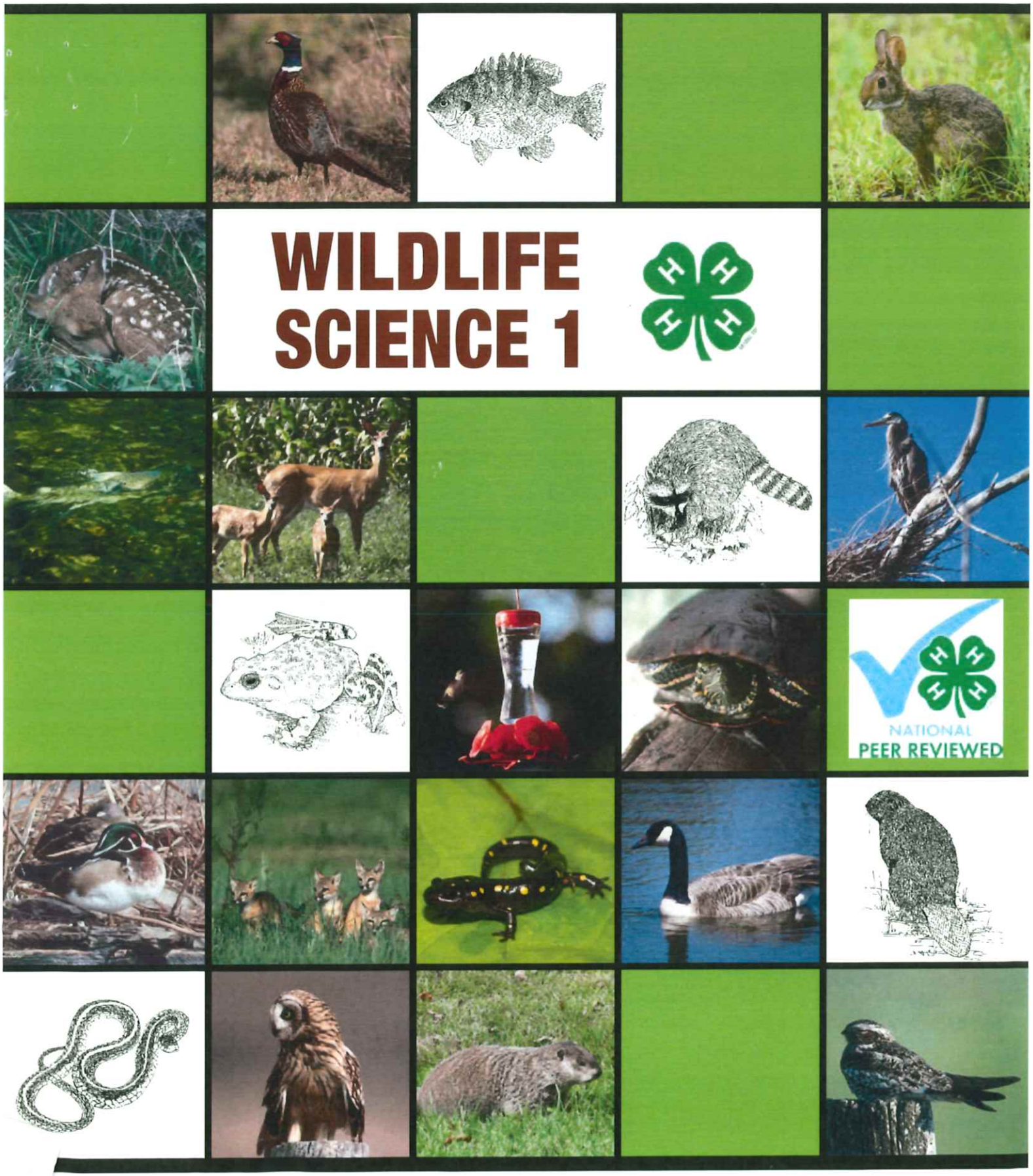
PURDUE
EXTENSION

4-H-1044-W

Level 1



WILDLIFE SCIENCE 1

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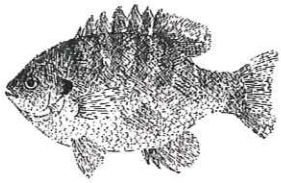
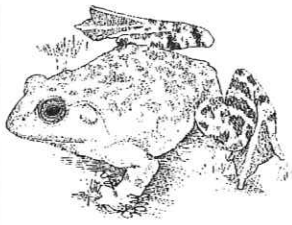
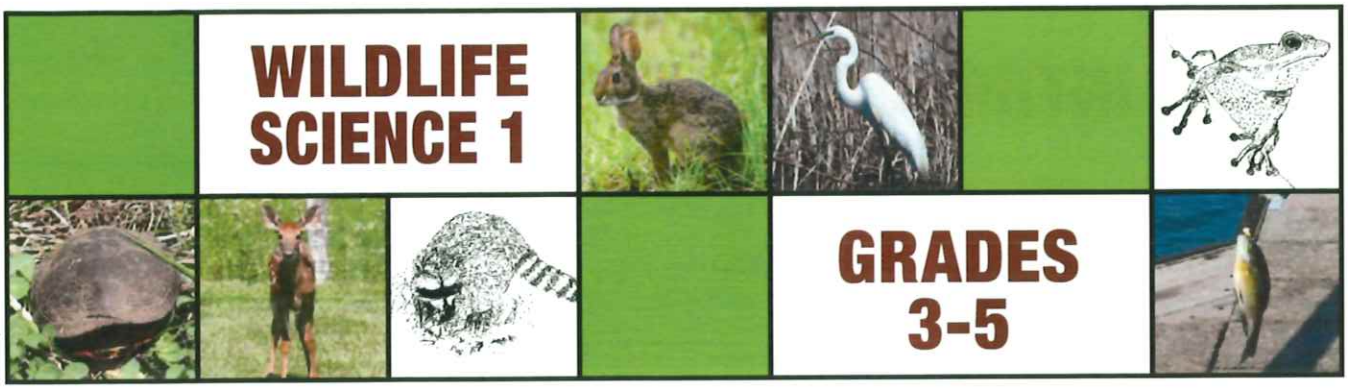


WILDLIFE SCIENCE 1





NOTE TO 4-H MEMBER

The 4-H Wildlife Science curriculum is for youth who enjoy learning about wildlife. Level 1 introduces the wildlife groups: mammals, birds, fish, and herptiles. You will learn about the similarities and differences among these groups and then study each one.

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Words defined in the glossary are in **bold** the first time they appear in the text.

Keeping a notebook or journal for your wildlife observations is a good idea. You can organize it into sections for each group—mammals, birds, fish, and herptiles—and use it for your entire 4-H wildlife science experience.

Discuss the Let's Chat questions with your parent, 4-H leader, or other facilitator after you have completed the activity.

Additional Contributors: The Wildlife Science curriculum (2017) builds upon previous works (Indiana 4-H Wildlife, 1995, revised 2001). The contributions of wildlife biologists, Extension specialists, Extension educators, 4-H members, 4-H parents, FFA coaches, fair judges, teachers, graduate students, and undergraduate students were critical in its development. Topic focus was determined by wildlife biologists. Activities were developed, used, and revised in 4-H clubs, after school programs, and the wildlife habitat evaluation program. Major input to previous works was provided by wildlife biologists Brian Miller, Brian MacGowan, and Rod Williams.

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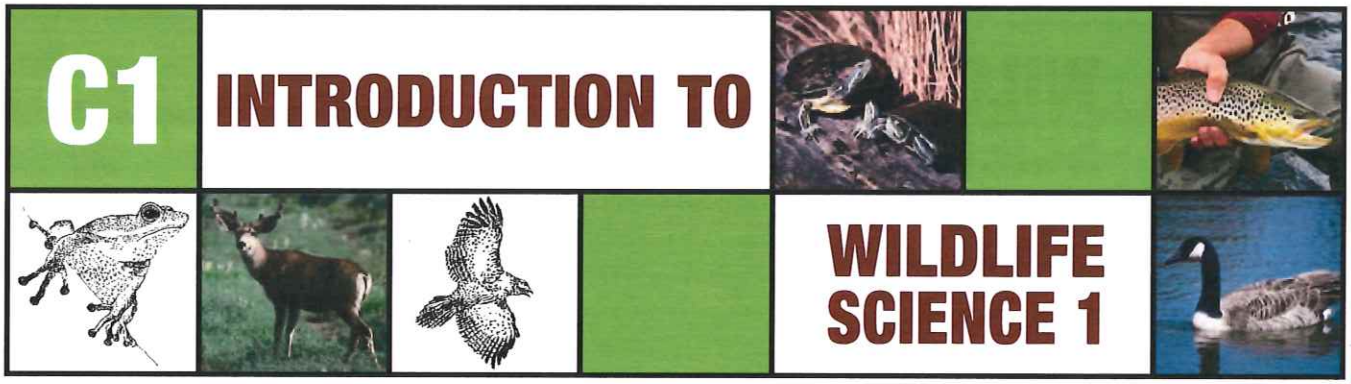
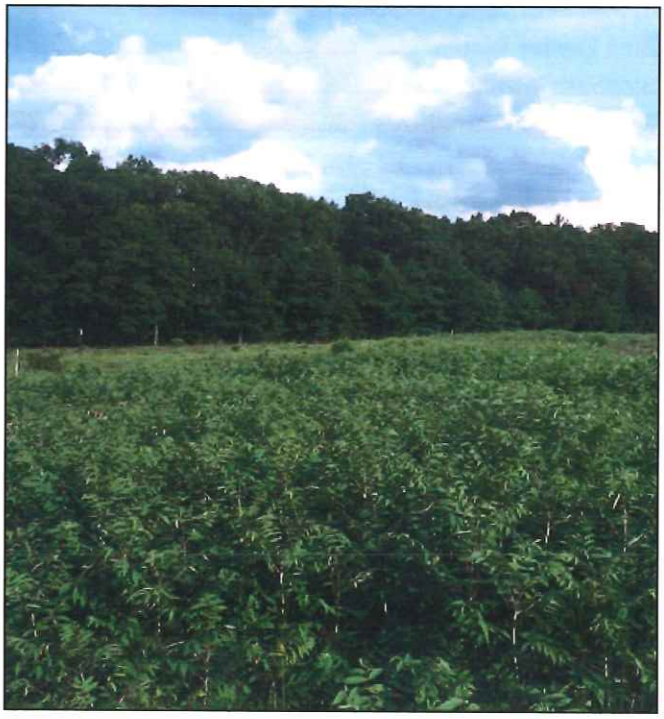


ANIMAL NEEDS

Can you name the four things all animals need?

INTRODUCTION

All animals need food, shelter, and water. Their fourth need is space to live in where they can find the first three. All these needs must be met in an animal's **habitat,** the space where it lives. In this activity you will learn how five animals meet their needs. The American bullfrog, bluegill, Eastern garter snake, raccoon, and red-tailed hawk represent the five mammal **classes**: amphibian, fish, reptile, mammal, and bird. The reptile and amphibian classes are sometimes combined and called **herptiles**.



GEAR

- Pencil

LET'S DO IT

1. Use your knowledge and information in the animal needs table to complete the last column (Animal) using: *raccoon, red-tailed hawk, garter snake, bluegill,* and *bullfrog.*
   - Use each animal only once.
   - Start with the animals you are sure about.
   - Guessing is fine.

LET'S CHAT

Share What Happened: Was completing the table difficult?

Apply: Why does a wildlife biologist need to know basic animal needs?

Generalize to Your Life: What do you need to know about bluebirds to create habitat around your house for them?

LET'S FLY HIGHER

- Identify the species of each animal in the animal needs table. Your facilitator can help if you need some clues.

ANIMAL NEEDS

HABITAT	FOOD	SHELTER	WATER	ANIMAL
Grassy or shrubby fields, outbuildings and moist habitats	Toads, frogs, slugs, worms, and almost anything it can overpower	Hibernates when temperatures are below 50°F	From prey	
Shallow water in lakes and ponds and slow-moving streams	Plankton and other **aquatic** creatures	Hides in fallen logs and aquatic plants	Takes water in through gills	
Lakes, ponds, and wetlands	Any small animal it can overpower, including rodents, small reptiles, crayfish, birds, and bats	Aquatic plants, hibernates in winter	Absorbs water through skin	
Prefers mixed forest and field with high trees but adapted to many habitats	Mainly small mammals but also birds and reptiles	Nests in trees	From prey, open water, and sometimes, snow	
Prefers deciduous and mixed forests but has adapted to many habitats	Almost anything (corn, fish, chickens, fruit, nuts, etc.)	Tree cavities and other dens	From prey and rivers and ponds	

MY NOTES and IDEAS

VERTEBRATE CLASSES

What are vertebrates?

INTRODUCTION

The term **wildlife** includes all animals that live in the natural environment but not under the direct control of humans. Level 1 of the 4-H Wildlife Science manual focuses on animals in the **vertebrate** group. Vertebrates are animals with a **backbone**. A backbone consists of a series of bones that connects the animal's skull to its pelvis. Each bone is called a **vertebra**.

Vertebrates are divided into classes. The classes of animals you will learn about are mammals, birds, reptiles, amphibians, and fish. In this activity you will learn the major differences between them.

Animals in the same class share **traits**. Here are some examples of unique traits of vertebrates.

- Mammals have hair.
- Birds have feathers.
- Fish have fins.
- Reptiles have scales.
- Amphibians can breathe through their skin.

GEAR

- Pencil

LET'S DO IT

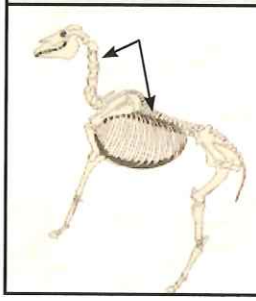
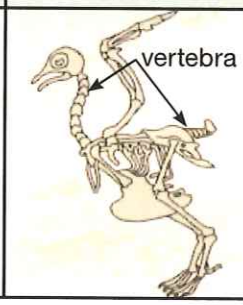
1. Read the information about vertebrate classes in the introduction.
2. Complete the vertebrate classes table by writing the vertebrate class for the pictures shown in each row.

LET'S CHAT

Share What Happened: What did you learn in this activity? Can you name the five classes of vertebrates you studied?

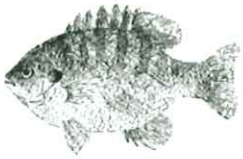
Apply: How could being able to talk about a wildlife group be useful?

Generalize to Your Life: What other groupings can you think of?

BACKBONES THAT ARE MADE OF VERTEBRA				
Mammal	Bird	Fish	Amphibian	Reptile
				

MY NOTES and IDEAS

Write the name of each vertebrate class in the last column for the pictures shown in each row.

			VERTEBRATE CLASS
			
			
			
			
			

Study the wildlife pictures in the table. Look for things that are alike and things that are different. Answer the questions based on what you already know and what you see in the pictures.

- *What traits do birds share?*

  _____

  _____

- *What traits do fish share?*

  _____

  _____

- *What traits do mammals share?*

  _____

  _____

- *What traits do reptiles share?*

  _____

  _____

- *What traits do amphibians share?*

  _____

  _____

DID YOU KNOW?

Amphibians and reptiles are often studied together in a group called herptiles. Herpetology is the study of amphibians (including frogs, toads, salamanders, and newts) and reptiles (including snakes, lizards, turtles, tortoises, and crocodiles).

READ ABOUT WILDLIFE

How do animals survive in the wild?

INTRODUCTION

Animals that live in the wild face many challenges. They must find a place to live in as well as food, water, and shelter within their habitat. This includes space to safely reproduce (give birth) and raise their young. Wildlife survives in many different ways. In this activity you will find a book about an animal or group of animals to learn about the habitat that animal lives in and how it survives in the wild.

GEAR

- A book about an animal or a group of animals. Choose a nonfiction book with information about how an animal survives in the wild. Your local or school librarian may be a good resource.
  Or choose a book from either of these series: *National Geographic Kids Reader Series* (suggested titles *Bats, Lizards, Wolves, Snakes, Polar Bears,* and *Owls*); and *Amazing Animal Kingdom Series* by Emma Childs, available as e-book reader downloads, if you prefer (suggested titles *Wolves, Foxes, Frogs, Bears, Snakes,* and *Rabbits*).
  Note: Do not use guidebooks or identification books for this activity.
- Pencil and paper

LET'S DO IT

1. Read the book you chose, or ask someone to read it to you.
2. Complete each sentence in the Book Report on this page with the species of animal you read about.

LET'S CHAT

Share What Happened: Why did you choose the book?

Apply: Could the animal you read about live near your home? Why or why not?

Generalize to Your Life: What can you learn from reading books?

BOOK REPORT

Book title:

_____

Wildlife species:

_____

Habitat the _____ prefers:

_____

Common food that _____ eats:

_____

How _____ get their food:

_____

How the _____ gives birth:

live young ☐ or ☐ lays eggs (circle one)

Interesting facts about the _____:

_____

_____

_____

_____

Where could people find more information about this animal?

_____

_____

_____

_____

LET'S FLY HIGHER

- Read another book about your animal or other wildlife.
- Watch an educational television show about wildlife.

MAMMAL TRAITS

How many animal traits can you list?

INTRODUCTION

Most people think of mammals when they think of wildlife. Wildlife animals live free in the natural environment. They are not under the direct control of humans. You will study mammal traits—those that are unique to mammals, those that are mostly mammal traits, and traits that mammals share with other classes of animals. Here are examples of unique, mostly true, and shared traits.

Unique traits of mammals: Traits of mammals that are not true of other classes of vertebrates:

- All mammals have hair (at some time in their life).
- All female mammals produce milk to feed their young.

Mostly true traits of mammals: Traits that are generally true for mammals but not always true for all mammals:

- Most mammals have ears that stick out. Exception: The dolphin is a mammal but does not have ears that stick out.
- Most mammals give birth to live young. Exception: The platypus is a mammal that lays eggs rather than giving birth to live young.

Shared traits of mammals and some other classes of vertebrates: Traits that are true for mammals and some other classes:

- Mammals are **warm-blooded**, which means they maintain a constant body temperature.
- Mammals use lungs to breathe air.
- Young mammals need to be taken care of to survive.

GEAR

- Pencil or pen

LET'S DO IT

1. Use the information in the introduction to complete the sentences.
2. In the word search puzzle, find and circle or highlight the nine words you used to complete the sentences.

LET'S CHAT

Share What Happened: What did you learn about mammals?

Apply: How can knowing the common traits of mammals help you identify new animals?

Generalize to Your Life: How might knowing the common traits of mammals help you care for a new pet?

LET'S FLY HIGHER

- Make mammal flashcards by finding pictures of mammals and pasting them onto index cards. Write the name of the mammal on the back of the card. Practice identifying each animal by its picture.
- Start a diary of all the wild mammals you have seen. Note when and where you saw them.

COMPLETE THESE SENTENCES

Something that makes an animal different or the same as another animal is a _____.

An animal that has a backbone is known as a _____.

Warm-blooded animals control their body _____.

Mammals breathe air using_____.

Each bone in a backbone is called a _____.

Female mammals feed their young _____.

All mammals grow _____ on their bodies.

Mammals do not lay _____ but have live births.

Wildlife animals live in the _____ environment and not under the direct control of humans.

WORD SEARCH

Find and circle or highlight the nine words you used to fill in the sentences.

a	s	t	d	f	g	h	j	k	l	p	o	i	u	y	t	e	r	w	q	z	x
d	u	i	f	h	g	m	t	e	m	p	e	r	a	t	u	r	e	n	b	v	c
s	k	a	k	a	l	t	y	r	u	v	r	i	e	o	w	p	q	z	m	x	n
g	b	r	g	t	r	f	k	v	c	e	d	e	w	s	x	z	a	v	b	n	c
n	h	t	t	y	u	l	m	u	i	r	l	p	o	h	a	i	r	p	o	s	i
v	n	m	l	k	i	j	h	g	f	t	d	s	a	q	w	e	r	t	g	y	u
b	e	v	c	m	x	z	q	s	x	e	w	d	c	r	f	v	t	n	g	b	y
j	f	r	j	d	k	s	l	a	p	b	l	o	k	l	i	m	u	j	u	n	h
h	g	q	t	p	w	o	e	i	t	r	y	u	m	a	z	l	m	x	n	c	b
j	f	p	w	e	i	r	u	t	y	a	l	s	k	r	d	j	f	e	h	g	v
p	l	o	k	n	b	m	i	j	b	t	y	g	v	u	t	f	c	r	g	d	x
j	d	j	s	k	a	r	l	x	m	e	n	v	b	t	w	q	a	z	s	g	e
f	g	y	t	u	r	i	a	w	o	q	p	s	h	a	e	c	m	f	h	t	s
l	e	n	z	w	k	r	m	o	z	l	q	r	w	n	f	v	p	e	k	c	r

HEAD, SHOULDERS, KNEES, AND TOES

What adaptations help mammals survive?

INTRODUCTION

Many different mammals live in the wild. Their body parts such as head, legs, and feet might be quite different, depending on what each mammal needs to survive in its environment.

Adaptation helps an animal survive in its habitat. Leg length and neck length are important adaptations for vertebrates. For example, a deer's long legs and neck allow it to reach leaves, twigs, and tree bark. A chipmunk has short legs and a short neck so it can find its food on the ground.

What wildlife eats, and how it eats, are also adaptions. Some mammals are **carnivores** that need to eat meat. Some carnivores hunt for their food, and others are **scavengers.** Scavengers find dead animals to eat. Mammals that hunt need adaptations to help them find and capture prey. Some mammals are **herbivores** that eat vegetation. Other mammals are **omnivores** and eat both meat and vegetation to survive. Many mammals are also food for other animals and need adaptations that help them avoid becoming another animal's meal.

GEAR

- Pencil

LET'S DO IT

1. Read the information about carnivores, omnivores, and herbivores in the Head, Shoulders, Knees, and Toes worksheet. Answer the questions that follow.
2. Complete the table in the worksheet by listing the adaptions that help the wildlife shown there survive.

LET'S CHAT

Share What Happened: What three categories describe how mammals eat?

Apply

- Why would it be difficult for a deer to be a predator?
- Why would it be difficult for a coyote to be an herbivore?

Generalize to Your Life: What adaptations do humans have?

MY NOTES and IDEAS

HEAD, SHOULDERS, KNEES, AND TOES WORKSHEET

1. Read each paragraph and answer the questions that follow.

Carnivores eat other animals. Most carnivores must be able to hunt and catch their **prey**. Some carnivores eat what others have caught and left behind. The coyote and bobcat are carnivores that have adaptations to help them find, stalk, and kill. Their eyes are at the front of their face to give them **stereoscopic vision**, which they need to chase and catch prey. They cannot see behind them but have a clear picture of what is in front. (You have this same type of vision, which is why someone can sneak up behind you!) Carnivores have powerful legs for running. Bobcats have retractable, sharp claws for grabbing prey and climbing trees. Coyotes have blunt claws that help them run better. Both have long sharp canine teeth for grabbing and ripping meat. They have strong jaws for crushing their prey. All of these adaptations help them catch their food.

What adaptations help carnivores survive?

_____

_____

_____

Herbivores eat plants. Rabbits and white-tailed deer are herbivores. Herbivores can eat any part of a plant including grass, leaves, and stems. Both animals have sharp front teeth (incisors) for cutting through plant material and strong molars in the back for mashing it. Herbivores' eyes are on the sides of their heads. They have some stereoscopic vision but can also see to the side and even some behind them. This helps them see predators sneaking up on them. Rabbits have powerful back legs for jumping away from predators. Deer have long, strong legs with hoofed feet for running away from predators. All of these adaptations help them survive.

What adaptations help herbivores survive?

_____

_____

_____

Omnivores eat meat and plant seeds (nuts, grain, berries) or fruits. They cannot digest grass, leaves, and stems. Omnivores have adaptations similar to both carnivores and herbivores. A raccoon's eyes are at the front of its face for better (stereoscopic) vision like carnivores. Raccoons catch fish, crayfish, and frogs as well as eat grain, fruit, berries, and nuts. Raccoons are most active at night and generally hide from predators during the day. White-tailed mice have eyes toward the sides of their head like herbivores. White-tailed mice eat insects, snails, grain, fruit, berries, and nuts. They are active during the day and at night. They hide in vegetation and leaf litter to avoid predators. Raccoons and mice have front feet that can grasp their food.

What adaptations help omnivores survive?

_____

_____

_____

HEAD, SHOULDERS, KNEES, AND TOES WORKSHEET *(continued)*

2. *Apply what you learned: Study the wildlife pictures below and write what adaptions help this animal survive.*

WILDLIFE	ADAPTION THAT HELPS THIS ANIMAL SURVIVE
	
	
	
	

MY NOTES and IDEAS

SQUIRREL FEEDER WATCH

How much do you know about squirrels?

INTRODUCTION

Observing squirrels can teach you a lot about wildlife. You might not know about the different species of squirrels until you start feeding them. This activity shows you how to make a squirrel feeder. Then you will watch it carefully and take notes to learn more about squirrels.

GEAR

Option 1

- Two 1-foot pieces of wood, 2 inches x 2 inches
- Hammer and nails (or drill and screws) to connect the two pieces of wood
- Large nail (3 or more inches long)
- Rope or bungee cord

Option 2

- 1-foot piece of wood, 1 inch x 4 inches
- 5-inch x 6-inch board, 1/8 to 1/4 inch thick
- Polyurethane or paint
- 64-ounce clear juice bottle
- Small hinge
- Rope or bungee cord
- Screws – several 3/4 inch and one larger
- Drill

LET'S MAKE IT – SQUIRREL FEEDER

Option 1

1. Pound the large nail into the center of one piece of wood. This nail will hold an ear of corn.
2. Nail or screw the two pieces of wood together at right angles, with the center nail pointing up.
3. Push an ear of corn onto the nail.
4. Use the rope or bungee cord to attach your feeder to a tree or post.

Option 2

1. Make a tray by cutting 3-4 inches off of the bottom of the juice bottle. Drill a few drain holes in the bottom of the tray. (Have an adult help you cut the juice bottle and drill the holes.)
2. Apply paint or polyurethane to the boards to protect them from the weather.
3. Use screws to attach the tray near the bottom of the 1x4 board. Attach the 5x6 board with a hinge about an inch above the tray so the board sits at an angle over the tray.
4. Place a large screw into the board a few inches above the hinge. Attach a bungee cord or rope to hold the feeder on a tree. (Or use the screw to attach the feeder directly to a post.)

Option 3

1. Buy a squirrel feeder.

Locating and filling your squirrel feeder

Put the feeder in an area safe from predators, especially cats and dogs. A wooden post or tree is a good place. It should be visible from a window, if possible, so you can watch the squirrels without disturbing them. Fill your feeder with nuts, corn, or seeds.

SAFETY FIRST:
Always ask for adult help when using tools.

Feeders should only provide a snack for squirrels. They should get most of their food from nature.

GEAR

- A squirrel feeder
- Pencil and paper or a notebook for your observations
- Camera (optional)

LET'S DO IT – SQUIRREL WATCH

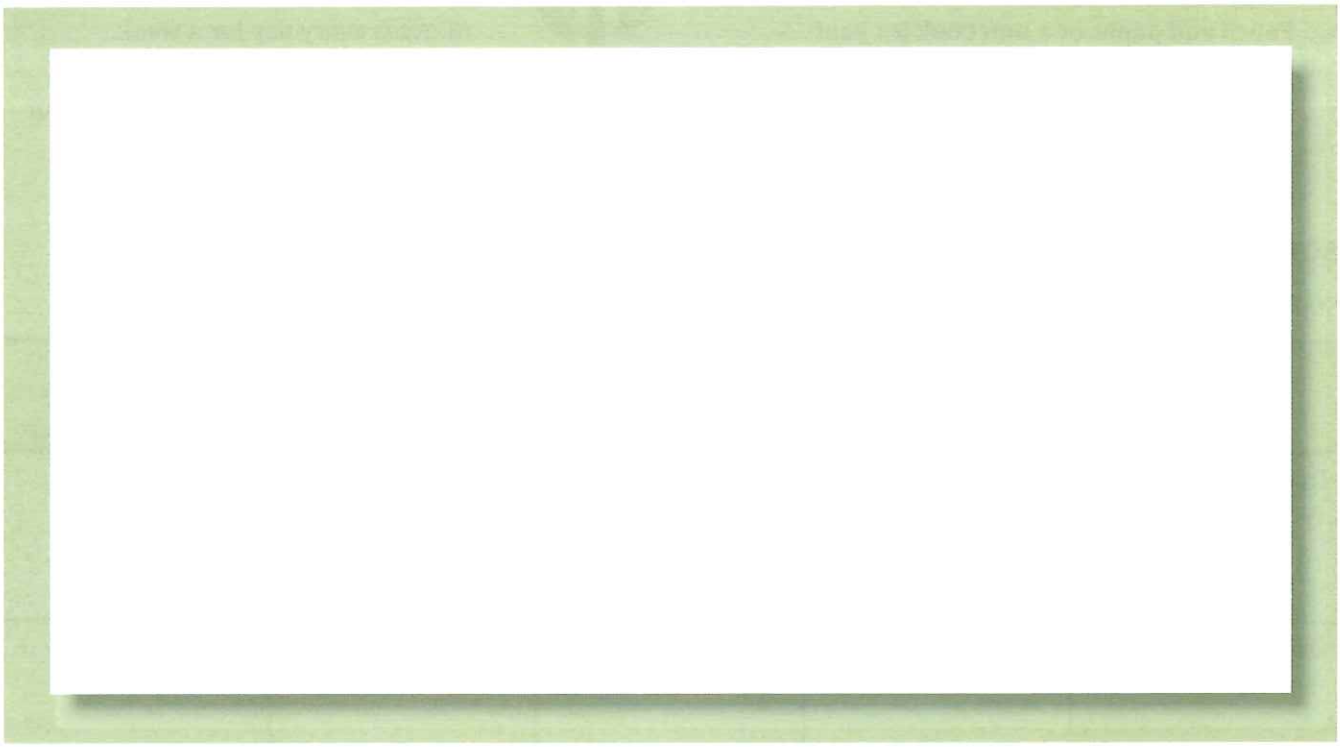
1. Watch your squirrel feeder for 5 minutes every day for a week.
2. Complete the squirrel feeder watch data chart. (You can make a chart like this on a computer or put it in your journal.)
3. Record what you see.

SQUIRREL FEEDER WATCH DATA

Start date: _____ Feed source (what's in your feeder): _____

	TIME	NUMBER OF SQUIRRELS	WEATHER CONDITIONS	OTHER OBSERVATIONS (squirrel colors, interactions)
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Sketch your squirrel feeding station below. If you made a chart on a computer, you can take a picture of your station and import it into your document.



LET'S CHAT

Share What Happened: Did your feeder attract any squirrels? If so, how many did you see?

Apply

- Why do people like to feed squirrels?
- What happens when a feeding station is removed?

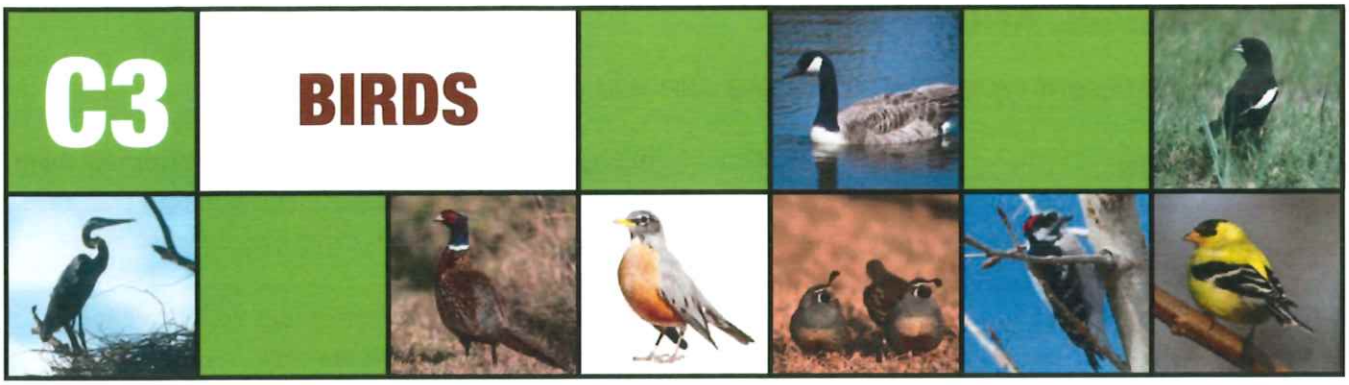
Generalize to Your Life: What can you learn by observing wildlife?

NOTE: You might want to keep one journal for all your wildlife observations. You can organize it in different ways:

- A section for each year of study
- A section for each vertebrate class—mammals, birds, fish, reptiles, and amphibians
- A section for each 4-H Wildlife Science manual (level 1 for grades 3-5, level 2 for grades 6-8, level 3 for grades 9-12)

LET'S FLY HIGHER

- Study the different species of squirrels found in your area, and find a picture of each type. Use the pictures to identify the different species of squirrels that visit your feeder.
- Watch the feeder at three different times each day for a week. Compare your results to see if the time of day makes a difference in how many squirrels visit your feeder.
- Use and compare different types of squirrel food to see what the squirrels like best.
- Make a chipmunk feeder. You can make it like the squirrel feeder, but use a pint-sized glass bottle with an opening 1 inch to 1-3/4 inches in diameter. Attach the bottle to a board with a strap (an old dog collar or similar) using nails, screws, or staples. Put corn and sunflower seeds in the bottle. Put your feeder on the ground in a shaded area where you can observe it. Write down what you see as you did for the squirrel feeder.



BIRD TRAITS

What traits do all birds share?

INTRODUCTION

Birds have several traits that no other classes have (with a very few exceptions).

- All birds have feathers and wings.
- All birds have beaks or bills and no teeth.
- All birds lay hard-shelled eggs that must be kept warm to hatch.

Other traits are true of birds and also true of some, but not all, of the other classes. For example:

- All birds are warm-blooded, which means they control their body temperature.
- All birds use lungs to breathe air.
- All young birds need to be taken care of to survive.

LET'S DO IT

Complete the sentences below by unscrambling the words in parentheses.

Birds have some (ratsit)_____ that are (fnefdtier) _____ from what other (mnaalsi)_____ have.

All (risbd) _____ have (giswn) _____ and (atreshf) _____ .

Birds do not have (ehtte)_____, and instead of lips, they have (kasbe) _____ or (lsibl) _____ .

Birds (nltoorc)_____ their body (mreeptrateu) _____ so they are called (mwra-doedlob)_____ animals. To (teerhba) _____ , birds use (nusgl) _____.

Birds lay (rhda-ldeehls) _____

eggs that need to be kept (mawr) _____ to (tcahh) _____.

Young birds cannot (rvesiuv) _____ on their own.

LET'S CHAT

Share What Happened: What did you learn about birds by completing this activity?

Apply: How can knowing the traits that birds share help you identify a vertebrate animal that you have never seen?

Generalize to Your Life: What traits do you share with birds?

LET'S FLY HIGHER

- Choose a wild bird and find out more about the way it lives by reading a book from your local library or searching the internet.
- Make bird flashcards by finding pictures of birds and pasting them onto index cards. Write the name of the bird on the back of the card. Practice identifying each bird by its picture.
- Use your journal or start a diary to keep track of all the types of wild birds you have seen. Note when and where you saw them. Add to this list over time.

BEAKS, LEGS, AND FEET

How many different types of bird beaks can you describe?

INTRODUCTION

By studying bird beaks, legs, and feet, you can learn how a bird survives in its habitat. Birds need a beak that fits the type of food they eat. A hummingbird has a beak adapted to sipping **nectar** from flowers. A hawk's beak is adapted for eating small prey.

Small birds use their delicate feet and legs to perch on trees and plants. Other birds have sturdy legs and strong feet for walking or swimming. Beaks, legs, and feet have developed to allow birds to eat the food available in their habitats. These are examples of adaptations to help the birds survive.

Bird legs and feet are grouped by how birds use them.

- *Grasping* – Strong robust legs with toes that have sharp curved talons, three toes forward, one toward the back
- *Perching* – Thin to strong legs with three toes forward, one toward the back
- *Swimming* – Strong legs with webs between the three forward toes
- *Wading* – Long, thin legs and long, thin toes
- *Climbing* – Short, strong legs with two toes forward and two toes back

BEAKS AND BILLS	FOOD
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms
	aquatic (water) insects – aquatic (water) vegetation – berries – birds – fish – fruit – grains – insects – mice – nectar (flower) – nuts – seeds – small mammals – worms

GEAR

- Pencil

LET'S DO IT

I. Beaks and Bills

1. Study the birds shown in the beaks and bills chart. Circle the food you think each bird eats. Most birds eat more than one food, so more than one answer might be right.
2. What do you think these birds eat?

Bald eagle _____

Cardinal _____

Thrasher _____

Wild turkey _____

LET'S DO IT

II. Legs and Feet

1. Study the birds shown in the legs and feet chart. Circle what they are used for.
2. What type of feet do these birds have?

Bald eagle _____

Cardinal _____

Thrasher _____

Wild turkey _____

LEGS AND FEET	USED FOR
	climbing – grasping – perching – swimming – wading - walking
	climbing – grasping – perching – swimming – wading - walking
	climbing – grasping – perching – swimming – wading - walking
	climbing – grasping – perching – swimming – wading - walking
	climbing – grasping – perching – swimming – wading - walking
	climbing – grasping – perching – swimming – wading – walking
	climbing – grasping – perching – swimming – wading - walking

LET'S CHAT

Share What Happened: Do birds have more variety in their beaks or their feet?

Apply: How does knowing about its beak and feet help you understand how a bird eats?

Generalize to Your Life: Why is it useful to group wildlife by their beaks or feet?

LET'S FLY HIGHER

Become a *birder*. A birder is someone who looks for birds in the wild.

- Choose a bird that should be in your area from a field guide or other source.
- Learn about its habitat, range, and call from a bird book from the library or at the Audubon Society website, www.audubon.org/news/how-begin-birding
- Search for this bird where you expect to find it. An adult can help you.
- Take a pair of binoculars and camera on your search, if possible. Once you find the bird, write the date, time, and location where you found it in a journal. Include any other observations, like the weather or bird behavior. Take a picture or make a sketch.
- Choose another bird to find. This can become a lifelong pastime and help you learn about many types of birds.

MY NOTES and IDEAS

BIRD FEEDER WATCH

What kind of birds will visit your bird feeder?

INTRODUCTION

You might never see all the species of birds that live around you, but you will likely see more of them by providing a bird feeder. And you can learn a lot about birds by observing them. This activity shows you how to make a bird feeder. Then you will watch carefully and take notes to learn more about the birds near your home.

Feeders should provide just a snack for birds. They should get most of their food from nature.

GEAR

Option 1

- Milk jug or 2-liter pop bottle, with lid
- Wooden dowel, about 6 inches long
- Scissors and punch or drill
- Wire
- Wire snips

Option 2

- Plywood, about 1-foot square
- Lath to surround the plywood (1 square foot of plywood needs 4 feet of lath)
- Hammer and nails

LET'S MAKE IT – BIRD FEEDER

Option 1

1. Cut two holes a few inches above the bottom of the jug or bottle. Make each hole about 2 inches in diameter (big enough for small birds to go through).
2. Punch a small hole under each opening and work the wooden dowel rod through it for a tight fit.
3. Punch two small holes under the lid, and slide the wire through. Pull the wire above the lid and twist it to make a hanger.

Option 2

1. Attach the lath to the plywood to keep birds from falling off the edges of the feeder.

Option 3

1. Buy a bird feeder.

Option 4

1. Put birdseed on a piece of turf or sidewalk. Make sure your feeding area is out in the open with no shrubs or trees around it, so birds can see any predators approaching.

Locating and filling your bird feeder

1. Find a safe place to mount your bird feeder. It should be visible from a window where you can watch it. A tree or post works well. Hang it high enough to protect birds from cats and dogs.
2. Fill your feeder with nuts, corn, peanuts, or seeds.

GEAR – BIRD WATCH

- Bird feeding station: Set up one or more bird feeders
- Pencil and paper or a notebook for making observations
- Camera (optional)

LET'S DO IT – BIRD WATCH

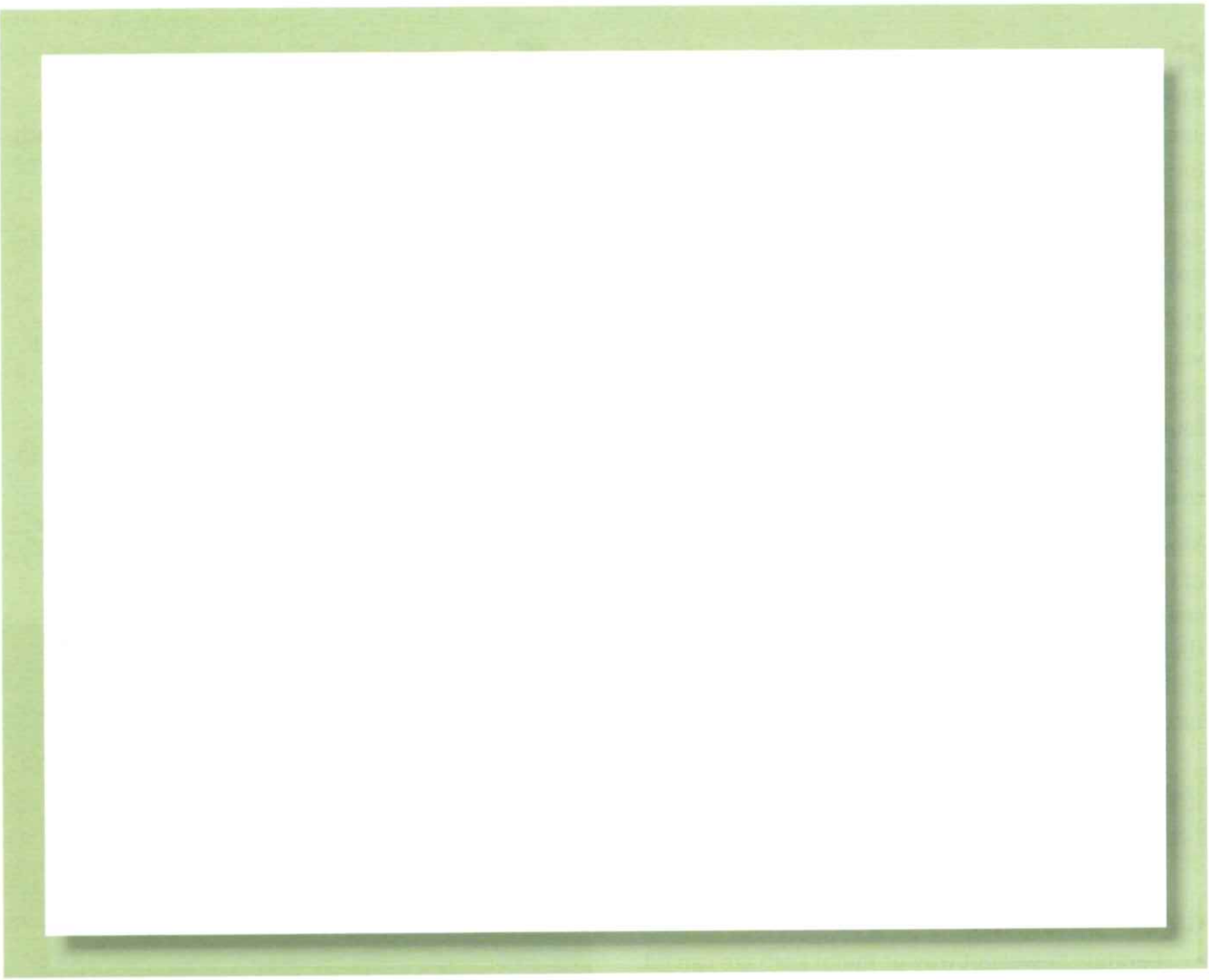
1. Watch your bird feeder for 5 minutes every day for a week.
2. Record what you see in the bird feeder watch data chart or in your journal.

BIRD FEEDER WATCH DATA

Start date: _____ Food source (what you provided in your feeder): _____

	TIME	NUMBER OF BIRDS	WEATHER CONDITIONS	OTHER OBSERVATIONS (bird colors, interactions)
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

The space below is for a sketch or picture of your bird-feeding station. If you made a chart on a computer, you can take a picture of your station and import it into your document.



LET'S CHAT

Share What Happened: How many birds did your feeder attract?

Apply

- Why do people like to feed birds?
- What happens when a feeding station is removed?

Generalize to Your Life: What can you learn by observing wildlife?

LET'S FLY HIGHER

- Research the different species of birds found in your area, and get a picture of each one. Use the pictures to identify the different species of birds that visit your feeder. Practice identifying each bird by its picture.
- Watch the feeder at the three different times each day for a week. Compare the data you get at different times. Are the bird species the same? Are there more birds at a particular time?
- Use and compare different types of food to see what the birds like best.
- Make your observations in a different place. Find a neighbor, organization, or nature area that has a bird-feeding station.
- Visit an established bird-feeding station to compare the types of birds that visit the different feeders.
- Participate in Audubon's Great Backyard Bird Count! Visit www.audubon.org/content/about-great-backyard-bird-count for more information.

BIRDBATH WATCH

Do birds like to take baths?

INTRODUCTION

Birds get much of the water they need from food (and sometimes, snow), but all species require some water for drinking. Birds bathe year-round if they can. They might not be able to find clean water at the proper depth in their habitat, so providing a birdbath is a great way to attract birds.

Make sure your birdbath has a gentle slope into the water, and that the water is no more than 2-3 inches deep. Keeping the water moving with a dripper or fountain will probably attract more birds. A birdbath attracts birds that don't visit feeders and allows you to observe and record birds and their activity.

Most birdbaths are sold with stands to raise them out of the reach of cats and dogs. However, many birds seem to prefer baths at ground level, the usual place they would find water in nature, in puddles. If you make a ground-level birdbath, protect water-soaked birds from predators with a fence.

SAFETY FIRST:
Always ask for adult help when using tools.

GEAR – BIRDBATH

- Ceramic flowerpot tray or metal garbage can lid. You can use this on the ground supported with bricks, or placed on top of a stand or drain tile. *Note: Birds can't get secure footing on a plastic lid.*
- Rocks and pebbles
- Water
- Optional dripper
  - Plastic milk jug with cap
  - Safety pin or diaper pin
  - Twine, wire, or rope to hang the dripper
- Bird field guide or other way to identify birds
- Camera (optional)

LET'S DO IT – SETTING UP YOUR BIRDBATH

1. Find a safe place to put your birdbath. You should be able to watch it from a window.
2. Use a drainage tile or cement block to make a stand that is 2-3 feet off the ground. Placing the birdbath on a stand allows the birds to see an approaching cat.
3. Put pebbles and rocks in the bottom of the birdbath to give the birds something to stand on.
4. Pour 2 inches of water in the bath.
5. Check the water every few days and add more as needed.
6. If your bath is large enough for deeper water, include flat stones that provide shallow spots for smaller birds.

LET'S DO IT – DRIPPER (optional)

Note: Dripping water attracts more birds. You need something to hold the dripper, like a tree, post, or plant hanger.

1. Poke a tiny hole near the cap of the jug and another in the bottom. It's difficult to make the hole so small it drips water, so start with the smallest hole possible.
2. Take the dripper outside to your bird water station.
3. Fill the jug with water and replace the cap.

4. Hang the jug by the handle 12-18 inches above the birdbath on a tree limb, post, or plant hanger.
   - Use a watch with a second hand or timer to time how fast the water drips out the bottom hole. A drop should fall every 5 to 10 seconds.
   - Air enters the jug from the hole near the cap. If the water drips more slowly than that, make the hole a little bigger. Time it again.
   - Refill the dripper when you plan to watch the birdbath.

GEAR

- Birdbath
- Pencil and paper or notebook for making observations
- Camera (optional)

LET'S DO IT – BIRD WATCH

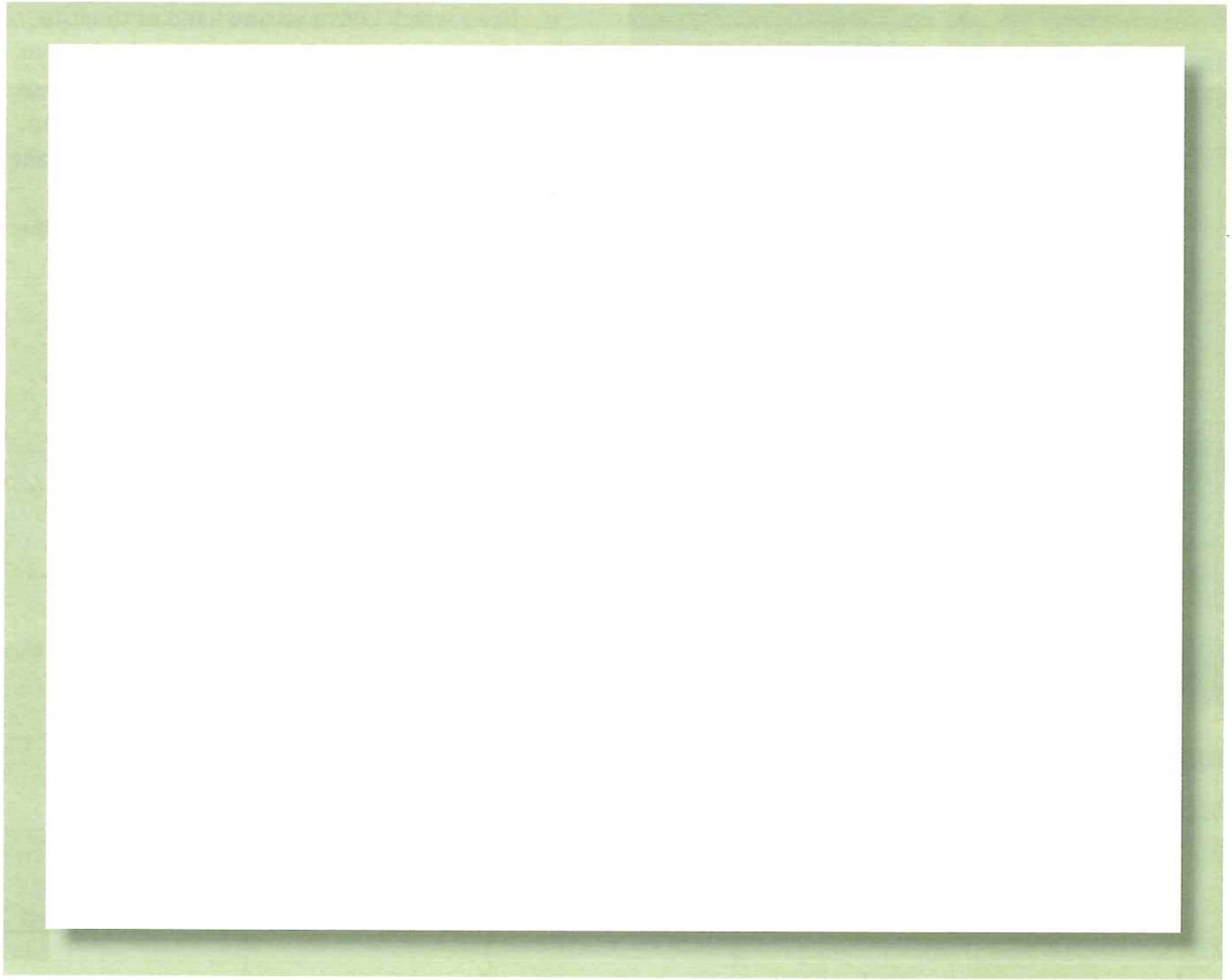
1. Watch your birdbath for 5 minutes every day for a week and complete the birdbath watch data chart.
2. Record what you see below or in your journal.

BIRDBATH WATCH DATA

Start date: _____

	TIME	NUMBER OF BIRDS	WEATHER CONDITIONS	OTHER OBSERVATIONS (bird colors, interactions)
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

The space below is for a sketch or picture of your birdbath. If you made a chart on a computer, you can take a picture of your station and import it into your document.



LET'S CHAT

Share What Happened: What kind of birds used your birdbath?

Apply: What did the birds use the bath for—drinking or cleaning or both?

Generalize to Your Life: Why is bathing important for all animals?

LET'S FLY HIGHER

- Research ways to make water available to birds in the winter.
- Make a winter birdbath.

NOTE: You might want to keep one journal for all your wildlife observations. You can organize it in different ways:

- A section for each year of study
- A section for each vertebrate class—mammals, birds, fish, reptiles, and amphibians
- A section for each 4-H Wildlife Science manual (level 1 for grades 3-5, level 2 for grades 6-8, level 3 for grades 9-12)

FEEDING HUMMINGBIRDS

Are there hummers near your house?

INTRODUCTION

Hummingbirds are fascinating to watch. Hummingbirds—often called hummers—flap their wings 50 to 70 times per second! These small birds hover by flowers and feeders to drink nectar and eat small insects and spiders. You might observe hummingbirds plucking insects from spiderwebs around the eaves of the house.

You can attract hummers by planting orange and red tubular or trumpet flowers, which are their natural feed. Examples are columbine, dahlias, gladiolus, hollyhocks, morning glories, nasturtiums, and petunias. Hummingbirds **pollinate** flowers, carrying pollen from one plant to another. You will probably see more hummingbirds if you use a feeder. You can buy or make hummingbird food using cane sugar. Hummers use sugar from nectar or feeders for energy and eat insects for protein.

GEAR

Option 1: Buy a hummingbird feeder.

Option 2: Make a hummingbird feeder.

- Water bottle with cap
- Plastic drinking straw, 3 inches long
- Hot glue or waterproof glue
- Red, yellow, and orange enamel paint or a piece of bright orange or red plastic from a food container
- About 1 foot of wire to hang the feeder
- Hole punch or drill
- Cane sugar or hummingbird food

LET'S DO IT

1. Poke or drill a hole that is just a little smaller in diameter than the straw about an inch from the bottom of the water bottle.
2. Push the straw a little over halfway through the hole.
3. Seal around the straw hole with the glue.
4. Paint the bottle, or glue red, orange, and/or yellow pieces of plastic to it.
5. Wrap the wire around the top of the bottle, just below the cap, and on the other end make a hook.
6. Buy hummingbird feed, or make your own:
    - Mix 1 cup of water with 1 cup of white or brown granular sugar in a saucepan.
    - Boil the mixture over low heat to slow **fermentation**.
    - Add 3 cups of cold water to the sugar/water mixture. This dilutes it to one part sugar to four parts water (1:4). Note: Do not use honey, which ferments more quickly than granular sugar.
    - Use the 1:4 ratio when first attracting hummingbirds. Then change the mix to 1:6 (one part sugar to six parts water). This is healthier for the hummers and encourages them to use natural food sources.
    - Do not use food coloring. The colors on your feeder are enough to attract hummingbirds.
    - Store the unused solution in the refrigerator.

Now it's time to go outside.

7. Pour the food into your feeder until it's about half full, placing a finger on the straw to keep the liquid from flowing out.
8. Put the lid on the bottle. Make sure it's tight and no liquid escapes unless you squeeze the bottle.

9. Carry your feeder by the wire, not the bottle, to a tree branch. The feeder should be at least 3 feet off the ground. A tree branch works well because the shade slows fermentation compared to feeders placed in the sun.
10. Hang the bottle where you can watch it without disturbing the hummers.
11. Ants, bees, and wasps can drink a lot of sugar water. Hang the feeder on thin monofilament fishing line to deter ants, and coat the feeding end of the straw with salad oil to deter bees and wasps.
12. Rinse the feeder with hot water and add new food every few days.

LET'S DO IT – HUMMER WATCH

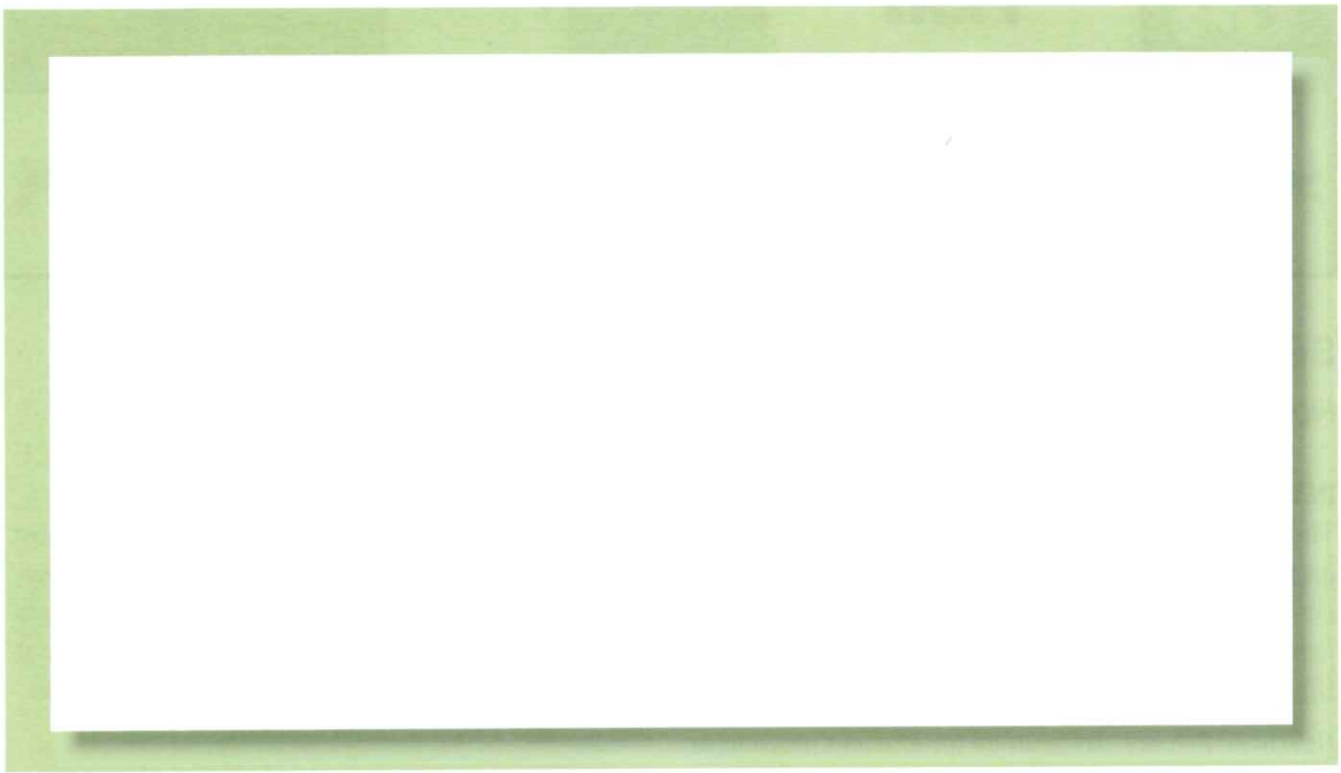
1. Watch your hummingbird feeder for 5 minutes every day for a week and complete the hummer watch data chart.
2. Record what you see below or in your journal.

HUMMER WATCH DATA

Start date: _____

	TIME	NUMBER OF HUMMERS	WEATHER CONDITIONS	OTHER OBSERVATIONS (bird colors, interactions)
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

The space below is for a sketch or picture of your hummer feeder. If you made a chart on a computer, you can take a picture of your station and import it into your document.



LET'S CHAT

Share What Happened: How long did it take for hummers to visit your feeder?

Apply: What benefits do hummingbirds provide?

Generalize to Your Life: Why do people like to feed hummers?

LET'S FLY HIGHER

- Try attracting hummers and other birds with natural grape jelly. (Don't use diet or sugar-free jelly.)
  - Put about a teaspoon of grape jelly in a brightly colored bowl.
  - Put the bowl out of reach of other animals. Raccoons and opossums also enjoy jelly. You can use a small margarine container with the sides cut down. Drill three or four holes along the rim to attach wires that can be used to hang the jelly container.
  - Grape jelly spoils quickly, so use small amounts, and clean and change the feeder every other day.
- Research at the library or on the internet to answer one or more of these questions:

How many kinds of hummers are there?

_____

Where do hummers go in the winter?

_____

How big are hummingbird eggs?

_____

How fast can hummers fly?

_____

Do hummingbirds damage flowers?

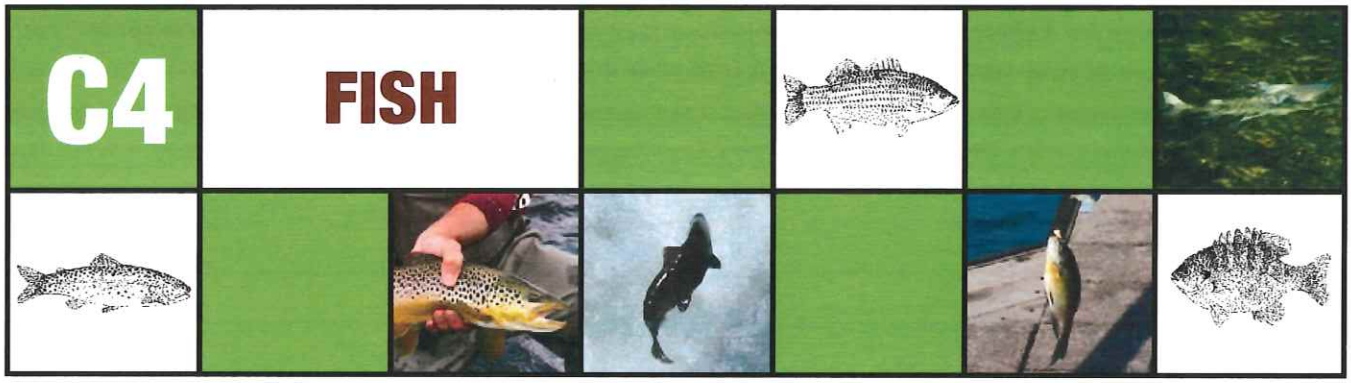
_____

How much nectar does a hummingbird eat each day?

_____

How many insects does a hummer eat each day?

_____



SOUNDS FISHY TO ME

How much do you know about fish?

INTRODUCTION

The name "fish" is most often applied to three major groups of vertebrate animals, or those with backbones: jawless fishes (example: sea lamprey); cartilaginous fishes (examples: sharks and rays); and boney fishes (found in inland waters in North America).

Nearly all fish are streamlined for efficient movement through water. Because water doesn't have much oxygen, fish have a large surface area in their gills. This allows the exchange of gases between their blood and the water. Fish depend on water and wetlands for at least one life stage. In this activity you study the traits (adaptations) of fish.

GEAR

- Pencil

LET'S DO IT

1. Read Fish Traits.
2. Use the information you learned to complete the crossword puzzle.

LET'S CHAT

Share What Happened: What new fact did you learn about fish?

Apply: Why can fish tell us when water quality is poor?

Generalize to Your Life: How might learning about fish be useful to your health?

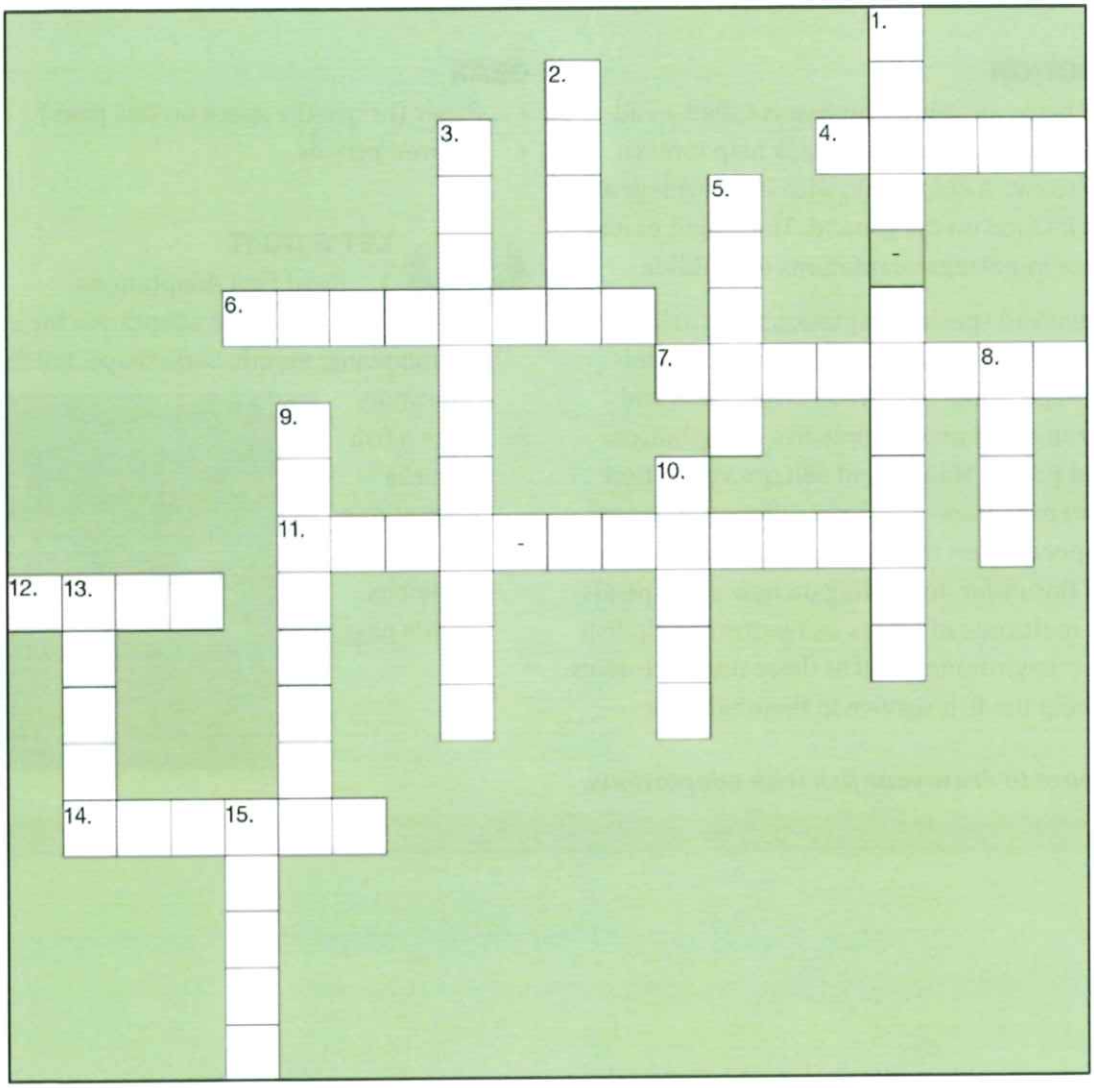
FISH TRAITS

No traits apply to all fish. For example, although most fish have fins, a few fish in nature do not. The following list gives common fish traits, but there are always exceptions; that is, you can find some fish that do not have some of these traits. Most of the traits found in fish are also found in other animals.

1. Fish have fins that are modified scales used for motion in the water.
2. Fish are born as a larva, a small fish that carries and feeds off of its egg sack until it has developed into a fish that can eat on its own.
3. Fish have a **swim bladder** to keep from sinking or floating.
4. Fish live in water.
5. Fish breathe using gills. Boney fish have a single gill opening with a protective flap.
6. Fish have a highly developed sense of taste and taste buds in their mouths, gills, and skin.
7. Fish are **cold-blooded**, which means they stay the temperature of the environment and cannot control their body temperature.
8. Fish have scales covering the body. Scales have rings that are somewhat like tree rings.
9. Most fish lay eggs that must remain in water. A few fish keep eggs in their bodies until after the larvae (young) hatch.
10. Fish do not care for their young. The young are independent, which means they live on their own.
11. Fish have an excellent sense of smell. They can detect tiny traces of some chemicals in the water.

FISH CROSSWORD PUZZLE

Use the clues under Down and Across to fill in the spaces.



DOWN

1. Found inside fish, this keeps them from sinking or floating.
2. Fish live in _____.
3. Young fish that live on their own are _____.
5. Something that makes one animal different or the same as another animal.
8. Structures that fish use for motion in the water.
9. A vertebrate is an animal that has a _____.
10. Fish do not care for their _____.
13. Fish breathe air using _____.

ACROSS

4. Some fish lay eggs, but some give _____ to live young.
6. A single bone that is part of a backbone.
7. Animals found in the natural environment.
11. A term that means an animal cannot control its body temperature.
12. Some fish lay _____.
14. _____ cover the bodies of fish.
15. A young fish that feeds off an egg sack.

LET'S FLY HIGHER

- Make fish flashcards by finding pictures of fish and pasting them onto index cards. Write the name of the fish on the back of the card. Practice identifying each fish by its picture.
- Start a diary of all the wild fish you have seen. Note when and where you saw them.

ADAPT YOUR FISH

What adaptations help fish survive?

INTRODUCTION

A trait that helps an animal survive is called an adaptation. A deer's long legs and neck help it reach tree leaves to eat. A chipmunk, with its short legs and neck, finds its food on the ground. The length of legs and neck are important adaptations for wildlife.

Fish have evolved special adaptations that help meet the challenges of survival. Some fish are tiny, and others are huge. Some fish live in swift rivers and must be strong swimmers; some live at the bottom of lakes and ponds. Many small fish use vegetation to hide from predators. Fish have different types of mouths depending on the food they eat. The number and size of fins differ depending on how a fish needs to move. A multitude of colors and patterns help fish hide in their environment. All of these traits are adaptations to help the fish survive in their habitats.

GEAR

- Paper (or use the space on this page)
- Colored pencils

LET'S DO IT

1. Read Fish Adaptations.
2. Choose one adaptation for each of the following: mouth, body shape, tail fins, and coloration.
3. Draw a fish with the adaptations you chose in the box on this page.

Use this space to draw your fish with adaptations.

LET'S CHAT

Share What Happened:

- Why did you choose the adaptations you used for your fish?
- What kind of food will your fish eat?
- Describe the habitat your fish lives in.

Apply: How do adaptations help fish survive?

Generalize to Your Life: What adaptations might fish need to adjust to climate change?

FISH ADAPTATIONS

Mouth:

- A fish that eats plants, insects, and decaying matter off the bottom needs a mouth near the bottom of its head. Its mouth doesn't have to capture moving prey.
- A fish that eats other fish and animals like crustaceans and frogs has a mouth that can capture, hold, and swallow its prey.
- A fish that feeds on insects on or above the surface needs a mouth that points upward.
- A fish that feeds within vegetation and on small insects in the water (a nibbler) has a forward-facing mouth.

Body shape:

- A thick body with a flat bottom helps bottom-feeding fish.
- A torpedo-shaped body helps a fish swim fast.
- A humpbacked shape helps a fish swim in a fast current.
- A thin, round body makes a fish harder to see and allows it to change directions quickly to avoid predators.

Shape of the tail fin:

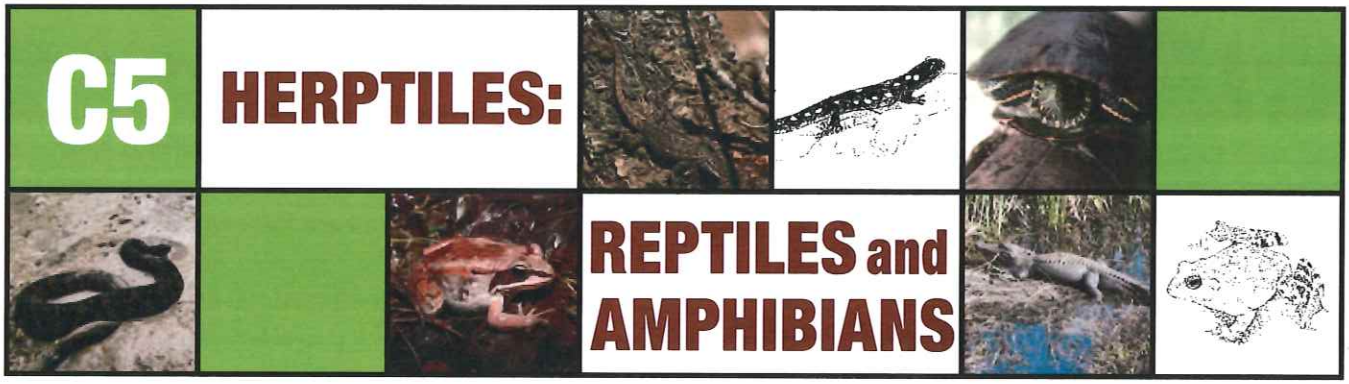
- Fish with rounded tail fins are generally slow but can have a short burst of speed.
- Fish with squared-off tail fins are strong, slow swimmers.
- Fish with a forked tail are fast swimmers when they need to be.
- Fish with a crescent-shaped tail fin are fast, strong swimmers.

Colors and patterns on the body:

- Fish with a light-colored belly and a dark back are harder to see from the bottom and the top.
- Fish with spotted, splotchy color can hide along the bottom and around rocks.
- Fish with stripes can hide among vegetation.

LET'S FLY HIGHER

- Make a three-dimensional clay model of your fish.
- Find pictures of real fish that have some of the same adaptations as your fish, and compare their habitat with the habitat you imagined for your fish.



CREEPING, CRAWLING, AND SLITHERING

What are the four main types of reptiles?

INTRODUCTION

Herptiles is a shortcut for talking about reptiles and amphibians. The word comes from herpetology, the scientific study of reptiles like snakes, turtles, and lizards, and the amphibian group of frogs, toads, and salamanders.

The four main types of reptiles are snakes, lizards, turtles, and crocodilian. Reptiles have a dry skin cover made of scales. Most have four legs that are adapted for running, climbing, or capturing prey, but some (snakes and glass lizards) have no legs. Reptiles lay eggs that have a leathery outer covering. The leathery shell and membranes protect the embryo from drying, so reptiles do not need to return to water to reproduce. Some reptiles, like some fish, keep their eggs in the body until the young are fully developed. Most reptiles use wetlands or water but depend less on water than fish and amphibians. Reptiles hibernate (become dormant) during cold times of the year but are occasionally seen sluggishly crawling on the snow.

No traits are only found in reptiles, so you sometimes must look at a combination of traits to identify reptiles from other classes.

GEAR

- Pencil

LET'S DO IT

1. Read Reptile Adaptations.
2. Complete the reptile traits table by putting an X or checkmark under the reptiles with the trait listed in the first column.

REPTILE TRAITS *Note: Some rows have more than one answer.*

TRAITS	LIZARD	TURTLE	SNAKE	CROCODILIAN
Legs, scales, cold-blooded	☐	☐	☐	☐
Vertebrae, no legs	☐	☐	☐	☐
Lays eggs, a shell made of bone called a carapace	☐	☐	☐	☐
Scales, vertebrae, cold-blooded, lays eggs	☐	☐	☐	☐
Breathes with lungs, some have a detachable tail that can grow back	☐	☐	☐	☐
Cold-blooded, teeth	☐	☐	☐	☐
Teeth, large powerful tails used for swimming	☐	☐	☐	☐
Lungs	☐	☐	☐	☐
Lays eggs on land	☐	☐	☐	☐

LET'S CHAT

Share What Happened: Was completing the table difficult?

Apply: How many types of reptiles have you seen? Where?

Generalize to Your Life: Why are snakes considered beneficial?

REPTILE ADAPTATIONS

Some characteristics that are true of reptiles are also true of some (not all) of the other classes:

- All reptiles are cold-blooded, which means they cannot maintain an internal temperature.
- All reptiles use lungs to breathe air.
- All reptiles have scales on their bodies.
- All reptiles that lay eggs, lay them on land.

Some traits are mostly true of all reptiles.

- Most reptiles lay hard or leathery shelled eggs on land. (A few, like the boa constrictor, have live births.)

The four main types of reptiles are lizards, turtles, snakes, and crocodilian. Each type has specific adaptations that help it survive.

- Lizards have legs and teeth. Some (skinks, fence lizards) have detachable tails, which they can lose to escape a predator and then grow back later.
- Turtles have legs and a shell called a **carapace**. Made of bone, it grows with the turtle as it ages. Turtles do not have teeth but instead eat with their bony beaks. The term tortoise generally refers to a turtle that doesn't live in the water. Turtles are more **aquatic** in both fresh and salt water, while a tortoise lives on land. Despite its name, the box turtle is a tortoise.
- Snakes have teeth and are legless. They move by using their muscles and the **friction** caused by their scales on the surface. Some snakes are **venomous**, but most are not.
- Crocodilian reptiles include crocodiles and alligators. They are large and have legs and teeth. They live both on land and in the water. They have large, powerful tails used for swimming. Crocodiles have special glands that allow them to live in saltwater; alligators lack this gland and therefore are found only in fresh water.

LET'S FLY HIGHER

- Make herptile flashcards by finding pictures of reptiles and amphibians and pasting them onto index cards. Write the name of the reptile or amphibian on the back of the card. Practice identifying each animal by its picture.
- Start a diary of all the wild herptiles you have seen. Note when and where you saw them. Practice identifying each animal by its picture.
- Go to a park or other area where reptiles might be found and look for them. Reptiles are cold-blooded and need to lie in the sun, so look in sunny areas on rocks or logs. Once you find a reptile, figure out which type it is. Take pictures.
- Research venomous Indiana snakes. Draw where they're found on a state map. Look up the snakes' habitat to find out where in a park you would most likely find them.

THREE MIDWEST REPTILES

What are the main differences between snakes, lizards, and turtles?

INTRODUCTION

Snakes are covered with scales. They hibernate when temperatures drop below 50ºF. They are called cold-blooded because they can't keep warm enough to be active in cold weather. Snakes eat a wide variety of food, including rodents, insects, slugs, salamanders, fish, tadpoles, bird eggs, frogs, and earthworms, depending on the species of snake.

Lizards eat a variety of insects, spiders, caterpillars, and occasionally, snails. In turn, they are eaten by birds such as hawks, snakes, and mammals such as opossums, skunks, and cats.

Turtles have been on earth for about 200 million years and have remained relatively unchanged. They are unique because their bodies are encased in a shell that helps protect them. Some turtles remain on land, and others spend most of their time in the water, although all turtles have lungs to breath air and lay their eggs on land.

In this activity you will learn more about these reptiles by studying one of each type.

GEAR

- Pencil
- Paper or journal

LET'S DO IT

1. Read About Turtles, Lizards, and Snakes.
2. Complete the turtle, lizard, snake table or make your own, to show each reptile's food, means of protection from predators, where they lay eggs, and how they move.

TURTLE, LIZARD, SNAKE

REPTILE	FOOD	PROTECTION FROM PREDATORS	LAY EGGS IN:	MOVEMENT
Eastern box turtle				
Five-lined skink				
Black rat snake				

LET'S CHAT

Share What Happened: What did you learn about one of the reptiles that you did not already know?

Apply: What habitat attracts a box turtle, five-lined skink, or black rat snake?

Generalize to Your Life: Why do many people consider these reptiles beneficial?

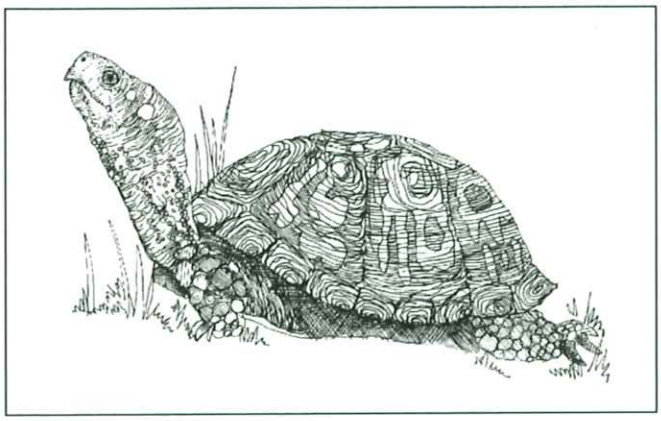
LET'S FLY HIGHER

- Many reptiles live in Indiana, and they have different adaptations from the ones in this activity. Learn all you can about one of the following reptiles: snapping turtle, painted turtle, red-eared slider, eastern fence lizard, garter snake, northern water snake, milk snake, hog-nosed snake, massasauga rattlesnake

ABOUT TURTLES, LIZARDS, AND SNAKES

Eastern box turtle

The eastern box turtle lives in forested areas. Its range is 1-2 acres. The box turtle is omnivorous, which means it eats both plants and animals—insects, snails, dead animals, mushrooms, berries, fruit, lettuce, and many other types of food.

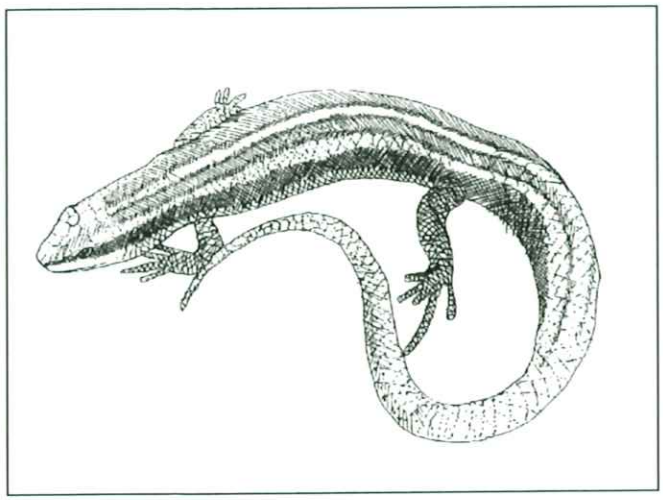


Turtles do not have teeth. They have horny bills to tear their food, and a thick tongue. Turtles move too slowly on their short, stubby legs to chase down their food or run from predators. A turtle can protect itself with its shell. It has hinged lower sections, so the turtle can completely hide in the shell and shut these front and back trapdoors.

Turtles lay their eggs on dry land, usually digging a hole in soft sand or soil. After laying its eggs, a turtle covers and then abandons them to hatch and survive on their own.

Five-lined skink

The five-lined skink is a lizard that lives in forested areas, where it can hide and hunt in leaf litter. It also likes to sun itself in rocky areas during the day.

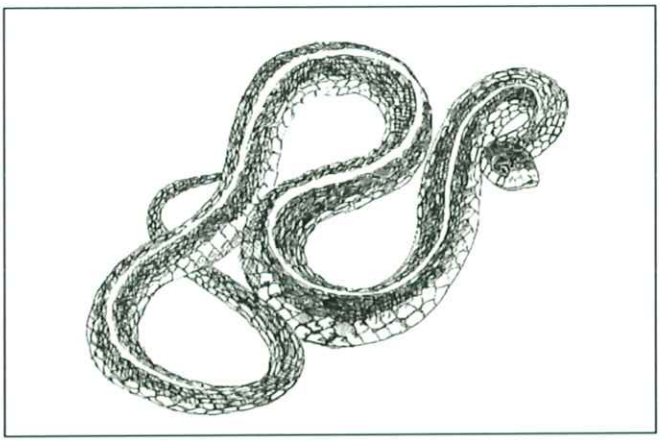


The skink has four short legs and can move quickly over short distances. It has a long tail that detaches when grabbed. The tail twitches and flops around to distract a predator so the skink can get away. The tail will grow back. The skink has a forked tongue, which it uses to smell its prey. It uses its jaws to capture and swallow insects. The slink is a carnivore, so it never eats plant material.

The female skink lays eggs in a moist, abandoned burrow or under a rotting log and protects them until they hatch. Then the young are on their own. Hatching takes 24 to 55 days, depending on how warm the environment is.

Black rat snake

The black rat snake is common in the Midwest. It is so named because its favorite foods are rats and mice. The snake's coloring—black to dark grey on top and light on the bottom—helps it hide from predators. Rat snakes are not dangerous. They hiss and try to look dangerous when disturbed to scare predators away.



Rat snakes have thin bodies and can grow to 6 feet long. They have forked tongues, which they use to smell. The rat snake is not poisonous; it squeezes as it coils around its prey. It then can detach its jaw to swallow a rat much larger than its mouth. It never eats plant material. The black rat snake moves well across the ground and up trees using wide scales on the bottom to push against the ground or tree bark. Black rat snakes like to hang on branches to warm themselves in the sun. They are strong swimmers and are often mistaken for water snakes.

These snakes lay eggs in abandoned burrows or under rotting logs but then abandon them to hatch and survive on their own.

EGG TO TADPOLE TO FROG

Could you draw an amphibian?

INTRODUCTION

Amphibians do not have scales like reptiles. Frogs and salamanders have moist, glandular skins; and toads have dry and rough (warty) skin. Amphibian toes do not have claws.

All amphibians begin life in water, and most move onto land when they become adults. Young amphibians pass through a larval stage before they reach adult form through **metamorphosis**. Their eggs are usually jelly-like and deposited in water, free-floating, or attached to water plants and rocks. For example, frogs begin life as eggs surrounded by a jelly-like coating. The eggs must remain in water. An egg hatches into a tadpole, which has gills to breathe underwater. Because the tadpole is cold-blooded, it spends much of its time in the sun to warm itself. As the tadpole grows, it goes through metamorphosis and changes into an adult frog. The frog then moves onto land, where it breathes with lungs. When it returns to the water, it can also breathe through its skin.

Polluted water and habitat changes harm amphibians, so they're not as common as they once were. Their porous, sensitive skin exposes them to chemicals in the water. So they are good indicators of water quality.

GEAR

- Pencil

LET'S DO IT

1. Read the introduction and About Amphibians I.
2. Complete the paragraph in the box on the next page using the given words.

ABOUT AMPHIBIANS I

Unique traits: Two characteristics of amphibians are not true of any other class.

- All amphibians live both on land and in water sometime during their lives.
- All amphibians can breathe through their skin.

Shared traits, mostly amphibians: Some traits are mostly true of all amphibians.

- Most amphibians go through metamorphosis. Some salamanders do not metamorphose but keep their larval growth form throughout their lives. These are known as neotenic salamanders. The hellbender and mudpuppy are both neotenic salamanders.

Shared traits: Other traits are true of amphibians and also true of some (not all) of the other classes.

- All amphibians are cold-blooded.
- All amphibians have gills at some point in their lives.
- All amphibians lay eggs surrounded by a jelly-like coating.

LET'S CHAT

Share What Happened: What did you learn about amphibians that you did not already know?

Apply: Why do you think polluted water can harm amphibians?

Generalize to Your Life: Why should we protect amphibians?

Use these words to complete the paragraph. Cross out each word after you use it.

COLD-BLOODED	WARM	LUNGS	JELLY
GILLS	CLASSES	TADPOLE	METAMORPHOSIS
LAND	EGGS	WATER	VERTEBRATES
SKIN	GROWS	FROG	TRAITS

Amphibians have a backbone just like all_____. Animals with backbones are divided into groups called _____. There are several _____ that identify amphibians. All amphibians start their lives in _____, and most move onto _____. Frogs begin life in water as _____ that are surrounded by a _____ -like coating. An egg hatches into a _____, which has _____ to breathe underwater. As the tadpole _____, it goes through _____ and changes into an adult _____. The adult frog then moves on to land where it can now breathe with _____. Because the frog is _____, it spends much of its time in the sun to_____ itself. When it returns to the water, it can also breathe through its _____ .

LET'S FLY HIGHER

- Look for eggs in a pond in spring.
- Return to study the eggs every day.
- Sketch what you see each day as you watch the changes.
- You can also watch how the larvae change into adults once the eggs hatch.
- You may catch amphibian larva-like tadpoles to observe them, but be sure to return them to the pond where you found them.

The eastern hellbender is endangered in five states and protected, or of special concern, in many others. "Their populations are declining in many of their geographic locations," said Rod Williams, a Purdue assistant professor of forestry and natural resources and leader of the university's hellbender efforts. "This species has hardly changed in 160 million years of existence, so we think it's worth the effort to do our part to save this living fossil."

HOW AMPHIBIANS SURVIVE

What adaptations do amphibians have that help them survive?

INTRODUCTION

Amphibians include salamanders, toads, and frogs. They have been around for a long time. They are the first vertebrate animals to venture onto land, but they still heavily depend on water.

Amphibians lay their eggs in water and have a larval stage that is fish-like with gills. The larva changes into an adult with lungs and legs. The adult can live on land. An amphibian must have adaptations, or traits that help it to survive.

GEAR

- Pencil
- Paper or journal

LET'S DO IT

1. Read About Amphibians II.
2. Describe amphibian eggs in your own words and answer the questions.

- Amphibian eggs:

- How do amphibians move?

- How do amphibians protect themselves from predators?

ABOUT AMPHIBIANS II

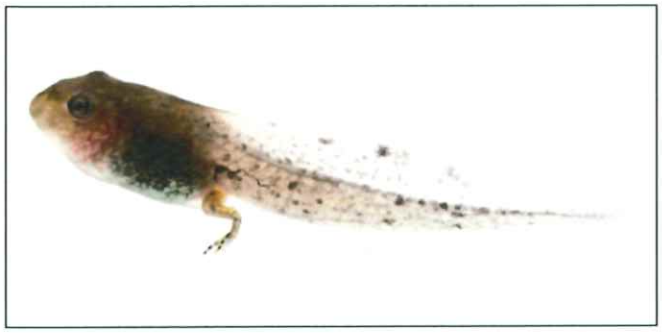
Eggs

Eggs are laid together in a thick mass. The eggs on the outside of the mass protect the eggs in the middle. The eggs on the inside have the best chance of survival. The sticky, jelly-like coating keeps the eggs from being separated, carried away, and drying out.

Larval stage

An amphibian hatches as a fish-like larva. A frog larva is called a tadpole. The larva has gills to breathe in the water. It feeds on water insects (like the one behind its tail in the picture.) During metamorphosis:

- Legs develop in small sack-like areas and then emerge. Lungs develop and the gills close.
- A salamander's back fin develops into a tail.



Adult body

- Amphibian eyes and nostrils are on top of the head so the animal can sit in the water or under cover on land with only its eyes and nostrils exposed.

- An amphibian has a large, broad mouth with a long, sticky tongue attached at the front of the mouth. This allows it to fling its tongue out to capture prey. It can fit large prey in its large mouth.
- An amphibian's coloring helps it blend into its environment. The upper body is a camouflaged pattern, and the underbody is usually a light, solid color. This makes the amphibian hard to see from above or below.
- A salamander has a streamlined body with short legs and a long tail. This helps it hide in leaf litter and vegetation and move quickly when it needs to.
- A frog has a streamlined, flat body with no neck, making it easier to swim. It has short front legs with five toes and powerful hind legs with webbing between the five toes so it can swim in water and jump on land.

Other adaptations

- Male frogs have vocal sacs that they inflate. The air is forced through the vocal cords to create a croaking sound. This sound attracts females and warns other males away from their territory.
- Tree frogs have a small claw at the end of each toe and toe pads that make it possible to climb trees.

LET'S CHAT

Share What Happened: What did you learn about amphibians that you did not already know?

Apply: Where would you look for frogs?

Generalize to Your Life: What other animal goes through metamorphosis?

LET'S FLY HIGHER

A great variety of adaptations can be found among amphibians. Investigate other interesting adaptations that some amphibians have.

GLOSSARY

Adaptation: A trait that helps an animal adapt to the environment to better survive

Aquatic: Describes an animal that lives in the water

Backbone: A series of bones that connects an animal's skull to its pelvis. Each bone is called a vertebra.

Carapace: A bony shell that grows with a turtle to protect it from danger

Carnivore: An animal that eats other animals (meat)

Class: A collection or group of individuals with certain common traits

Cold-blooded: Animals (fish, amphibians, and reptiles) that cannot maintain a constant temperature but change with the temperature of the environment

Fermentation: Chemical breaking down of a substance, often accompanied by the formation of a gas

Friction: A force that holds back the movement of a sliding object

Habitat: The area where an animal naturally lives and grows

Herbivore: An animal that eats vegetation

Herptiles: The combined classes of amphibians and reptiles

Metamorphosis: The process of transformation from an immature form to an adult form in two or more distinct stages. Eggs hatch as larvae with gills, and change to adults with lungs.

Nectar: A plant's saccharine (sugar) secretion that attracts birds and insects that pollinate the flower

Omnivore: An animal that eats both meat and vegetation

Pollination: The process of transferring pollen from the male part (anther) to the female part (stigma) of a flower; needed to create fruit and berries

Scavenger: An animal that eats dead animals (possibly hit by a car or killed by another animal)

Swim bladder: Organ that keeps fish from sinking or floating

Trait: Something that makes an animal the same as or different from other animals

Venomous: Describes an animal that injects a harmful substance into its victim by biting or stinging it

Vertebra: Each of a series of small bones forming the backbone of an animal (plural, **vertebrae**)

Vertebrate: An animal with a backbone

Warm-blooded: Maintains a constant body temperature

Wildlife: Animals that live in the natural environment and not under the direct control of humans

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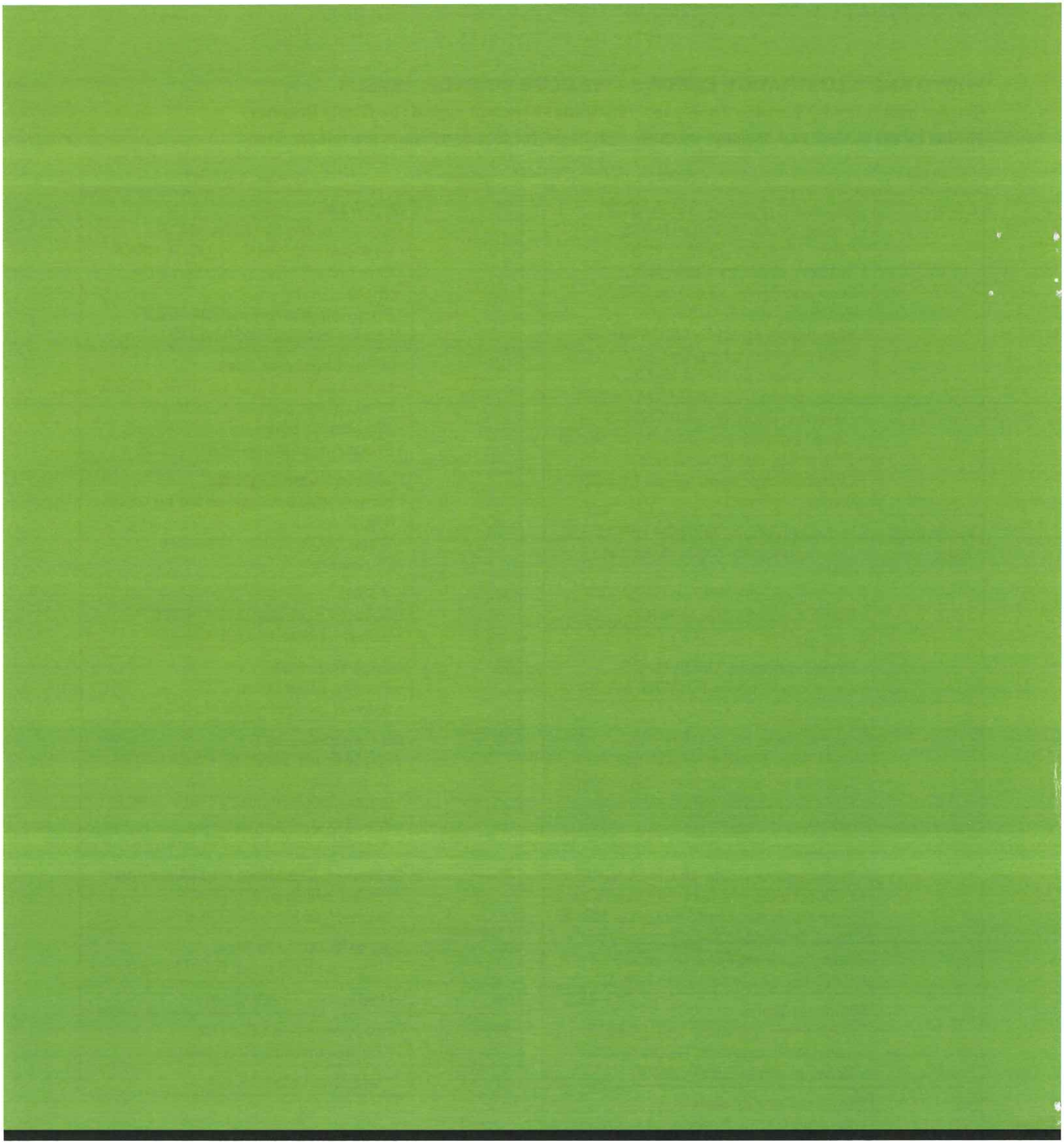

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