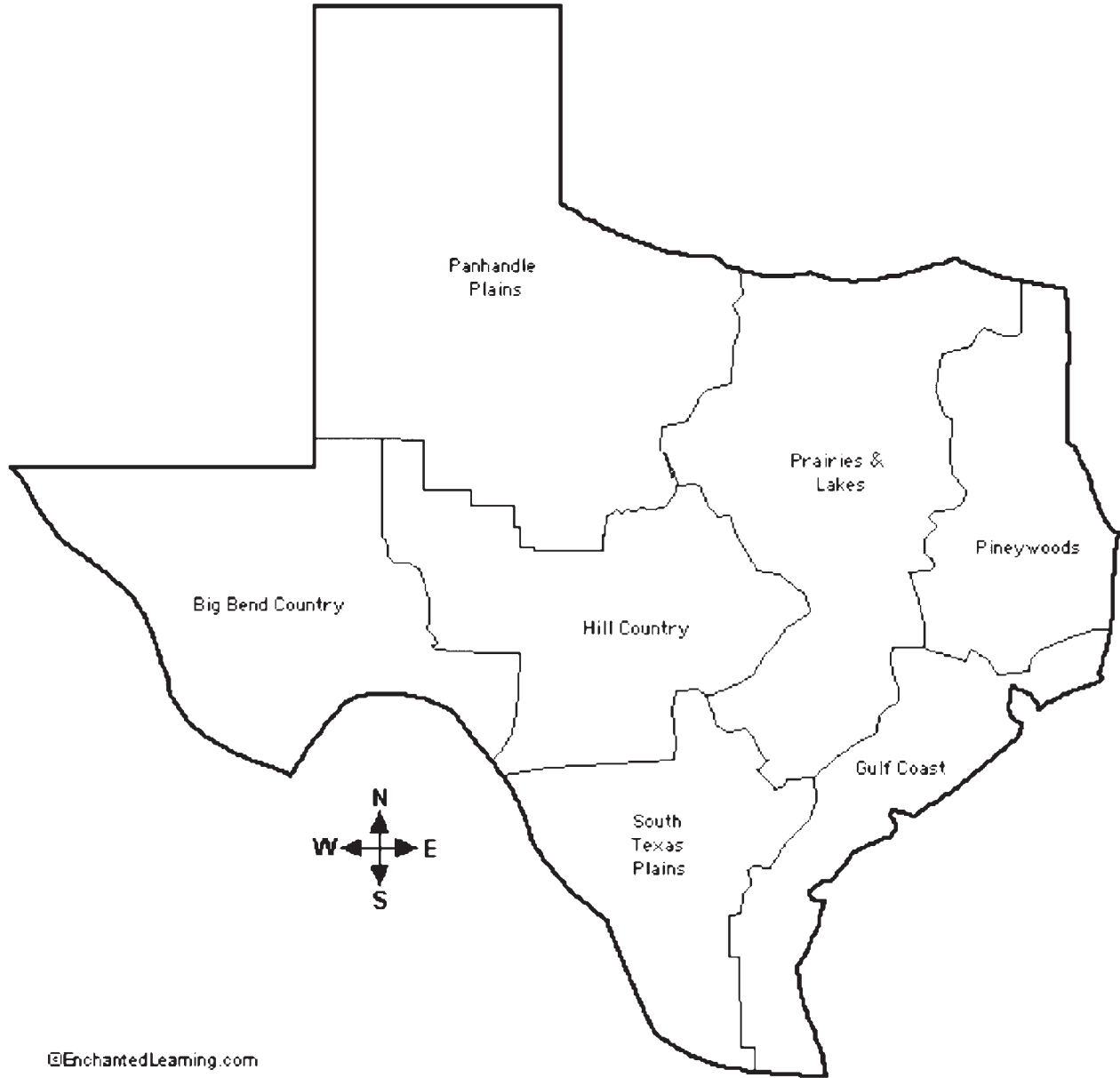
- *Toad Home on the Range* map sheet
- *Toad Home on the Range* activity sheet
- Crayons, markers, or colored pencils
- Pen/pencil
- Resources to research names of the regions (optional)

Instructions

- 1.** Using the appropriate map for your grade level, students should label the regions of Texas and complete the legend with colors or shading. If needed, students can research the names of the regions to help them label the map.
- 2.** Once the regions are mapped, students should place a symbol (X, circle, etc.) in the location of the community in which they live. The symbol should be added to the legend and labeled.
- 3.** Once their maps are finished, students should complete the activity sheet. Younger students may need the regions described for them; older students should research the characteristics of the regions on their own.
- 4.** As an additional enrichment activity, older students can research the range of the Houston Toad and add it to their maps.

TOAD HOME ON THE RANGE

MAP SHEET: GRADES 1 & 2



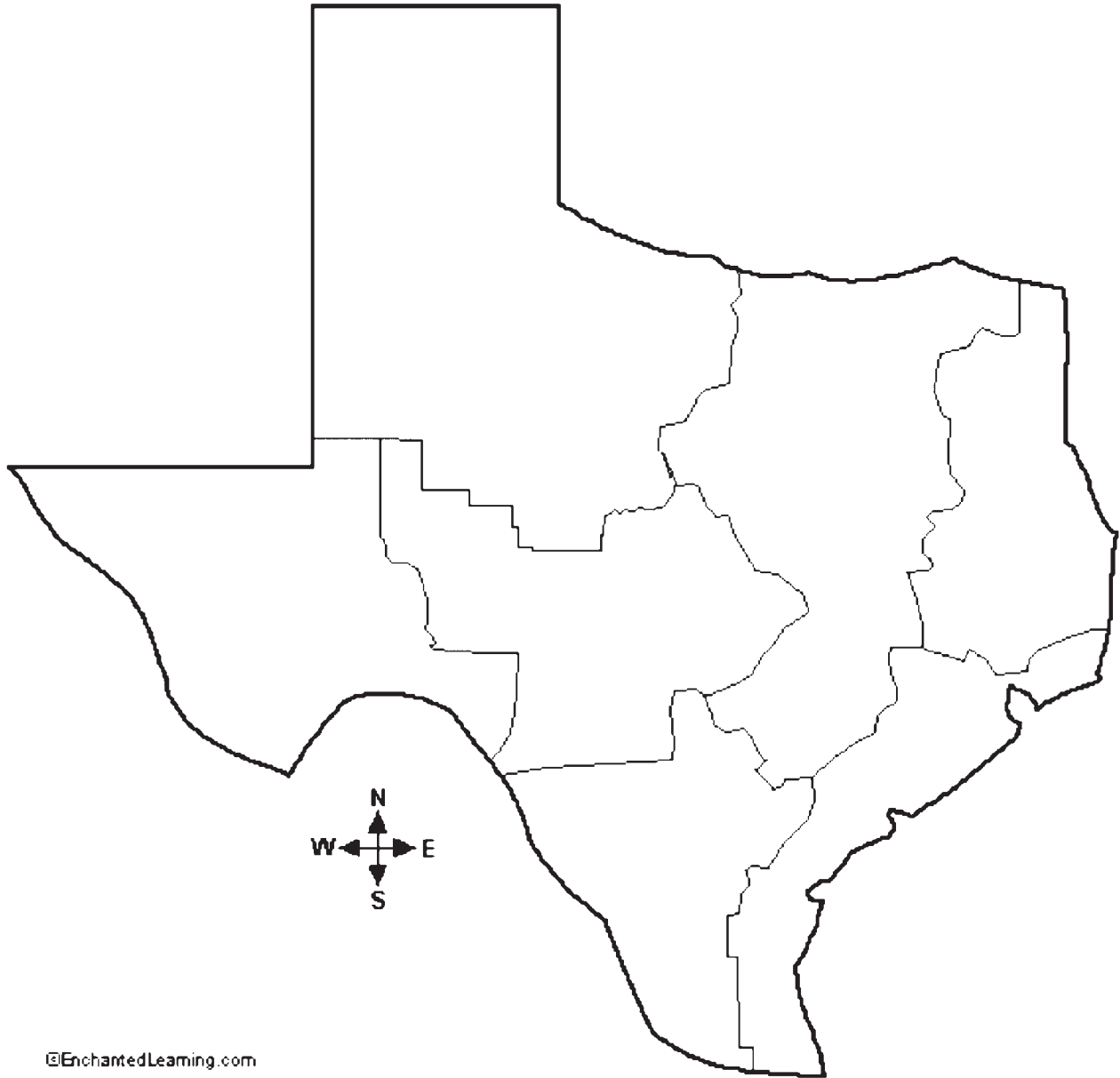
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LEGEND:

<input type="checkbox"/>	PANHANDLE PLAINS	<input type="checkbox"/>	BIG BEND COUNTRY
<input type="checkbox"/>	HILL COUNTRY	<input type="checkbox"/>	SOUTH TEXAS PLAINS
<input type="checkbox"/>	PRAIRIES & LAKES	<input type="checkbox"/>	GULF COAST
<input type="checkbox"/>	PINEYWOODS		

TOAD HOME ON THE RANGE

MAP SHEET: GRADES 3 & 4



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LEGEND:

- | | | | |
|--------------------------|-----------------------------|--------------------------|---------------------------|
| <input type="checkbox"/> | PANHANDLE PLAINS | <input type="checkbox"/> | BIG BEND COUNTRY |
| <input type="checkbox"/> | HILL COUNTRY | <input type="checkbox"/> | SOUTH TEXAS PLAINS |
| <input type="checkbox"/> | PRAIRIES & LAKES | <input type="checkbox"/> | GULF COAST |
| <input type="checkbox"/> | PINEYWOODS | | |

TOAD HOME ON THE RANGE



1. What region of Texas includes the community where you live?

2. Describe the habitats of each region.

Panhandle Plains:

Big Bend Country:

Hill Country:

Prairies and Lakes:

Pineywoods:

Gulf Coast:

South Texas Plains:

3. Which region do you think is home to the Houston Toad? Why?

TOAD TALES

LESSON & ACTIVITIES

TOAD TALES ACTIVITY SHEET, GRADES K - 3 | 30

TOAD TALES ACTIVITY SHEET, GRADES 4 - 6 | 31



TOAD HOME ON THE RANGE

GRADES K – 6

TEKS STANDARDS MET: English, Language Arts and Reading K: 14A | English, Language Arts and Reading 1st - 3rd: 18A | English, Language Arts and Reading 4th-5th: 16A | English, Language Arts and Reading 6th: 15A

OBJECTIVES:

Research information about the Houston Toad.

Write a story about life as a Houston Toad, expressing ideas and feelings about real or imagined people, events, and ideas.

VOCABULARY:

Endemic – limited in range, found only in one state or country

Habitat – the environment in which an animal lives

BACKGROUND INFORMATION:

The Houston toad is an endemic species to central Texas. The habitat that it lives in is a tough place to survive. From the moment an egg is laid until it becomes an adult and lays its own eggs, the toad's life is full of many challenges, making it a great character for stories.

The Houston toad requires a very specific habitat. The young toads and adults require small stands of woods (to provide shade) with sandy soils (where it can burrow to avoid the heat). In order to lay their eggs, adult toads require shallow seasonal ponds. These ponds fill up with the first good rain of the spring and only last for a few months, which means they will be home to fewer predators.

The life cycle of the Houston toad is similar to many frogs and toads. It goes through a process called metamorphosis. First, an egg is laid in a pond. The egg must stay moist; if it dries out it will not turn into a toad. From the egg hatches a tadpole, which has gills and a tail. As it gets bigger, the tadpole starts to grow first its back legs, then its front legs. The tail is absorbed back into the body, the gills disappear, and it begins to breathe through lungs. It then becomes a toadlet, which looks like a miniature version of an adult toad. After about a year, the toad is full size and considered an adult.

A Houston toad faces many challenges throughout its life. As an egg it has to stay moist and not be eaten. As first a tadpole and then a toadlet, it has to find food and avoid predators. The adult toads have to avoid predators, find food, stay moist and avoid the heat. One of the biggest challenges for the toads is getting to the pond to lay eggs, because the seasonal ponds may change or disappear, and toads often have to cross roads or avoid cattle to get to the pond.

ACTIVITY 1 – TOAD TALES



Materials

- *Toad Tales* activity sheet
- Pen/pencil
- Paper

Instructions

- 1.** Using the activity sheet, have students brainstorm what they know about the Houston Toad. When they have completed everything they already know, have students research the toad to complete the information on the activity sheet.
- 2.** With the character information students have compiled, they will take on the character of a Houston Toad. Have students write first-person short stories about their life as a Houston Toad. They should include details about their struggles, their habitat, and how they feel about their adventures.

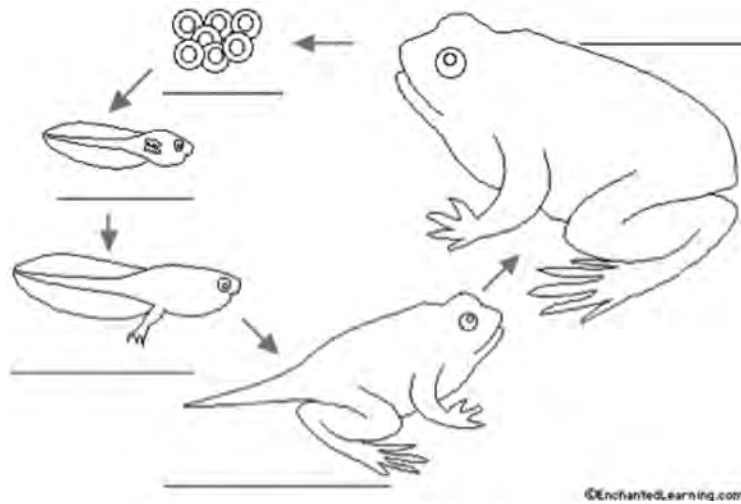
TOAD TALES

GRADES K – 3



1. Setting: Draw a picture of the Houston Toad's habitat.

2. Character Development: Label the life cycle of the Houston Toad.



3. Plot Development: Name two things that might happen to a Houston Toad in the wild.

TOAD TALES

GRADES 4 – 6



1. Setting: Describe the habitat of the Houston Toad.

2. Character Development: Describe the life cycle of the Houston Toad.

3. Plot Development: Describe the challenges that a Houston Toad might face in the wild.

TOAD POPULATIONS

LESSON & ACTIVITIES

TOAD POPULATION WORKSHEET | 36, 37 & 38



TOAD POPULATIONS

GRADES 3 – 5

TEKS STANDARDS MET: Mathematics 3rd-5th: 3A, 3B, 5A, 13A, 13B, 14A, 14B, 14C, 15A, 15B, 16B
Mathematics 3rd: 4B, 4C | Mathematics 4th: 4D, 4E | Mathematics 5th: 3C

OBJECTIVES:

- Complete a table.
- Create a line graph using information from a table.
- Complete a bar graph using information from a table.
- Find the average of a set of numbers in a table.
- Correctly use pictograms to represent numbers.
- Draw conclusions from graphs and other mathematical information.

VOCABULARY:

Average – the sum of a set of numbers divided by how many numbers are in the set

Endangered – in danger of becoming extinct, not many individuals left in the wild

Population – a group of one or more individuals of a species living together in a particular area or habitat

BACKGROUND INFORMATION:

Scientists conduct a lot of research on populations of endangered animals, like the Houston Toad, to help them understand reasons why they are endangered, how different factors (like weather, pollution, etc.) may affect the population, and the best ways for humans to help them to survive and reproduce. One type of data collected by scientists is the number of males and females in a population. Not only can this information tell us the number of individuals remaining in a population, it can also help us to determine how quickly the population might be able to recover. Scientists use the number of males and females remaining and combine this data with information about the mating season, development time (time it takes a toad to go from egg to tadpole to frog), survival rate (what is the chance an egg will survive to be an adult frog), and other information to estimate how the population will grow. Of course, this can change based on what happens in the animals' habitat, like wildfires, an influx of predators, and other factors.

Collecting population information each year helps scientists to make educated decisions on how to best protect and conserve these populations and their habitats. Comparing the average number of males to the average number of females can help scientists to determine how quickly the population might be able to reproduce. For example, scientists could calculate the average number of offspring that could be produced based on the average number of males and females. They could also determine if the population changes the following year match the expected number of offspring to evaluate if there are other factors affecting offspring survival. A population's numbers will increase more quickly if there are more females because more offspring can be born each year. However, in the long term, this will cause result in less genetic diversity in the population.

ACTIVITY 1 – TOAD POPULATIONS



Materials

- *Toad Population* worksheet
- Pencil
- Calculator (optional)

Instructions

1. Give each student a Toad Population worksheet.
2. Working alone or in pairs, have students complete the worksheet. Examples can be done as a class or correct answers can be discussed after worksheets have been completed

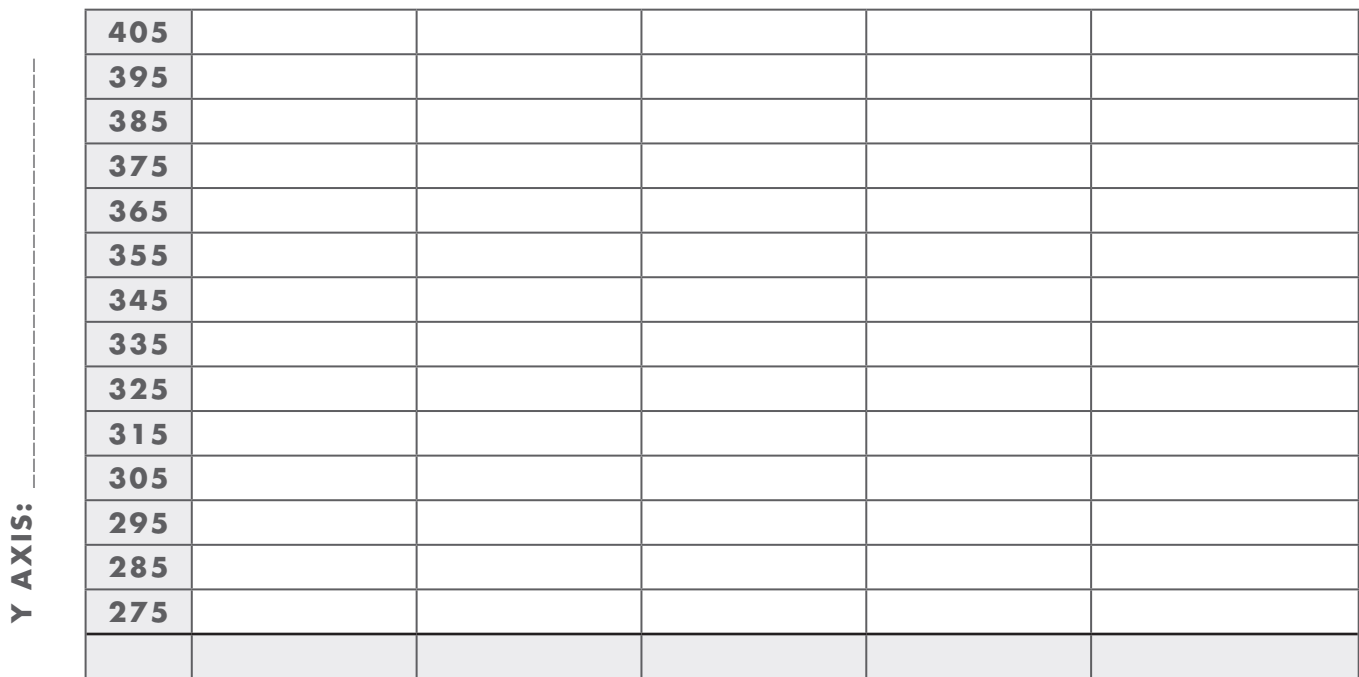
TOAD POPULATIONS PAGE 1 OF 3



1. The numbers in the table below are actual population estimates for Houston Toads at two breeding ponds in Bastrop State Park. Complete the table to find the total number of toads in the population each year.

YEAR	1990	1991	1992	1993	1994
Male Toads	256	310	241	325	280
Female Toads	73	85	51	62	75
TOTAL					

2. Using the information from the table above, construct a line graph showing the number of Houston Toads in the population each year.
- Step 1:** Label the axes.
 - Step 2:** Put a dot on the graph to show the number of toads in the population each year.
 - Step 3:** Connect the dots for a line graph.



X AXIS: _____

3. Does it look like the population is: a. Staying the same b. Increasing c. Decreasing

TOAD POPULATIONS

4. What are some reasons why an animal population would increase?

5. What are some reasons why populations of endangered animals would decrease?

6. Create a bar graph comparing the number of males and females in the population each year. The first year has been done for you.
 - a. **Step 1:** Label the axes.
 - b. **Step 2:** Color in the number of male (M) and the number of female (F) toads in the population each year

Y AXIS:	350										
	325										
	300										
	275										
	250										
	225										
	200										
	175										
	150										
	125										
	100										
	75										
	50										
		M	F	M	F	M	F	M	F	M	F

X AXIS: _____

7. Find the average number of male toads in the population (from 1990-1994). Round the number to the closest one. Which pictogram shows the correct average?



TOAD POPULATIONS



8. Find the average number of female toads in the population (from 1990-1994). Round the number to the nearest one. Which pictogram shows the correct average?



9. Scientists often compare the number of males to the number of females in a population of animals. Why is this information important to a scientist? What does this information tell you about the population of animals?

10. In order for a population of animals to increase more quickly, should there be more males or more females in a population?

THE DECLINE OF THE HOUSTON TOAD

LESSON & ACTIVITIES

A HOME FOR THE TOADS ARTICLE | 42



THE DECLINE OF THE HOUSTON TOAD

GRADES 3 – 5



TEKS STANDARDS MET: English Language Arts and Reading 5th: 2B, 11B, 28 | Science 3rd-5th: 9A

OBJECTIVES:

- Use context clues to discover meaning of unfamiliar words.
- Determine facts and verify them through established methods.
- Give organized presentations.
- Identify the basic needs of living things and their dependence on the environment.
- Research information about the Houston toad.
- Utilize information to create a presentation.

VOCABULARY:

Habitat – the environment in which an animal lives

Historic distribution range – where a species used to be found; however, is no longer there

Urbanization – growth of cities

Introduced – non-native species

Loss of breeding pond – the draining or alteration of small ponds

Endangered – in danger of becoming extinct, not many individuals left in the wild

BACKGROUND INFORMATION:

The Houston toad is quickly declining due to a variety of reasons. From land conversion to invasive species, the Houston toad has a lot to contend with in its environment. This article introduces vocabulary terms as well as factual information that may be utilized in presentation form.

ACTIVITY 1 – HOUSTON TOAD PRESENTATION



Materials

- Vocabulary definitions from Activity 1
- Pen/pencil
- Resources to research the Houston toad

Instructions

1. Instruct students to use this article as a starting point for their research.
2. Split the class into groups of 5-6 students and provide each group with one of the following topics:
 - o Urbanization- what is it and how is it affecting the Houston toad?
 - o Introduced Species- what are some examples and how is it affecting the Houston toad?
 - o Houston toad habitat- what is so special about where they live?
 - o Ways to help- what can we do to help the Houston toad?
 - o Identifying the Houston toad- how can we identify the Houston Toad? What are differences between other similar toads like the Gulf coast toad?

A HOME FOR THE TOADS

The Houston toad's **habitat** is pine or oak woodland or savannah with deep sandy soils. Savannahs are grassy areas with scattered trees and bushes. The Houston toad's **historic distribution range** was in the Post Oak Savannah and Coastal Prairie regions of Texas. Today Houston toads are found in only nine counties in the Post Oak region of east central Texas. The largest population of Houston toads is found in Bastrop State Park and surrounding lands. In order to survive within the Post Oak region the Houston toad needs deep, sandy soil to burrow into when it is hot and dry (aestivation) or cold and dry (hibernation), places to find food (food is insects and other invertebrates), safe places in tall grasses to hide from predators, and small natural ponds where they can lay their eggs. Loss of habitat is the most severe threat to the survival of the Houston toad.

There are many different causes to the toad's loss of habitat. **Urbanization**, or the growth of cities (such as Houston), replaces natural vegetation with buildings and roads. Loss of native plants, from the conversion of native vegetation into cropland and **introduced** grass pastures, reduces the kinds and numbers of insects needed for food. Introduced sod-forming grasses, like Bermuda grass, grow too dense for the toad to move through it. **Loss of breeding pond** habitat, when small natural ponds are drained or altered, leaves Houston toads without good places to breed and lay their eggs. Uncontrolled heavy grazing by livestock can remove the tall grass cover the toads need to hide from predators, and which promotes insect diversity for their diet.

A very important problem for the Houston toad and for most Texas endangered species is lack of awareness about their natural history and habitat needs. Many people have never heard of the Houston toad. Everyone can help Houston toads by learning about their natural history and conservation needs and sharing this information with others. Well-informed students can teach their parents, brothers and sisters, and friends all about this fascinating toad. Understanding the life history of the Houston toad will help build support for efforts to help this **endangered** species survive, keeping them from extinction.

TOAD CONSERVATION

LESSON & ACTIVITIES

DECOMPOSITION WORKSHEET | 46 & 47

MAKE A TOAD ABODE WORKSHEET | 48 & 49



TOAD CONSERVATION

GRADES K – 6

TEKS STANDARDS MET: Science K-2nd: 1C | Science 3rd-6th: 1B

OBJECTIVES:

Define the term conservation.

Identify one way the Houston Zoo works to conserve Houston toads.

List three ways to help conservation efforts at home.

Demonstrate how to use, conserve, and dispose of natural resources and materials.

Construct a toad abode.

VOCABULARY:

Conservation – the preservation or restoration of anything in a particular ecosystem

Endangered – in danger of becoming extinct, not many left in the wild

Bio-indicators – an organism that tells the health of an ecosystem

Head start – a conservation practice that gives a species an advantage in the wild by spending part of their life cycle safely in captivity

BACKGROUND INFORMATION:

The Houston toad is an endangered amphibian, which means there are very few of these toads left in the wild. This species of toad is currently found in only a few small pockets of Texas. Conservation of the Houston toad is important because toads and all amphibians are bio-indicators. This means that amphibians are typically the first species to indicate if an ecosystem is unhealthy.

Amphibians are an extremely important part of the ecosystems where they are found, so it is important that we conserve them. Healthy functions in ecosystems are important to human life because humans are a part of ecosystems too. We rely on natural processes for clean water, oxygen, food, climate and other natural resources. Not only are amphibians bio-indicators in land and water habitats, they also play an important role in the food chain. They are food for larger animals, and they help to control the insect population. At the Houston Zoo, a number of staff are involved in the conservation of Houston toads.

In order to preserve the Houston toad population in Texas, many biologists, conservationists, and private citizens are working to help protect and restore the habitat the Houston toads need to survive. In addition, there are employees of the Houston Zoo who have created a “head start” program for the Houston toad. This means scientists from the Zoo work with other local organizations to collect Houston toad egg strands from ponds each spring to bring back to the Zoo. The eggs hatch safely inside a Zoo building built specifically for them, and the tadpoles grow up to become large, strong toads! Once the toads have reached a specific size, they can be taken back to the exact spot where they were found in the wild and released. One advantage of keeping the toads in captivity until they reach a larger size is because they become big enough to not become prey for larger animals. The larger the toad is, the higher chance it has of survival! This head start process helps to increase the overall population of endangered Houston toads.

Field researchers, biologists and scientists are the people we typically think about when we hear the word conservation. However, all people can become conservationists in their own home! The first activity is designed to highlight the amount of time different types of materials take to decompose in a landfill. Students are then asked to think of ways to conserve these items at home.

Although Houston toads are very rare, we can help the more common toads living around our home by creating toad abodes. Creating new homes for toads increases their chance of survival around our homes. These homes are known as toad abodes. Toads need cool, moist areas to in which to live. They also like dark moist places where they can catch a lot of bugs and insects since this is the bulk of their diet. This place should also have shade, especially plants like native wildflowers and grasses. The second activity is designed to allow students to provide habitats in their own backyard for native wildlife.

ACTIVITY 1 – DECOMPOSITION TIME

Materials

- *Decomposition* worksheet
- Pencil/Pen

Instructions

1. Distribute a decomposition worksheet to each student.
2. Ask students to estimate how long each item takes to decompose in a landfill.
3. Then, compare student answers with the estimates drawn by scientists.
4. Ask students to come up with ways they can help conserve these items at home so they don't end up in habitats where wild animals (like the Houston toad) live!
5. Complete critical thinking questions on the second page of the worksheet.
6. Answers: aluminum can – 200 years, milk jug – 500 years, plastic bag – 100 years, 6 pack plastic ring – 450 years, styrofoam – unknown (maybe forever), leather boots – 50 years, paper bag – 1 month

ACTIVITY 2 – DECOMPOSITION TIME

Materials








- *Make a Toad Abode* worksheet
- Pen/pencil
- Clay gardening pot, empty coffee tin, or dark plastic container
- Small digging shovel, trowel, or metal spoon
- 1 cup of water
- Paint (optional)

Instructions

1. Use a shovel or small trowel to dig a hole in your chosen spot. This hole should be slightly larger than the size of the "abode" you are making. Keep the dirt you just removed; you will use it later!
2. Take your "abode" and lay it in the hole you just dug. Lay it in the hole on its side, just like in the photo below.
3. Using the dirt you set aside earlier, lay it in the bottom side of the pot. This will create a nice soft "bed" for your toad when he arrives home.
4. Pour the cup of water all over the soil you just put back in the Toad Abode. This will keep the area moist and help pack in the dirt.
5. Toad abodes can be painted before or after being constructed.
6 pack plastic ring – 450 years, styrofoam – unknown (maybe forever), leather boots – 50 years, paper bag – 1 month

DECOMPOSITION TIME



ITEM IMAGE	ITEM NAME	STUDENT DECOMPOSITION ESTIMATE	ACTUAL DECOMPOSITION ESTIMATE	WAYS TO CONSERVE
	ALUMINUM CAN			
	MILK JUG			
	PLASTIC BAG			
	6-PACK PLASTIC RINGS			
	STYROFOAM			
	LEATHER BOOTS			
	PAPER BAG			

ANSWER BANK: 100 YEARS • 500 YEARS • 200 YEARS • 450 YEARS • 50 YEARS • 1 MONTH

DECOMPOSITION TIME



1. How could you use green practices like reduce, reuse, and recycle to limit the amount of products in your home from going into a landfill?

2. Are there any products in your home that can't be recycled? Why or why not?

3. Will we ever run out of space for landfills? Why or why not?

4. What do you think would happen to trash if we ran out of space for landfills?

5. What practices besides reduce, reuse and recycle can we try now to limit our impact on the environment later?

6. How does trash affect wildlife like the Houston toad?

MAKE A TOAD ABODE!

-
1. Use a shovel or small trowel to dig a hole in your chosen spot. This hole should be slightly larger than the size of the “abode” you are making. Keep the dirt you just removed; you will use it later!
 2. Take your “abode” and lay it in the hole you just dug. Lay it in the hole on its side, just like in the photo below.



3. Using the dirt you set aside earlier, lay it in the bottom side of the pot. This will create a nice soft “bed” for your toad when he arrives home.
4. Pour the cup of water all over the soil you just put back in the Toad Abode. This will keep the area moist and help pack in the dirt.
5. Now just sit and wait to see or hear your toads! You can also paint your toad abodes if you like. Make sure not to use paint which will be toxic or harm the toad in anyway.



MAKE A TOAD ABODE!



1. List in the space provided below some good places around your school or your neighborhood where you think a Toad Abode could be placed.

1. _____

2. _____

3. _____

Now, get into groups of three and discuss your answers to the question above.

1. Why are these good places?

2. What makes them different?

3. Are some places better Toad Abodes than others?

GLOSSARY



ADAPTATION – a physical or behavioral characteristic that helps an animal to survive and reproduce in its environment

AMPHIBIAN – bare-skinned vertebrate which typically has two stages of life; one gill-breathing in water and the other lung-breathing on land

AVERAGE – the sum of a set of numbers divided by how many numbers are in the set

BIO-INDICATOR – organisms used to monitor the health of the environment

CONSERVATION – the preservation or restoration of anything in a particular ecosystem

ECTOTHERMIC – cold-blooded; relies on external sources of heat to maintain body temperature (cannot regulate body temperature by internal processes)

ENDANGERED – in danger of becoming extinct, not many individuals left in the wild

ENDEMIC – limited in range, found only in one state or country

HABITAT – the environment in which an animal lives

HEAD START – a conservation practice that gives a species an advantage in the wild by spending part of their life cycle safely in captivity

HISTORIC DISTRIBUTION RANGE – where a species used to be found; however, is no longer there

INTRODUCED – non-native species

LOSS OF BREEDING POND – the draining or alteration of small ponds

METAMORPHOSIS – a change in form from one stage of life to another

POPULATION – a group of one or more individuals of a species living together in a particular area or habitat

PREDATOR – an animal that hunts other animals

PREY – an animal that is hunted by other animals

REGION – a geographic area that is defined by specific shared characteristics

URBANIZATION – growth of cities

SUPPLEMENTAL ACTIVITIES

The following activities can be utilized in conjunction with the lessons and activities provided throughout this guide or can be utilized as independent activities. Background information provided with the lessons in this guide can be utilized to supplement the information provided in the supplemental activities. These activities are suitable for a variety of grades, but modifications can be made for students as needed.



ADAPTABLE AMPHIBIANS

Help students understand the amazing and unique adaptations that Houston toads and other amphibians have by dressing a student up as a toad! Students can work in pairs, groups, or as a class to identify important toad characteristics by comparing them to everyday objects.

ACTIVITY 1: BUILD A HOUSTON TOAD

Materials

- Slinky eye glasses or a headband with Styrofoam balls for eyes
- Ear muffs
- Coffee filter
- Empty bottle of Tylenol
- Tube of antibiotic cream
- Lotion
- Poison symbol
- Swimming flippers
- Beach shovel and bucket
- Noisemaker or party blower
- Thermometer
- Empty Pepto Bismol bottle
- Fake worm

Instructions

1. Put students into small groups or work as a classroom. The groups or the class will work together to match everyday objects to the toad's adaptations.
2. Cut out the following descriptions and give a set of descriptions to each group. If working as a class, you can pass out one description to each pair.
3. Have the students match each description of an adaptation to the everyday object that represents this adaptation.

Answers

- Amazing eyes – slinky eyeglasses
- Tympanum – ear muffs
- Semi-permeable skin – coffee filter
- Analgesics – Tylenol and antibiotic cream
- Mucous glands – lotion
- Poison glands – poison symbol
- Webbed feet – flippers and sand shovel and bucket
- Tongues – party blower
- Cold-blooded – thermometer
- Regurgitate – Pepto Bismol
- Hunt – fake worm

ADAPTABLE AMPHIBIANS

Houston toads and other frogs and toads have AMAZING EYES. Their eyeballs go down inside their head to help push food down their throats. They also have a transparent nictitating membrane which protects the eye and cleans it.

Toads hear using big round ears on the side of their heads called TYMPANUM or tympanic membranes. Tympanum means drum. The Tympanum or ear drum receives sound waves and covers the ear canal.

Amphibians have SEMI-PERMEABLE SKIN, and they breathe and drink by absorbing water and oxygen through their skin. Tiny pores in their skin allow water and oxygen molecules through.

Scientists discovered that amphibians' SKIN contains chemicals which act as ANALGESICS (PAINKILLERS) AND ANTIBIOTICS. In fact, some amphibians are just walking chemical factories! These may be very beneficial to people.

Amphibians' skin contains MUCOUS GLANDS which help keep them and their skin moist.

The skin of amphibians also contains POISON GLANDS as a defense against predators. Houston toads have poison glands on the top of their heads that are bean shaped and are called parotoid glands. Most of these toxins aren't strong enough to harm people, but stronger poisons can cause muscle spasms, heartbeat irregularities and breathing trouble. If your dog picks up a toad this is why they start to drool or foam at the mouth.

Amphibians have strong WEBBED FEET that help them swim, and in some species, act as parachutes to help them escape predation. Toads have shorter and strong back legs for burying into the sand.

Toads have long TONGUES that are usually attached near the back of the jaw. Their tongue is folded over, with the tip of the tongue pointing back toward their throat. This allows their tongues to be flipped out very rapidly and accurately in order to catch an insect or other tasty treat. Mucous glands in the mouth produce a sticky substance that helps to catch prey.

Houston toads and all amphibians are COLD-BLOODED which means their body temperature matches the temperature of their surroundings. They don't have to expend a lot of energy trying to keep warm like warm-blooded animals, so they are less active when it's cold and don't have to eat as much.

Toads and other amphibians can REGURGITATE their stomach if they eat something that is too big or poisonous. They throw up their stomach, wipe away the undesirable thing they ate and gulp their stomach back in.

Houston toads HUNT based on movement. A toad will wriggle its back foot like a lure to get a prey item to move so they are able to detect it and eat it!

HOUSTON TOAD MAZE

In the Houston toad maze, participants will experience the life cycle of the Houston toad while learning about some of the natural and man-made threats this endangered species faces in its habitat. This interactive and educational obstacle course can be set up in the classroom or outdoors utilizing a few everyday items. Be creative and adapt it to fit your needs. This activity can be used for other amphibian species as well.

Materials

- Toad vests (rectangular piece of dark colored fabric with a circle cut out in the middle to slip over the head)
- Prepared direction signs with stakes (message for each sign below)
- Velcro
- Two blue tarps
- Felt algae with Velcro (green or brown felt cut out like the shape of a cloud)
- Plastic bottles with skull and cross bones
- Plastic insects and fish
- Long string or jute twine, ground pegs or tent stakes
- Laminated animal photos (egret, raccoon, bullfrog, fish, calling Houston toads, toad egg strands)
- Large box or blanket
- Two chairs
- Pine needles, sticks, or leaves
- Beach ball
- Sidewalk, long piece of butcher paper, or yoga mat
- Recording of Houston toad call (optional)
- Kiddie pool or other large container
- Stamp and stamp pad or stickers

Instructions

1. Set up the maze according to the instructions below.
2. Line up the participants into one line. Participants should be wearing the toad vests.
3. When you say the word go, participants should make their way through the course one at a time (or with staggered start times), following the directions on the sign at each stop.

Set Up Directions

STOP 1:

Lay out a blue tarp (pond) with felt algae scattered throughout the pond. Attach a strip of Velcro on the back of the algae so it can be affixed to the vest. Also, scatter plastic bottles with skull and cross bone emblems and plastic fish in the pond to signify pollutants and predators in the water.

HOUSTON TOAD MAZE



STOP 2:

Lay out string in a pattern on the ground that participants will have to carefully hop through without touching. Also post up some laminated pictures of predators on stakes (i.e. heron, raccoon and bullfrogs) which they must also avoid touching.

STOP 3:

Put pine needles, sticks, or leaves in the kiddie pool and hide plastic bugs within. The plastic bugs should have Velcro on the back so they can be affixed to the vest.

STOP 4:

Set up a cardboard box as a tunnel (or two chairs with a blanket draped across) so participants can crawl through to the other side. Cover the box and/or tunnel with sand, pine needles or leaves to make it look like they are going underground.

STOP 5:

Use long butcher paper, sidewalk or yoga mat as an obstacle the participants have to jump cross. If you have volunteers (or other participants), place one or two volunteers on each end and have them gently bounce a beach ball at the participants.

STOP 6:

Lay out another blue tarp and place laminated pictures of egg strands across the tarp. Post a laminated picture of a vocalizing Houston toad on a stake. (Optional: Play a CD with the sound of a Houston toad call.) Participants will give up their food items and receive a stamp or sticker.

SIGNS FOR STOPS

STOP 1:

You are one of thousands of tadpoles that have hatched from toad eggs in the pond. Tadpoles start out as herbivores, eating algae and plant material in the pond. Wiggle through the pond and pick up some algae, and stick it to your vest. Be sure to watch out for pollution in the pond, and the fish too! Toad tadpoles can be harmed by pollutants in the water and can be eaten by fish!

STOP 2:

You have grown legs, developed lungs, and absorbed your tail. This process is called metamorphosis. It is now time to crawl out of the pond as a small toad. You are a tasty snack for many predators, and there are cattle all around the pond that may step on you! Carefully step through the obstacle course avoiding predators, and do not touch the string, otherwise you might get stepped on!

HOUSTON TOAD MAZE



STOP 3:

You have made it into the forest canopy. It is now time to move through the native grasses eating lots of bugs. Now that you are a toad, you have switched to a carnivorous diet! Look through the habitat to find some yummy invertebrates to eat and stick one on your vest!

STOP 4:

It's summer in Texas, and boy, it's starting to get hot! You are in danger of drying out, and your skin must stay moist. Houston toads are adapted to burrow into the deep sandy soil with their back legs, and hibernate while it is too hot. Go into your burrow backwards to keep safe and cool during the hot summer.

STOP 5:

After hibernating for many months and coming out occasionally to eat bugs, heavy rains come. It is time for you to make your way to a pond so you can lay eggs of your own. You listen for the sound of male Houston toads calling and make your way to the pond. Unfortunately, you come across a road and will need to cross it without getting squished! Try to make it across the road without getting hit by the car.

STOP 6:

You are one in a thousand little tadpoles that have made it back to the pond to lay your eggs; congratulations! Wow, life as a toad is not as easy as it seems!

A HEAD START FOR HOUSTON TOADS

In order to preserve the Houston toad population in Texas, employees of the Houston Zoo have created a “head start” program. This means scientists from the Zoo work with other local organizations to collect Houston toad egg strands from ponds each spring to bring back to the Zoo. The eggs hatch safely inside a Zoo building built specifically for them, and the tadpoles grow up to become large, strong toads! Once the toads have reached a specific size, they can be taken back to the exact spot where they were found in the wild and released. One advantage of keeping the toads in captivity until they reach a larger size is because they become big enough to not become prey for larger animals. The larger the toad is, the higher change it has of survival! This head start process helps to increase the overall population of endangered Houston toads.

Materials

- Photos of head start process
- Pencil or pen
- Houston toad call (optional)
- *Head Start Worksheet*

Instructions

1. Lay out photos of steps relating to the head start process in a random order.
2. Ask students to put the photographs in the correct order based on what they know about the Houston toad’s life cycle.
3. Discuss each photo.
4. Ask students to complete the head start worksheet.

Answers

PHOTO 1: MALE HOUSTON TOAD CALLING AT POND

This unique call of the Houston toad (a high pitched trill which lasts about 12 seconds) attracts females to the pond to deposit their eggs. Biologists listen for the call of the Houston toad at night in the early spring to locate ponds where they might be able to find eggs. If you have access to the call of the Houston toad, play it for the students.

PHOTO 2: HOUSTON TOADS IN AMPLEXUS (OPTIONAL)

Male toads grasp the female and fertilize the eggs externally as she deposits her eggs.

PHOTO 3: HOUSTON TOAD EGG STRANDS IN POND

Female Houston toads wrap eggs around plants in the water in long strands. Each little black speck is the egg, which is protected by a jelly-like substance. In natural conditions, only 2 in every 1,000 tadpoles hatched from these eggs would survive to adulthood.

A HEAD START FOR HOUSTON TOADS

PHOTO 4: BIOLOGISTS CAREFULLY COLLECT EGGS FROM THE POND

The eggs will be transported back to places like zoos where the eggs can develop safe from predators.

PHOTO 5: TADPOLE NURSERY AT THE HOUSTON ZOO

Eggs are acclimated to the water at the Zoo. Toad keepers monitor water quality and keep tanks very clean so the eggs continue to develop.

PHOTO 6: HOUSTON TOAD TADPOLE

Tadpoles emerge from the eggs. They are very active and hungry. When toads are tadpoles, they are herbivores. In the wild they would eat things like algae, decaying plants, and tree pollen. In captivity they eat food items such as collard greens, lettuce, and sweet potatoes.

PHOTO 7: HOUSTON TOAD TADPOLE GOING THROUGH METAMORPHOSIS

The tadpoles grow quickly with lots of food and warm water at the Zoo. They grow their back legs first and their front legs second. Once they have grown their front legs the keepers must quickly get them out of the water because they have now developed lungs for breathing. Last, they will absorb their tail which provides nutrients as they switch over to their new carnivorous diet.

PHOTO 8: JUVENILE HOUSTON TOADS

When Houston toads first come out of the water, they are about half the size of a penny. They are fed very small bugs like fruit flies, spring tails, and tiny crickets. The toads will grow very quickly.

PHOTO 9: ADULT HOUSTON TOADS

The toads are fed lots of crickets and grow large very quickly. The toad keepers clean their tanks daily to make sure the toads stay healthy. It's now time for the toads to be released back into the wild.

PHOTO 10: TOADS IN PLASTIC BIN

Toads are loaded up in plastic bins and travel back to the ponds from which the eggs came. This might be at Bastrop State Park or at private properties owned by Texas landowners that care about the conservation of the toad.

PHOTO 11: TOADS BEING RELEASED

Depending on the size of the toads and the time of year the toads are released, they will either be released close to the pond or in the forest where they would spend their time as adults foraging for bugs and hibernating in the deep, loose sandy soil they need to survive.

PHOTO 12: RELEASED TOADS IN THEIR NEW HABITAT

Houston toads must now survive on their own. Hopefully the head start process has given them an extra chance at survival, helping them to continue their species.

A HEAD START FOR HOUSTON TOADS



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A HEAD START FOR HOUSTON TOADS



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A HEAD START FOR HOUSTON TOADS



A HEAD START FOR HOUSTON TOADS



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A HEAD START FOR HOUSTON TOADS



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A HEAD START FOR HOUSTON TOADS



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A HEAD START FOR HOUSTON TOADS



A HEAD START FOR HOUSTON TOADS



1. Describe what it means to “head start” an endangered species.

2. How can the head start process help an endangered species?

3. Is it necessary to head start animals that are not endangered? Why or why not?

4. Which of the following needs to occur for biologists to be able to head start Houston toads?

- a. A male Houston toad must be found calling around a pond
- b. A female Houston toad must deposit her eggs at a pond
- c. Biologists must be able to find Houston toad eggs
- d. There needs to be a safe place to take the eggs
- e. All of the above

5. What are some of the natural and man-made threats for tadpoles in the pond?

6. Describe the diet of a Houston toad tadpole. What do they eat in captivity? What do they eat in the wild?

7. Name some types of predators of Houston toad tadpoles.

A HEAD START FOR HOUSTON TOADS

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8. When is it time to release a Houston toad into the wild?



9. Draw the head start process below.

HOUSTON TOAD SURVIVAL GAME

The Houston Toad originally lived across southeast Texas, but due to a combination of drought, habitat loss, and predation, they were listed as an endangered species in 1970. The largest population currently makes their home at Bastrop State Park. The reason they have survived here is because this park has the correct habitat type – forested areas with deep sandy soils and still or slow flowing shallow water.

The forest helps shade toads from the hot sun when they are out hunting for food, and is also easier for toads to move through. Toads have a difficult time moving through thick grasses, such as in cattle grazing pastures. The sandy soils are loose and make it easy for toads to burrow. They burrow during hot dry times of the year to stay cool and when temperatures are below freezing to stay warm. Pools of water with shallow edges are easier for tiny toadlets to climb out of when they have metamorphosed out of the tadpole stage. If these pools of water are shaded by the forest, the toadlets have a better chance of surviving the hot temperatures. This activity allows students to explore the toad's life cycle, habitat requirements, and predators – all things that affect the survival of the endangered Houston toad.

Materials

- Rope
 - Forest boundary: green, 200 feet long (shaped into rectangle)
 - Ponds: blue, 200 feet long (cut into 4 different sizes: 25 feet, 75 feet, 40 feet & 60 feet)
- Butcher paper
- Identification signs (toad eggs, tadpoles, toadlets, toads, snakes, bullfrogs, fish, cows, and cars)
- Poker chips
- Whistle (to be blown at the end of each round)

Instructions

- 1.** Place a large rectangular boundary about 50x75 feet with green rope in a large area to be the forest floor.
- 2.** Lay out four ponds of different sizes with rope inside the forest area all on one end.
 - a. puddle, 25 foot circumference
 - b. small pond, 40 foot circumference
 - c. cattle pond (medium), 60 foot circumference
 - d. small lake (large), 75 foot circumference
- 3.** Use a piece of butcher paper and lay it across the forested area on the end opposite the ponds. This will represent a road.
- 4.** Sprinkle poker chips inside each pond and in the forest.
- 5.** There are four rounds to this game. Play each round as instructed below.

HOUSTON TOAD SURVIVAL GAME

ROUND 1: EGG STAGE

The objective of this round is to survive the egg stage and hatch into a Houston toad tadpole. This round takes 15 seconds.

1. Distribute the following identification signs to students: toad eggs and predators (snakes, bullfrogs, and fish).
2. Students who are toad eggs, bullfrogs, and fish should be assigned a specific pond.
3. Toad eggs must stay attached in a line in their pond, but can move around the pond. If an egg is tagged by a predator, that person is out. The rest of the line stays together and continues in the game.
4. Fish and bullfrogs can tag toad eggs within the pond only; snakes must stand on the edge of a pond and tag toad eggs as they pass. Any toad egg that is tagged is out.
5. Blow the whistle at the end of 15 seconds. Toad eggs should remain in place.

ROUND 2: TADPOLE STAGE

The objective of this round is to survive tadpole stage and metamorphose into a Houston toad toadlet. This round takes 30 seconds.

1. No rain occurred so the smallest pond dried up. Toad eggs in the small pond are now out.
2. All other toad eggs survived to become tadpoles. Trade your toad egg sign for a tadpole sign. Tadpoles can move independently of each other, but must stay in the pond. In order to survive to become a toadlet, tadpoles must collect 2 pieces of food in the pond (poker chips) and avoid being tagged by a predator.
3. Cattle now have access to the pond – watch out because they can squish tadpoles! Some of the toad eggs that didn't survive are now cattle. Cattle must stand on the edge of the pond and tag tadpoles as they pass. Any tadpole that is tagged is out.
4. The rest of the toad eggs that didn't survive can become predators.
5. Blow the whistle at the end of 30 seconds.

ROUND 3: TOADLET STAGE

The objective of this round is to survive the toadlet stage to become a Houston toad. This round takes 45 seconds.

1. Remaining tadpoles that collected two pieces of food survived and become toadlets. Trade your tadpole sign for a toadlet sign. All other tadpoles are out.
2. Toadlets must cross from one side of the forest to another. In order to survive to become a toad, toadlets must collect 2 pieces of food (poker chips) and avoid being tagged by a predator.
3. Dead tadpoles, fish, and frogs can now be different predators: cattle, snakes, or cars. Cattle and snakes can tag toadlets on land, while cars can only tag toadlets as they cross the road.
4. Blow the whistle at the end of 45 seconds.

HOUSTON TOAD SURVIVAL GAME



ROUND 4: TOAD STAGE

The objective of this round is for toads to make it back into a pond. This round takes 45 seconds.

1. Remaining toadlets that collected two pieces of food survived and became toads. All other toadlets are out.
2. It rained a lot so the small pond has returned.
3. Toads must cross from one side of the forest, collect two pieces of food, and make it into a pond without being tagged by a predator.
4. Cattle, snakes, and cars are the only predators. The same rules apply from round 3.
5. Blow the whistle at the end of 45 seconds.

WRAP UP

1. Toads that are in a pond with two pieces of food lived! All other toads are dead.
2. How many toads survived? Are there an even number of male and female toads (boys and girls)? How do you think this would affect the next generation?
3. Is there anything we could do to protect the toads from some or all of the predators?
4. What effect would environmental factors (droughts, rain, etc.) have on the toads?
5. What other man-made issues (like cars) might affect the toads?

The cover features a bright yellow background. In the center is a large circle with a dark, textured background. The circle's border is a thick yellow line with a dashed, hatched pattern. The title 'HOUSTON TOAD EDUCATOR'S GUIDE' is centered in the circle in white, with 'HOUSTON TOAD' in a larger font and 'EDUCATOR'S GUIDE' in a smaller font below it. A thin white horizontal line is positioned below the title. Below the line is a paragraph of text in white, centered within the circle. The text describes the Houston toad as one of the most endangered amphibians in North America, adapted to a tough environment in Texas, and notes their willingness to fight for survival, calling them 'Toad-ally Texan!'.

HOUSTON TOAD EDUCATOR'S GUIDE

The Houston toad is one of the most endangered amphibians in North America. Adapted for a tough environment, unique to the Lone Star State, and willing to fight for survival, they are Toad-ally Texan!