WETLAND ANIMAL ENGINEERS

Wetlands are a challenging place to live! How do animals living in wetlands change their ecosystem in order to better survive?

LESSON AT A GLANCE

GRADE LEVEL

- 3rd - 5th grades

CORRELATING STANDARDS

- SC.3.7.2.C
- SC.4.6.3.B
- SC.5.13.4.C

ACTIVITY TIME

- 15 min - Warm Up:
  - Structure Sort
- 20-40 min - Main Activity:
  - Design a Nest
- 45-60 min - Extension Activity:
  - Wetland Jeopardy

MATERIALS

- Map of Nebraska habitats
- Amazing Adaptations worksheet
- Computer access for research in the classroom or library
- Jeopardy Challenge Google Slides

INTRODUCTIONS

Wetlands are unique aquatic ecosystems in Nebraska. The diverse species that live there have incredible methods for survival. These adaptations can be physical (on their bodies) or behavioral (how they act). Often, these are tied closely together. For this lesson we're taking a closer look at the species that have adaptations to engineer structures that allow them to survive in a very unique habitat - wetlands!

OBJECTIVES

This lesson was designed to be used in partnership with the video "Wetland Animal Engineers". The video and lesson will allow students to better understand that some Nebraska species can address their environmental challenges well by engineering a home or shelter that will meet their needs.

<u>As a result of this lesson:</u>

- Students will understand that Nebraska has diverse and changing habitats, including wetlands.
- Students will know that certain animals have physical and behavioral adaptations that allow them to survive in Nebraska's wetlands.

BACKGROUND INFORMATION

What is a Wetland?

How do we define wetlands? This type of habitat is made unique by three key characteristics:

1. **Vegetation - water loving plants adapted to growing in highly saturated conditions grow here**
2. **Hydric soils - soils found here have developed under saturated conditions that limit oxygen (anaerobic conditions), they often carry a rotten egg smell**
3. **Hydrology - wetlands are saturated by water at some time during the growing season (the time when plants are actively growing)**

Wetlands in Nebraska include marshes, lakes, river and stream backwaters, oxbows, wet meadows, fens, forested swamps, and seep areas. These wetlands vary greatly in nature and appearance due to physical features such as geographic location, water source, water permanence, and chemical properties. At some points during the year we may find that some wetlands are bone dry while others always contain some amount of water. There are instances where we may come back after a steady rain and the wetland will be filled to the brim with water. Some wetlands receive their water from groundwater aquifers while others are totally dependent on precipitation and runoff. And finally, the water chemistry of wetlands ranges from fresh to saline (salty), and from acidic to basic. These descriptions identify the extremes of wetland characteristics. Nebraska's wetland resources possess these extremes and virtually every combination in between.

The vegetation, soils, and water that make up a wetland provide habitat for our native species. The wildlife that depend on these habitats for survival often face challenges due to living in such a dynamic environment. Many of these organisms have incredible adaptations that allow them to act as engineers, changing their environment to fit their needs. Using special structures on their body, they construct incredible feats of engineering. From nests above water and below, to dens, lodges, webs and casings, a wide variety of species are capable of making these fascinating changes to their wetland environment in order to meet their needs and survive.

Begin by watching the video Wetland Animal Engineers found at:

https://youtu.be/rFU21Or_jEo
or scan the QR code

SCAN ME

Types of Engineering in Wetlands

Nests

Several wetland species in Nebraska build nests in order to create a safe space to raise their offspring and survive. But not all of these nests are created in the same way! Birds are a great example of these types of nest-building engineers found living in wetlands and their nests can look very different. Some birds build directly on the ground like swans, geese, killdeer and avocets. Yellow-headed Blackbirds, Red-winged Blackbirds and Marsh Wrens are mid-height weavers, interlacing strips of plants together to create a cup-like nest in the cattails and sedges growing on the edges of the water. Moving into the trees we find the acrobatic Baltimore Oriole who weaves fibers into a sock-like pouch while the Great Blue Heron gathers in groups at the treetops building their nests out of sticks and dried grasses. The methods of building each nest differ, but for most the function is the same. To provide a protected home in which to raise young and continue their life cycle. Did you know that birds aren't the only ones building nests? Take a dip under the water's surface and you'll find that some fish species like the Bluegill will carve out a nest in the sandy bottom of a lake or pond. After the eggs are laid, the males will protect them until they are ready to hatch.

Dens and Lodges

When we imagine an animal engineer, it's nearly impossible not to think of beavers. We have lots of them here in Nebraska, and they are capable of drastically changing the environment in order to meet their needs. Whether they are building a dam to stop or slow water, a lodge to live in, or even a den in the bank of a wetland - these mammals sure know how to design a variety of natural architecture. Beavers are incredibly skilled wetland engineers, and there are others too!

Smaller with a rat-like tail, the Muskrat is also a common mammal found in wetlands engineering mound-like lodges and dens all around the water's edge. Other species like ducks, geese, and swans can also use these mounds to grab a better vantage point, and may even build their own nest upon them! Of course, we can't leave out the American river otter, another member of the den engineering team. They like to grab a hollow space under tree roots or claim an abandoned den, which they alter to fit their needs and can access from under the water for extra security.

Types of Engineering in Wetlands

Dens and Lodges Continued...

There's even a miniscule den-digging organism called the salt creek tiger beetle that has earned its place as an engineer. This endangered insect relies on Saline wetlands near Lincoln, Nebraska to complete its life cycle. The larvae burrow underground, spending around two years growing there until they are ready to emerge as an adult beetle.

Species digging dens and building lodges in these ways can dramatically impact the environment at large, while smaller tunneling can affect the micro-habitats that exist within the larger habitat. From mammal to insect, each species is altering their environments to meet their needs and live well in their ever-changing surroundings.

Webs and Cases

Often small and overlooked, insects are incredible engineers that make alterations to their environment in order to survive. One such insect is the caddisfly larvae. While this insect ultimately grows into a winged, moth-like adult insect, they actually begin their life cycle underneath the water as a worm-like larva. Being in such a vulnerable state, the caddisfly larva can become easy prey for fish and other aquatic insects. To avoid becoming a snack, the caddisfly actually builds a casing around its body made out of sand particles, gravel, bits of wood and even plants. Whatever can be found in the underwater environment is taken by the caddisfly and built up around its fragile body to become a case that acts as both camouflage and protection. Amazing!

Additionally, an arachnid often found engineering in wetlands is the long-jawed orb weaver. This spider uses its strong silk to weave a circular web, perfect for trapping winged insects. Webs built on the edges of wetlands like this are an ingenious way of capturing insects commonly found flying nearby.

Ethan Freese / Platte Basin Timelapse

ACTIVITY PROCEDURES

Warm Up Activity:
Habitat Discussion (15 minutes)

Setting: Indoors

1. Lead a discussion among students regarding the habitats found in Nebraska. This can be done in partners with questions written on the board, or as a whole group.
    - What types of habitats do we find in Nebraska?
        - Check out the eco-region map included in this lesson if you're unsure.
    - The map is a great place to start, but students are likely more familiar with the following:
        - Forests
        - Rivers
        - Wetlands
        - Prairie
    - What makes Nebraska's habitats unique from other states?
    - How have Nebraska's habitats changed over time? Who has changed them?
    - What wildlife are commonly found in Nebraska? Why do you think they are common?
    - Do you have a favorite habitat in Nebraska? Why?

Main Activity:
Amazing Adaptations (20-40 minutes)

Setting: Indoors or outdoors

1. Many animal species in Nebraska's wetlands have unique adaptations that allow them to survive! Some use these adaptations are for engineering a shelter, while others survive by using their adaptations to hunt or behave in a unique way. In this warm up activity, we'll take a look at several of the species mentioned in the video plus others, and work to identify the types of adaptations these animals have that allow them to survive in a wetland habitat.
2. Adaptations can either be physical or behavioral.
    - Physical adaptations tend to be the structures on an animal's body that allow them unique advantages for survival. They can be seen or touched.
    - Behavioral adaptations relate to how an animal uniquely acts in order to survive. They are patterns or what an animal will do, often in relation to the physical adaptation they are equipped with.

Ethan Freese / Platte Basin Timelapse

ACTIVITY PROCEDURES CONTINUED

- Go over these definitions with students before moving on to ensure they understand the difference between a physical and behavioral adaptation. Point out that often, the two are tied closely together.
  - Ex. - A beaver has specially adapted teeth in order to chew, build, and even eat. The teeth are something physical. Do beavers have special behaviors that the teeth allow them to do? Yes! Beavers can chew much tougher materials, drag and haul them, stack them, and build with these specialized teeth. This is a unique adaptation that beavers have in order to survive well in a wetland!

3. Before the lesson, print out the worksheet titled Amazing Adaptations. There are six different sheets with three types of Nebraska animals on each sheet. The goal is for students to evaluate the animals they have on their worksheet and determine what physical and behavioral adaptations that species has. Then, they should circle the types of habitat they think it lives in.
   - While species may pass through other habitats listed, we're looking for the habitats that the species would truly live in.
4. Check out this example of what students will see on the worksheet:

5. Determine how you would like students to work on this. It could be an individual activity, or students could work in pairs or small groups.
   - Students can work on just three animals - a one-sided worksheet, or you can print double-sided for students to complete this activity for six species.
6. Students should work to come up with at least one item for each column - physical and behavioral adaptations.
   - Physical adaptations tend to be easier to come up with since they are easily seen. It's okay if there are more listed in that column than under behavioral adaptations.
   - If you'd like, this activity could go deeper and become a research activity. Students can browse the internet to learn more about the species and better fill in the worksheet.


Dakota Altman / Platte Basin Timelapse

ACTIVITY PROCEDURES CONTINUED

7. A completed sheet will look similar to this:

   - Please note that student answers are not restricted to the answers that can be found on the answer key. There may be other adaptations that were not included. They may even have an argument for habitats.
8. If you are keeping this a simple warm up activity, give students 10-15 minutes to work on their answers and do the best they can.
   - If you are approaching this as a research activity, provide closer to 30 minutes and computer time for students to gather the answers they need.
9. Once complete, reconvene as a class to discuss the various species and their adaptations that students were challenged by.

Wrap Up:
Discussion Questions (5-10 minutes)

1. Review physical and behavioral adaptations if it feels needed. Call on a few students to explain each one.
2. Do students think that all animal species from the activity were engineers? Why or why not?
3. Were there animals that students were not familiar with? What were they?
4. Did students learn anything new about the species on their worksheet?
5. How do students think their species would react to a major change in that species' environment? (flooding, fire, etc.)

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ACTIVITY PROCEDURES CONTINUED

Extension Activity:
Wetland Animal Engineers Jeopardy Challenge (45-60 minutes)

Setting: Indoors

1. Using the attached google slides link, play jeopardy with students and test their knowledge!
   a. Wetland Animal Engineers Jeopardy Challenge
2. If you can, print out the jeopardy grid slide or transfer it onto a white board in order to cross off the categories as they are chosen.
3. Split students into two teams and have them come up with a team name.
4. Determine which team will go first. Each team should have a designated member who will answer the question for the whole team. No shouting out answers until the team has discussed!
5. If Team 1 doesn't answer the question correctly, it goes to Team 2 for a try.
   a. If Team 2 answers correctly, they get the points AND they choose the next question from the jeopardy board.
   b. If they answer wrong, no one gets the points, and it is still Team 2's turn.
6. Track each teams' points as you play, checking in a few times throughout so they know where they are at. At the end you may declare a winner.
7. Remind students that this is a fun way to review what we have learned about animal engineers and Nebraska's wetlands.
8. Reward them all with time outside!

Check out the Entire Wetlands of Nebraska Project:
Take a deep dive into Nebraska's best wetlands resources, including expanded website content, documentaries featuring Nebraska's five main wetland types, printed guides and more!
Find it at www.nebraskawetlands.com, or scan the QR code.

SCAN ME

WETLANDS of nebraska

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Nebraska Game and Parks Commission, 2023

Contact:
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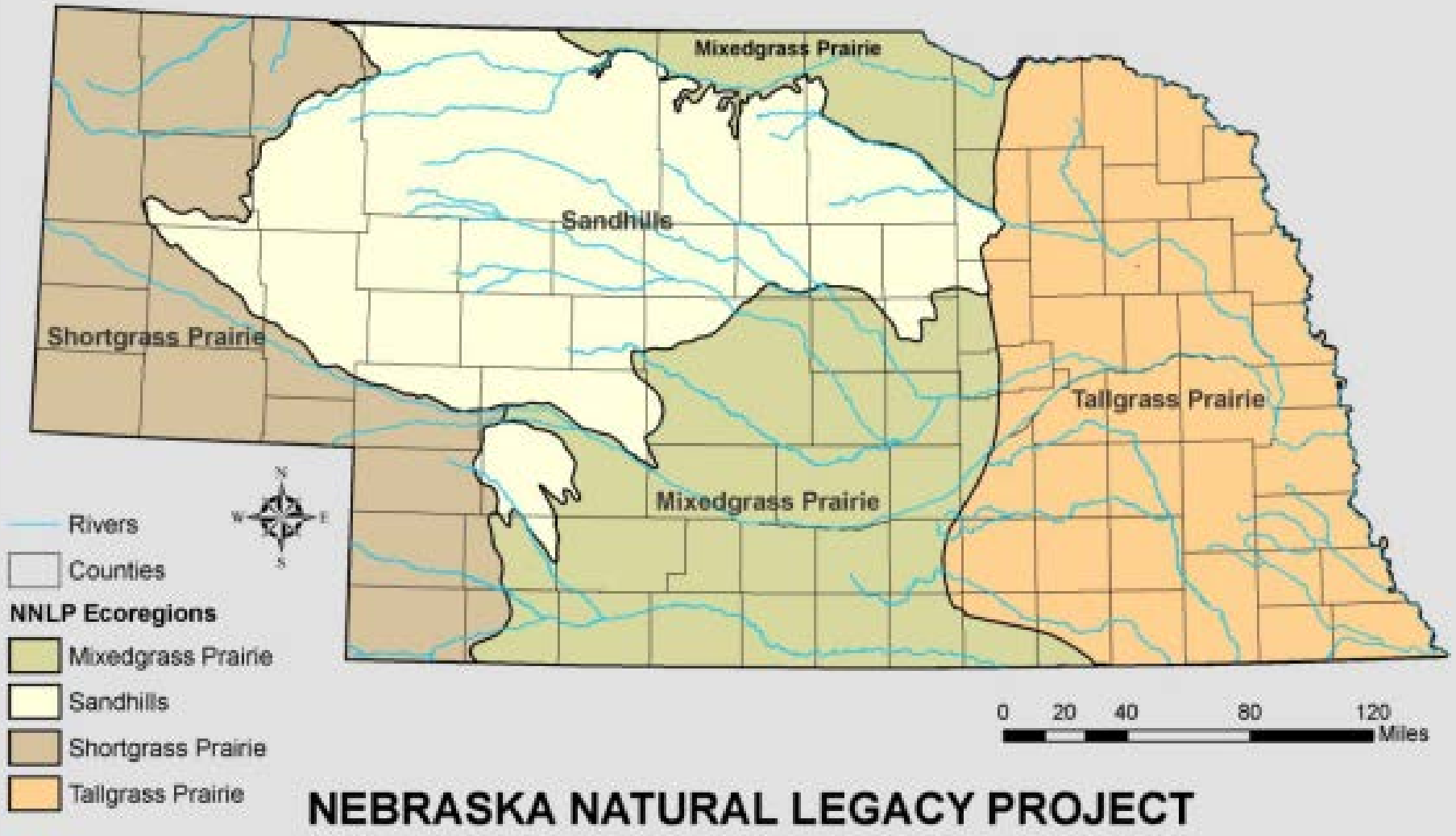
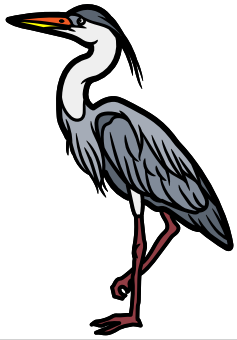
ECOREGIONS OF NEBRASKA

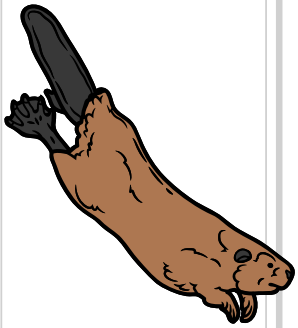


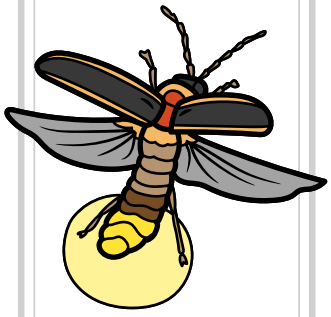
NEBRASKA NATURAL LEGACY PROJECT

AMAZING ADAPTATIONS

NEBRASKA SPECIES

GREAT BLUE HERON	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

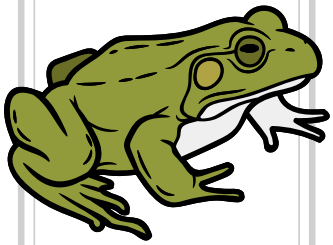
BEAVER	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

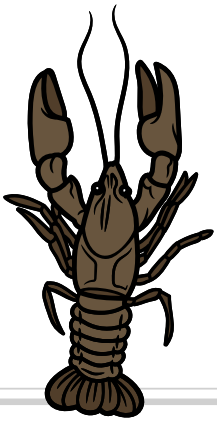
LIGHTNING BUG	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

OSPREY	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

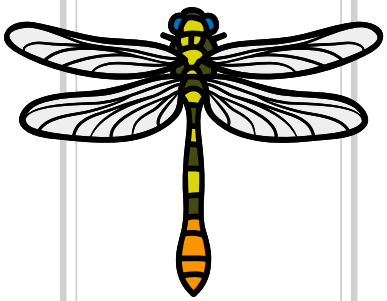
BULLFROG	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

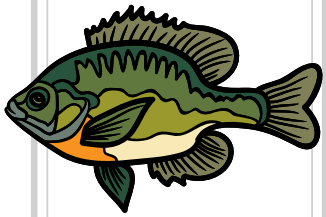
CRAYFISH	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

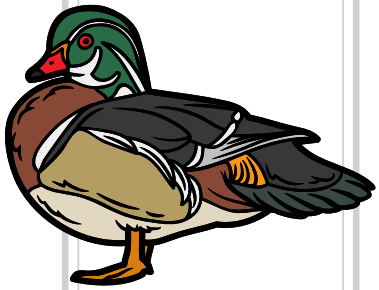
RED-WINGED BLACKBIRD	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

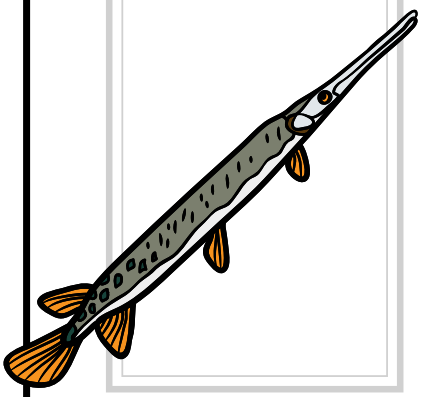
DRAGONFLY	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

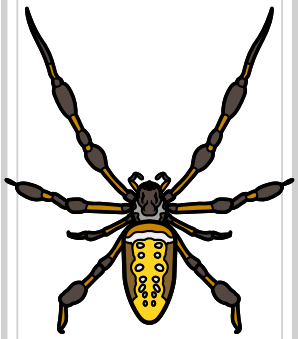
BLUEGILL	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

WOOD DUCK	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

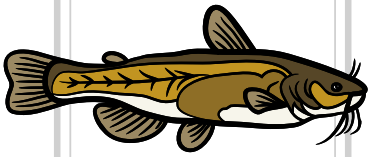
GAR	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

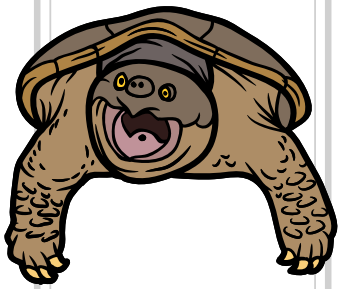
ORB WEAVER	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

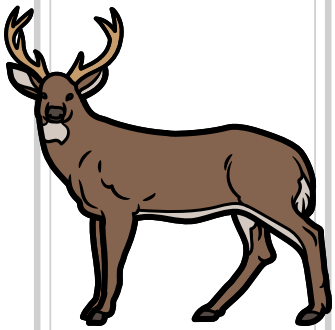
STRIPED SKUNK	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

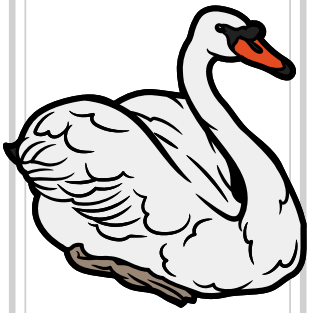
CATFISH	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

SNAPPING TURTLE	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

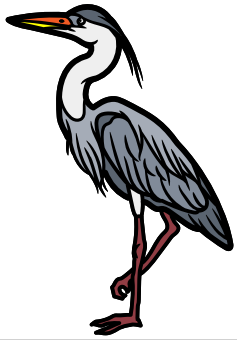
WHITE TAILED DEER	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

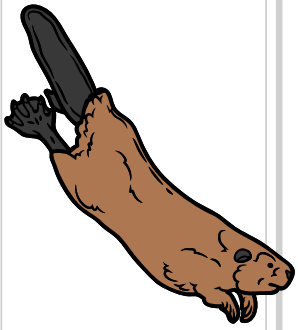
TRUMPETER SWAN	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

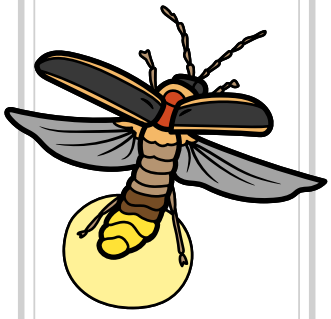
BIG BROWN BAT	PHYSICAL	BEHAVIORAL	HABITAT TYPES
			wetland river forest prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

GREAT BLUE HERON	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	long legs long, sharp beak good eye sight	stalking prey catching prey hunting	wetland river forest prairie

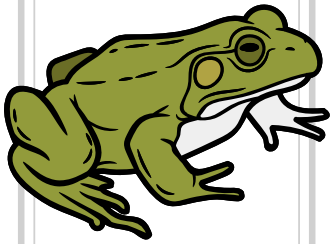
BEAVER	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	webbed feet long hard teeth large flat tail	swimming chewing and building swimming and warning	wetland river forest prairie

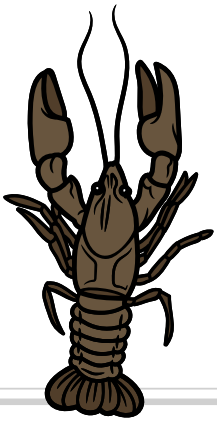
LIGHTNING BUG	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	glowing tail, also called bioluminescence	changes pattern or brightness of flashes to attract a mate	wetland river forest prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

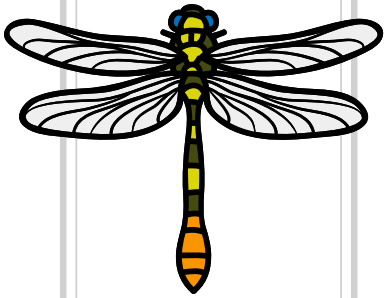
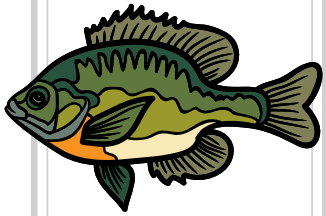
OSPREY	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	sharp talons	catching fish	wetland
	amazing eyesight	hunting fish	river
	wings	flying and diving	forest
	sharp beak	eating fish	prairie

BULLFROG	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	webbed feet	swimming	wetland
	big eyes	hunting	river
	tongue	catching prey	forest
	big mouth	swallowing large prey	prairie

CRAYFISH	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	claws	defending	wetland
	antennae	finding food or predators	river
	fan-like tail	swimming away quickly	forest
			prairie

AMAZING ADAPTATIONS

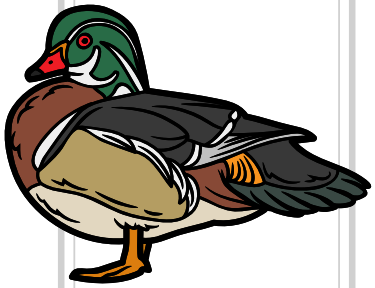
NEBRASKA SPECIES

	PHYSICAL	BEHAVIORAL	HABITAT TYPES
RED-WINGED BLACKBIRD 	wings red feathers (male) Brown feathers (female)	flying attract a mate hide from predators	wetland river forest prairie
DRAGONFLY 	large eyes wings	hunting for insects flying and hunting	wetland river forest prairie
BLUEGILL 	green colors sharp spiny fins narrow body	camouflage protection from predators swimming fast	wetland river forest prairie

AMAZING ADAPTATIONS

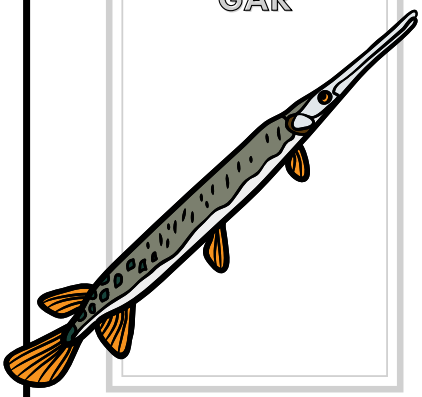
NEBRASKA SPECIES

WOOD DUCK



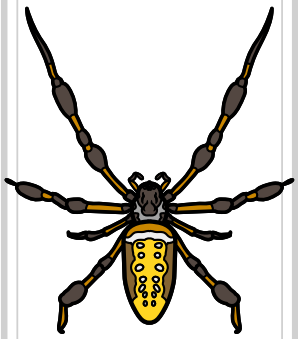
PHYSICAL	BEHAVIORAL	HABITAT TYPES
colorful feathers (male)	attracting a mate	wetland
webbed feet	swimming	river
rounded beak	straining foods	forest
		prairie

LONGNOSE GAR



PHYSICAL	BEHAVIORAL	HABITAT TYPES
tough scales	protection from predators	wetland
long body with spots	blending into the environment	river
long mouth with sharp teeth	grasping prey	forest
		prairie

ORB WEAVER

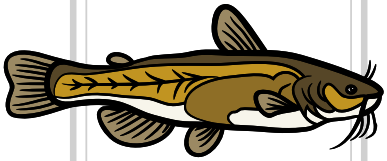


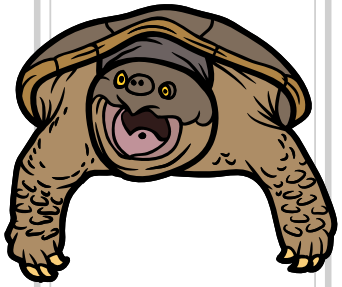
PHYSICAL	BEHAVIORAL	HABITAT TYPES
spinnerets / silk	spin webs to capture prey	wetland
long legs	attach web to surfaces	river
mouth parts	feel and consume prey	forest
		prairie

AMAZING ADAPTATIONS

NEBRASKA SPECIES

STRIPED SKUNK	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	stripe of white smelly spray from musk glands fluffy tail	warning predators defense against predators lifts to warn predators	wetland river forest prairie

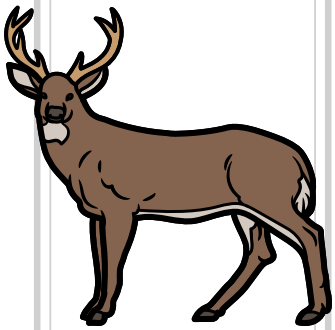
CATFISH	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	whiskers fins gills	sensing and tasting swimming breathing under water	wetland river forest prairie

COMMON SNAPPING TURTLE	PHYSICAL	BEHAVIORAL	HABITAT TYPES
	sharp beak strong shell tough skin long neck	biting and hunting protection protection reaching predators or prey	wetland river forest prairie

AMAZING ADAPTATIONS

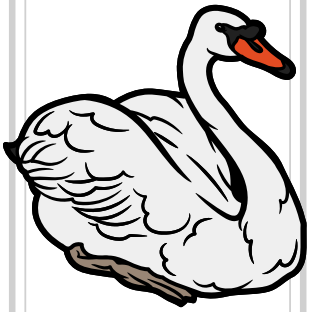
NEBRASKA SPECIES

WHITE TAILED DEER



PHYSICAL	BEHAVIORAL	HABITAT TYPES
antlers (male)	earning a mate	wetland
rotating ears	hearing predators	river
white tail	distracting predators	forest
sensitive nose	smelling predators	prairie

TRUMPETER SWAN



PHYSICAL	BEHAVIORAL	HABITAT TYPES
webbed feet	swimming	wetland
large wings	migrating	river
thick feathers	keeping warm	forest
long neck	reaching food under water	prairie

BIG BROWN BAT

PHYSICAL	BEHAVIORAL	HABITAT TYPES
wings	flying and hunting	wetland
teeth	catching insects	river
vocalizations	detecting insects	forest
		prairie