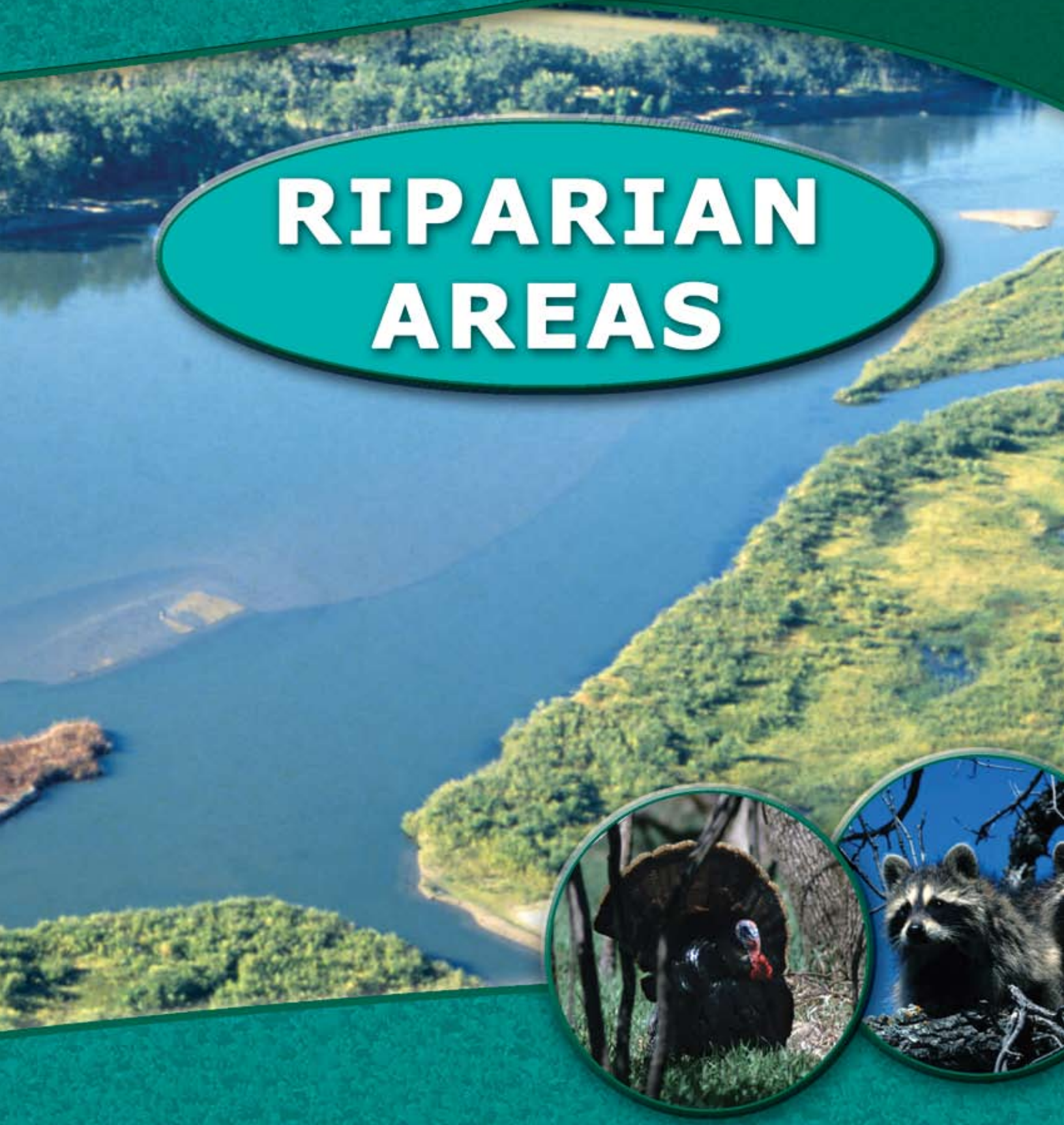
Habitats of North Dakota

RIPARIAN AREAS



By Gwyn Herman and Laverne Johnson

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HABITATS OF NORTH DAKOTA

RIPARIAN AREAS

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About Habitats of North Dakota

Distribution of these **Habitats of North Dakota** units is made possible by the North Dakota Game and Fish Department in collaboration with the North Dakota Center for Distance Education.

The information presented in **Habitats of North Dakota** seeks to promote teaching and learning about the wildlife and conservation topics of North Dakota. Five separate units have been developed to discuss the habitats. They are ***Wetlands***, ***Prairie***, ***Badlands***, ***Woodlands***, and ***Riparian Areas***.

The **Habitats of North Dakota** units have been produced, published, and distributed by the North Dakota Center for Distance Education.

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Dr. Gwyn Herman and Ms. Laverne Johnson were born and raised in rural North Dakota, and both have a deep love for their home state. They are educators who have over 60 years of combined teaching experience at all grade levels, including the teaching of North Dakota Studies to both fourth and eighth grade students.

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Gwyn Herman (left) and Laverne Johnson (right)

Welcome

Welcome to the study of *Riparian Areas* of North Dakota! This book is filled with interesting and useful information about the riparian areas of North Dakota—what they are, where they are located, which animals and plants call these areas their homes, the importance of riparian areas to water quality and flood control, how riparian areas are threatened, and why they must be preserved and protected for future generations. Through reading and engaging in a variety of activities that accompany this text, you will find yourself on a dynamic and educational journey. **Read on....**

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Wildlife Habitats and Conservation History by Chris Grondahl, Wildlife Biologist

Wildlife has long been an important part of the North Dakota prairies. American Indians depended on this abundant resource for their food, clothing, and shelter for thousands of years before Euro-Americans arrived in the area.

In European countries, wildlife resources were scarce. The only people who were allowed to hunt in Europe were wealthy landowners and members of royal families.

In the 1800s, Euro-Americans immigrated to North Dakota. The earliest settlers depended on hunting and trapping game animals to help feed their families and make a living. At the same time, market hunting for these wildlife resources began.

Market hunters killed large numbers of wildlife for furs and feathers, which they sold to people in the clothing industry on the East Coast and in Europe. They also sold meat to restaurants.

No laws existed to protect wildlife in North Dakota in those early years. Populations of wildlife such as the white-tailed deer, bighorn sheep, elk, and pronghorn decreased to very low numbers.

In 1883, Theodore Roosevelt came from New York to the Badlands of northern Dakota Territory to hunt. He liked the area so much that he bought two ranches in the Badlands and spent summers enjoying the wildlife and wide-open spaces of North Dakota.

Theodore Roosevelt's adventures in a land of wildlife and open spaces inspired his interest in wildlife conservation. Conservation is defined as caring for, managing, and protecting natural resources, including wildlife. When Theodore Roosevelt became President of the United States in the early 1900s, one of his major goals was to preserve and protect these natural resources. He set aside 230 million acres of land throughout the United States in the form of national parks, national forests, and other areas for conservation and public use. Other conservationists during this time realized the importance of protecting habitat and wildlife and developed plans to manage these resources.

During the 1900s, laws were passed to protect wildlife. In 1930, the North Dakota Game and Fish Department was created. Its purpose was to manage the state's wildlife resources for public enjoyment. Hunting was an important part of this management plan.

In order to pay for managing wildlife conservation, the U.S. government began collecting a special tax on hunting equipment such as guns and bullets. The money collected was given to state wildlife agencies for wildlife and conservation programs. A similar system was also adopted to fund fisheries programs. In this way, the group that uses and enjoys the resource pays for its management.

The state Game and Fish Department has used these funds along with money collected from sales of hunting and fishing licenses to purchase tracts of land that could be used by hunters and anglers. These public areas are called "Wildlife Management Areas," or WMAs. Public lands that were purchased by the federal government included National Grasslands, waterfowl production areas, and wildlife refuges. These lands were purchased for the public, not only for protecting habitats for wildlife, but also for providing places for people to enjoy all kinds of outdoor recreation. Habitat (food, water, shelter, and space) is the key to sustaining healthy wildlife populations, and quality habitats have been created and preserved by individuals, conservation organizations, and governments.

An example of a very important habitat development for wildlife in North Dakota is a program called the "Conservation Reserve Program" (CRP). CRP was established by the U.S. government and farmers to plant grass on some less fertile land that had been plowed for crop-raising. For 10 to 20 years, these grass habitats have replaced low production farm ground. CRP has increased populations of wildlife such as white-tailed deer, pheasants, ducks, and nongame species.

Figure 1. Teddy Roosevelt traveled to North Dakota over 100 years ago. Here, he learned to enjoy and appreciate the wide open spaces and the importance of hunting and conservation. *(State Historical Society of North Dakota, 0410-127)*

The "North American Model of Wildlife Conservation" was developed as a result of all the effort wildlife conservationists put forth in the last 100 years to create good wildlife habitat and keep wildlife available for everyone to use. This model promotes equal access to wildlife for everyone and is in contrast to the European model in which wildlife was controlled and used only by wealthy people.

Just like what happened 100 years ago when some people sold wildlife for personal profit, there are commercial interests doing that today. The public owns the wildlife in North America. Our North American wildlife conservation system has been extremely successful. Activities that prevent access to wildlife by the public destroy the framework of this system. The more that people of all ages understand the importance of the North American model, the better chance present and future generations will have of enjoying this great American resource.

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RIPARIAN AREAS

Which of the following has something to do with Riparian Areas of North Dakota?

- A Heart made of water
- A Tobacco Garden
- A Goose without feathers
- A Turtle without a shell
- A Forest with no trees
- A river that is Red
- A 100-pound fish
- A fish with no bones
- An animal with no eyes and no mouth
- An animal with only one foot
- A pig toe not on a pig

So which of the choices above has something to do with Riparian Areas of North Dakota? **Answer: All of them!**

Introduction

A **stream** is a body of running water within a channel, which flows downhill by the force of gravity. A **riparian** (rih-PAIR-ee-uhn; ry-PAIR-ee-uhn) **area**, or riparian zone, is the area of vegetation (plant life) that borders and is influenced by a stream. The root word of "riparian" is a Latin word meaning "bank of a river." A **river** is a natural stream of water that empties into an ocean, a lake, or another stream. A small, shallow stream is called a **creek**.

Watersheds

Water is a **renewable resource**, which means it is a resource that can be used but does not get used up. The earth is always being supplied with fresh water through the never-ending water cycle.

Figure 2. The Turtle River is a small river in northeastern North Dakota and is typical of many of our small rivers and streams. Other than spring melt and rain events, water flows are fairly slow. The water temperatures are warmer than they are in streams and rivers in western states; therefore, this makes them very productive for all kinds of life. The riparian zone consisting of trees, grasses, and shrubs add significantly to this diversity.

Figure 3. Wetlands are filled by melting snow and springtime rain. Some water held in wetlands seeps into the ground to fill the aquifers. The slow seepage of water from wetlands through the soil and decayed vegetation purifies the water found in aquifers. Aquifers provide water to cities and farms for human use, irrigation, and watering livestock.

In the water cycle, energy from the sun heats water on the earth. As the water is heated, it evaporates, or rises into the air in the form of water vapor. When the water vapor mixes with the cool air, it forms tiny droplets of water, which collect to form clouds. This water in the clouds then falls back to the earth as precipitation (rain, snow, sleet, hail).

Water runs downhill by the force of gravity; therefore, the precipitation that falls on land drains to the lowest part of the land. The higher land sheds (removes) the water, which then runs downhill to the lowest point. A **watershed** is an area of land that drains downward to the lowest point.

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Goodman Creek is a small stream that drains a couple of townships near Golden Valley in Mercer County. It flows southward until it drains into the larger Spring Creek. **Spring Creek** drains parts of Dunn County and Mercer County and flows into the larger Knife River southwest of Beulah. The **Knife River** drains parts of six counties and joins with the much larger Missouri River at Stanton. The **Missouri River** flows south-eastward, draining about one-sixth of the continental United States. At St. Louis, Missouri, the Missouri River flows into the Mississippi River. The **Mississippi River** continues flowing south until it drains into the **Gulf of Mexico**, which is part of the **Atlantic Ocean**.

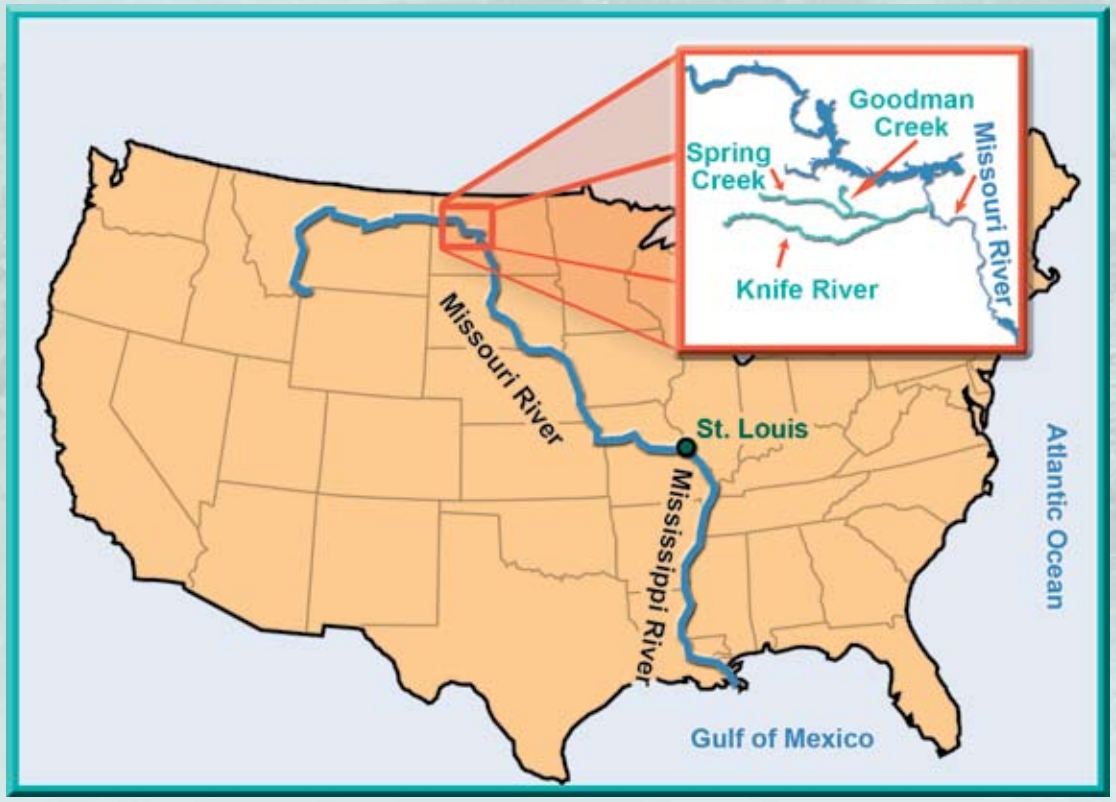

Figure 4. Water that falls in the form of rain or that melts in the spring from the existing snow cover, has to travel somewhere if it is not absorbed into the ground. Water begins a long journey toward the ocean right here in North Dakota in small creeks that are dry many months of the year. These small tributaries feed larger creeks and streams, which eventually reach the Missouri River. The Missouri River continues carrying the water south. *(Graphic by Cassie Theurer)*

Continental Divide

There is a special kind of watershed called a "continental divide." A **continental divide** is a ridge that separates river systems so that they flow to different oceans. The largest and best-known continental divide in North America is the **Great Divide**, located at the crest (top) of the Rocky Mountains. This is an **east-west** continental divide. On the east side of the Great Divide, the rivers all flow to the Atlantic Ocean, and on the west side the rivers flow to the Pacific Ocean.

A **north-south** continental divide runs through North Dakota. It is called the **Northern Divide**. Many people think that a continental divide must be located in mountains, or at least on high ground, but this is not true. The position of North Dakota's continental divide is on fairly level land, and it looks no different from the rest of the landscape. Nevertheless, the rivers located on either side of this line will never join each other, and the water in each of these rivers will end up on opposite sides of the continent.

The waters to the south and west of the Northern Divide flow into the Gulf of Mexico, and the waters to the north and east of it flow into Hudson Bay in Canada. The Gulf of Mexico is part of the Atlantic Ocean; Hudson Bay is part of the Arctic Ocean.

Rivers such as the James and Sheyenne are separated by only a few miles in some places. Because of the Northern Divide, however, their waters will never mingle and finally will end up about 3,000 miles apart.

Streams and rivers carry the water to lower points as small watersheds join to become larger watersheds. The largest watersheds on the continent are called **river basins**. River basins are drained by river systems. A **river system** is made up of all of the streams and rivers that drain a river basin. Because oceans are at the extreme lowest points of river basins, the final destination of all river systems is an ocean.

North Dakota has three river systems: (1) the Missouri River with its tributaries, (2) the Red River with its tributaries, and (3) the Mouse, or Souris, River with its tributaries. A **tributary** is a river that flows into another river; for example, the Knife River is a tributary of the Missouri River.

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Figure 5. All water in North America flows in a pre-determined pattern when it hits the ground. The Northern Divide is a line running through North Dakota. It determines the direction of the water flow from melting snow and rain. Water on the north and east sides of the Northern Divide flows toward Hudson Bay in Canada. Water on the south and west sides of the Northern Divide drains toward the Gulf of Mexico. Water in North Dakota finds its final resting place either in Hudson Bay or the Gulf of Mexico. *(Graphic by Cassie Theurer)*

Comprehension

1. Where did the word "riparian" come from?

2. How is the earth always being supplied with fresh water?

3. Where is the Great Divide located? What two oceans does it divide?

4. Which continental divide runs through North Dakota? What two oceans does it divide?

5. What drains river basins?

6. What is at the extreme lowest point of a river basin? What is the final destination of all river systems?

7. Name the three river systems of North Dakota.

Critical Thinking

1. Someone standing on the Great Divide would see a very different view from what someone standing on the Northern Divide would see. Explain.

2. Pretend you get into a boat on either the James or the Sheyenne River, but you don't know whether it is the James or the Sheyenne. Pretend you float in that boat all the way to the ocean. When you get to the ocean, you know which river you started out on. How do you know?

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River Systems

The largest river in North Dakota and the longest river in the United States is the **Missouri River**. Its headwaters (beginnings) are in the Rocky Mountains in Montana. The natural flow of the river through North Dakota was changed in the 1950s by the building of two dams—the Garrison Dam and the Oahe Dam. A **dam** is a wall built across a river in order to hold back the water.

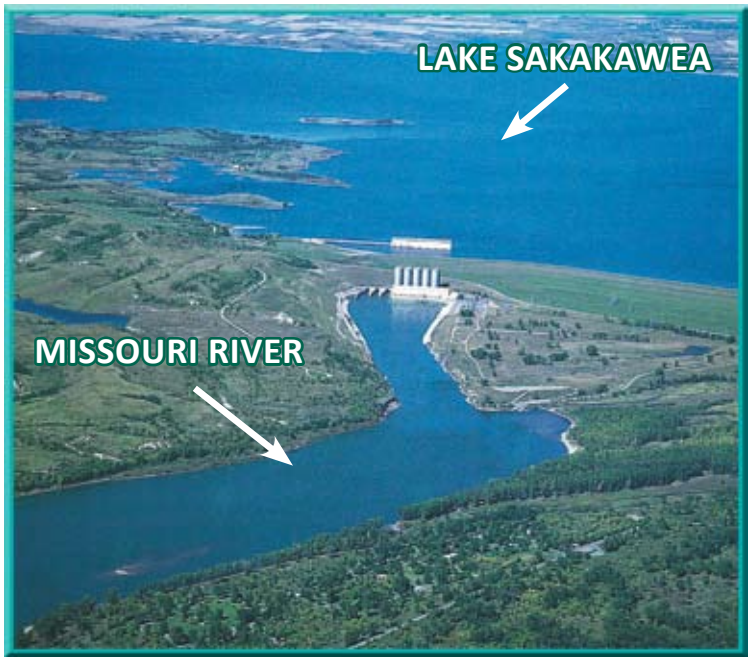

Figure 6. The construction of the Garrison Dam in the mid 1950s covered many acres of prairie and cottonwood forest along the Missouri River. Today, a reservoir takes the place of what was once a large riparian zone.

The water that is held back by a dam forms a lake that is called a **reservoir**. The reservoir formed by the building of the Garrison Dam is **Lake Sakakawea**. This artificial (not natural) lake is almost 200 miles long and ranges from 1 to 14 miles wide. The main part of the lake is from 70 to 175 feet deep, and the shoreline going around the lake is over 1,500 miles long. **Lake Oahe**, in the southern part of the state, is the reservoir that was created when the Oahe Dam was built on the Missouri River in South Dakota.

Figure 7. The Missouri River is the largest river in North Dakota. It has a variety of tributaries which collect water from smaller creeks and streams located in local watersheds. *(Graphic by Cassie Theurer)*

After leaving North Dakota, the Missouri River flows south-eastward through South Dakota and along the borders of Nebraska and Iowa. It joins the Mississippi River at St. Louis, Missouri.

The Missouri River system in North Dakota includes many tributaries. Among them are the James, Yellowstone, Little Missouri, Knife, Heart, and Cannonball Rivers, as well as Cedar Creek, Little Muddy Creek, and Tobacco Garden Creek.

Figure 8. The Red River travels more than 500 miles and creates the natural boundary between the states of North Dakota and Minnesota. This photo of the Red River, near Fargo, shows a lush riparian forested area that provides recreational opportunities for people and wildlife habitat for many species of mammals, reptiles, amphibians, and birds. *(Courtesy of Neil Howe)*

Figure 9. The Red River is the second largest river in North Dakota. It is unique because it flows north (opposite direction of the Missouri River) and has hundreds of small bends and curves. The health of our water system really is an international issue because water that drains into this river flows into Lake Winnipeg in Canada and eventually into Hudson Bay. *(Graphic by Cassie Theurer)*

The source (beginning) of the **James River** is in Wells County. This river flows east to New Rockford and then south to Jamestown. After passing through the Jamestown Reservoir, created by the Jamestown Dam, it is joined by a tributary called "Pipestem Creek." The James River continues its southward flow into South Dakota. Near Yankton in southeastern South Dakota, the James River empties into the Missouri River.

The **Red River** forms the second-largest river system of North Dakota. At Wahpeton, the Bois de Sioux (boy- dah-Soo) and Ottertail Rivers join to form the headwaters of the Red River. The Red River separates North Dakota from Minnesota as it flows northward from Wahpeton.

On a map, the Red River looks almost like a straight line, but actually, it has been called the "'crookedest' river in the world" because it has so many small curves and bends in it. This river is sometimes called the

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"Red River of the North" because there is another Red River that is located in the southern part of the United States.

The Red River continues flowing north into Manitoba where it empties into Lake Winnipeg. The waters of Lake Winnipeg are carried by the Nelson River to Hudson Bay.

In North Dakota, the **Sheyenne River** is the largest tributary of the Red River and the longest tributary in North Dakota. Other tributaries of the Red River in the state include the Wild Rice, Maple, Rush, Elm, Goose, Turtle, Forest, Park, and Pembina Rivers.

The **Souris** (Sir-us) **River** begins in eastern Saskatchewan and flows south into North Dakota. It then makes a loop and heads back north into Canada again. Near Brandon, Manitoba, the Souris River joins the Assiniboine (ah-Sin-ah-boin)

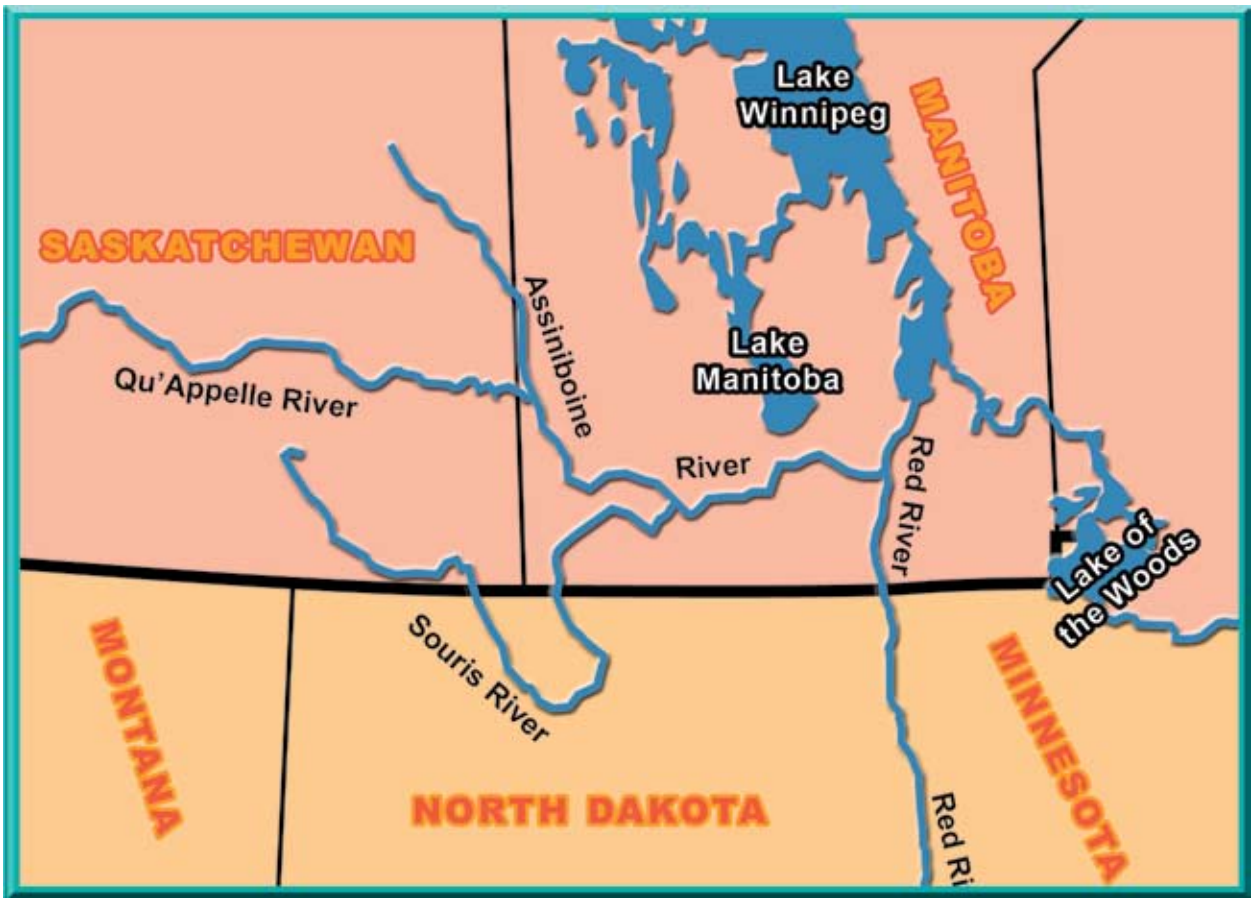

Figure 10. The Souris River, which flows through Minot, originates in Saskatchewan. It then flows into North Dakota and then back to Canada where it meets with the Assiniboine River before flowing into the Red River. *(Graphic by Cassie Theurer)*

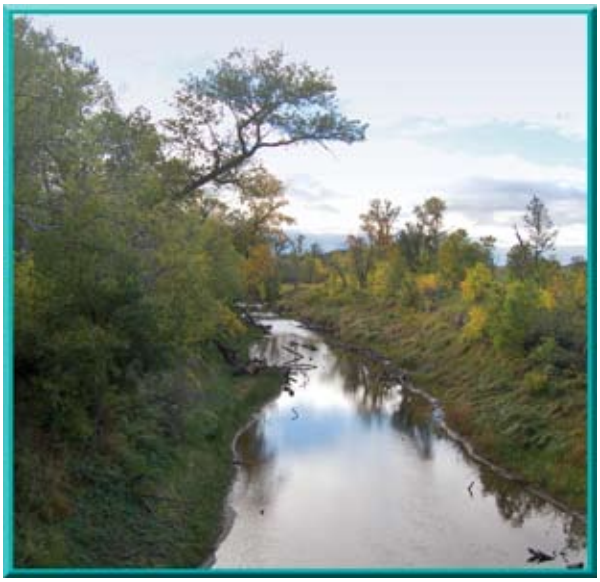

Figure 11. The Souris River is a relatively small river. The riparian zone is important for wildlife and fish. The Souris River is also known as the Mouse River. A dam on the Souris River north of Minot forms the reservoir known as Lake Darling.

River. The Assiniboine River joins the Red River at "The Forks" in Winnipeg, Manitoba. The French word "souris" means "mouse." In North Dakota, the Souris River is also called the **Mouse River**.

Riparian Zones

Riparian zones in North Dakota are generally made up of a variety of trees, shrubs, grasses, and forbs. **Forbs** are native wildflowers with deep roots. The width of riparian zones varies. Along a small creek, the riparian zone might be only 5 to 10 feet on each side of the channel, whereas a large river might have a riparian zone of ¼ mile or more on each side.

Forest ecosystems are commonly part of the riparian zones of large rivers. An **ecosystem** is an area that contains organisms (living things) interacting with one another and with their non-living environment. **Forest ecosystems** consist of trees and other vegetation (plants), wildlife, and non-living things such as soil and water. Many species of birds and other wildlife inhabit riparian forests.

Many of the forests in North Dakota are deciduous forests that are found along rivers in the eastern half of the state. **Deciduous** (de-Sid-jew-us) **trees** are those that lose their leaves each fall. They have larger, wider leaves, and generally have more branches and rounder crowns (tops) than coniferous (koe-Nif-er-us) trees.

Coniferous trees have leaves that are so narrow and sharp that they are called "needles." Because the needles stay green all year long, coniferous trees are often referred to as "evergreens." Coniferous trees are not common in riparian zones. Less than 6 percent of the forested land in North Dakota is made up of coniferous trees.

In riparian forests, the tree species closest to the edge of the water is generally the **willow** tree. Deciduous riparian forests along the Red River, Sheyenne River, and

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Figure 12. Sheyenne River Valley near Valley City. Ash, oak, elm, and box elder trees are common along the river corridors of North Dakota. The riparian areas formed by the trees and other vegetation are very important for wildlife, water quality, and beauty.

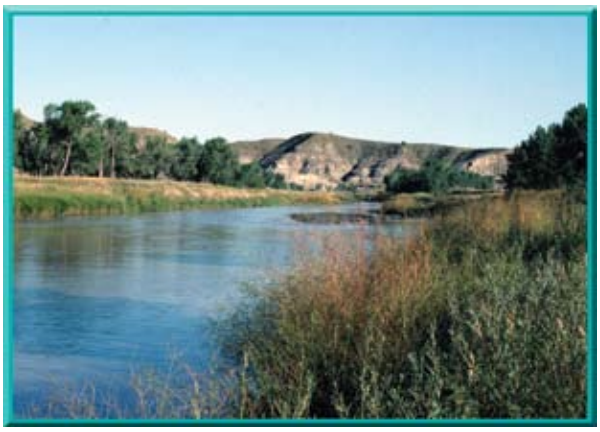

Figure 13. Cottonwood trees are one of the most common tree species along the Little Missouri River in western North Dakota. Other trees such as ash and willow can also be found. This riparian zone is somewhat of an oasis in this otherwise dry climate.

their tributaries are mainly made up of **American elm** and **green ash trees**. Also found in elm-ash forests are **box elder**, **bur oak**, **aspen**, and **ironwood** trees.

Other riparian deciduous forests are found along the James River, particularly between Jamestown and Grand Rapids in LaMoure County, and along the Mouse and Des Lacs Rivers in Ward, McHenry, and Renville Counties.

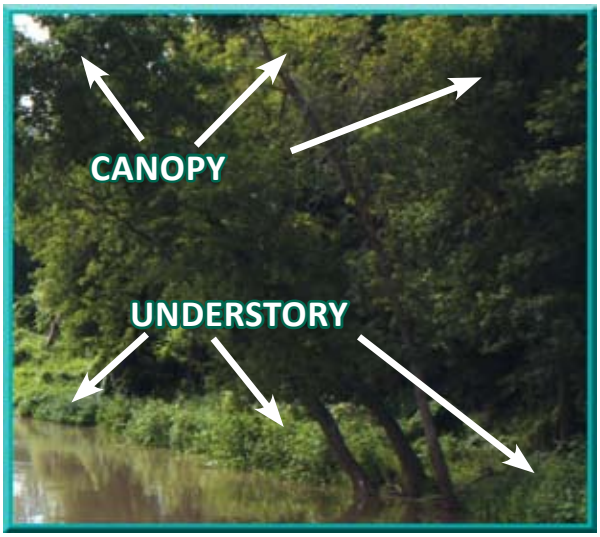

Figure 14. A healthy forest consists of several types and ages of trees. The top layer called the "canopy" creates a shaded and cooler area called the "understory." The understory consists of shorter trees and bushes.

Riparian deciduous forests in the western part of the state occur along the Missouri River and the Little Missouri River. The dominant tree of the western North Dakota riparian forests is **cottonwood**. This fast-growing tree may reach heights of 100 feet. Cottonwood trees require regular flooding in order to grow and reproduce.

The crowns (tops) of the trees form the **canopy**, or roof, of the forest. The layer of vegetation below the canopy is called the **understory**. The understory consists

of smaller trees, shrubs, and **saplings** (young, thin trees). It provides shelter and nesting areas for many species of wildlife.

Among the fruit-bearing shrubs of the understory are **chokecherry**, **juneberry**, **American cranberry**, and **currant**. The berries of these plants furnish food for birds and other wildlife. They are also important for deer, moose, and other animals that browse. **Browsing** refers to animals eating leaves, stems, and buds from plants.

Other types of plants are also part of the understory. **Vines** are plants that twist along the ground or climb up shrubs and trees in order to reach sunlight.

Common vines of riparian areas in North Dakota include woodbine, riverbank grape, and bittersweet. **Woodbine** turns a brilliant red color in the fall. **Riverbank grape** produces clusters of purple fruit that birds like to eat. **Bittersweet** has a fruit that opens into a brilliant orange flower that stays on the vine well into the winter.

Grasses are plants with hollow, non-woody stems and narrow leaves. Forbs are native wildflowers with deep roots. **Non-flowering plants** include mosses and other plants that do not have stems, roots, or leaves. The non-flowering plants often cover rocks, logs, and moist areas of the ground. Each of these types of vegetation is important for specific species of wildlife.

Figure 15. Bittersweet is one of three vines that can be found growing along the ground and climbing shrubs and trees in the riparian forests of the state. The riverbank grape is probably the most important to wildlife such as birds that eat the sweet, purple fruits.

The **forest floor** is a busy place, serving as the home of small mammals and other wildlife, as well as insects and decomposers. **Decomposers** are tiny life forms that feed on dead plants, dead animals, and animal droppings. As the decomposers break down these substances, nutrients are put back into the soil. **Nutrients** are substances that are necessary for living things to grow and maintain life.

Besides forests, riparian zones may include other features such as grasslands and sandbars. Native grasses have tough stems, which allow the grass to remain standing during the winter.

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Figures 16 & 17. Sandbars are a product of the natural processes of bank erosion and sedimentation that occur along a river. Bare sandbars provide habitat for shore birds and waterfowl. They also may be vegetated and provide food and cover for species such as white-tailed deer and pheasant. Backwaters created by sandbars provide rearing areas for fish, amphibians, and turtles. **INSET Sandbars** provide loafing (resting) areas for waterfowl and feeding and nesting areas for shore birds.

This provides shelter for various wildlife species. Native prairie is also needed for ground-nesting birds in the spring.

Some rivers such as the Missouri and Yellowstone Rivers have sandbars. A **sandbar** is an accumulation of sand that was formed by the current, or flowing action, of the water in a river.

Sandbar formation is a natural process of rivers as they cut away sand and soil from riverbanks during times of high water flows. Trying to stabilize or support riverbanks by activities such as rip-rapping with rocks can stop sandbar formation and the natural process of a river. This negatively impacts fish and wildlife.

Sandbars provide critical habitat for shore birds such as the piping plover and least tern. They are also important for ducks, geese, and other waterfowl that use them for nesting areas. Sandbars also grow vegetation such as willows, cottonwood trees, and other plants, which provide good habitat for white-tailed deer and pheasants.

Comprehension

1. What is the largest river in North Dakota and the longest river in the United States?

2. How was the natural flow of the Missouri River through North Dakota changed in the 1950s? Name the one in North Dakota.

3. Where does the Missouri River flow after it leaves North Dakota? What river does it join? Where?

4. Where is the source of the James River? Into what river does it empty? In what state?

5. What is the second-largest river system in North Dakota? Where are its headwaters? In which direction does it flow? What two states does this river separate?

6. What is the largest tributary of the Red River and the longest tributary in North Dakota?

7. Which river begins and ends in Canada but loops into North Dakota? What is another name for this river?

8. What types of vegetation generally make up riparian zones in North Dakota?

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9. What makes up a forest ecosystem?

10. Which tree species usually grows closest to the edge of a river?

11. What is the dominant tree of western North Dakota riparian forests?

12. What makes up the understory of a forest?

13. What do decomposers put back into the soil?

14. Where are sandbars found?

Critical Thinking

1. Through which states on the Missouri River did Lewis and Clark travel before they reached North Dakota? Why was traveling to North Dakota much harder than the return trip home from North Dakota?

2. Why do coniferous trees make better Christmas trees than deciduous trees?

Riparian Areas in a Nutshell

- A riparian area, or riparian zone, is the area of vegetation that borders and is influenced by a stream.
- The earth is always being supplied with fresh water through the never-ending water cycle.
- The Northern Divide is a continental divide running through North Dakota.
- Small watersheds join to become larger watersheds that are drained by river systems.
- An ocean is the final destination of all river systems.
- The three river systems of North Dakota are the following with their tributaries: Missouri River, Red River, and Mouse, or Souris River.
- The Missouri River is the largest river in North Dakota and the longest river in the United States.
- Lake Sakakawea and Lake Oahe are reservoirs created by dams on the Missouri River.
- The Red River flows north from Wahpeton and forms the border between North Dakota and Minnesota.
- The Souris, or Mouse, River begins in Canada, loops into North Dakota, and goes back into Canada.
- Riparian zones may vary from 5 feet to ¼ mile or more on each side of the channel.
- Large rivers commonly have forests as part of their riparian zones.
- Most of North Dakota's forests are deciduous forests in the eastern half of the state.
- The willow tree is usually the tree species closest to the water.
- Cottonwood is the dominant tree of western North Dakota riparian forests.
- Forests consist of a canopy, understory, and forest floor.
- Riparian zones may include features such as grasslands and sandbars.

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Riparian Areas Vocabulary

Browsing:
- Animals eating leaves, stems, and buds from plants

Canopy:
- Roof of the forest
- Formed by crowns of dominant and medium-sized trees

Coniferous trees:
- Trees with needles
- Evergreens

Continental divide:
- A ridge that separates river systems so that they flow to different oceans

Creek:
- A small, shallow stream

Dam:
- A wall built across a river in order to hold back the water

Deciduous trees:
- Trees that lose their leaves each fall

Decomposers:
- Tiny life forms that feed on dead plants, dead animals, and animal droppings

Ecosystem:
- An area that contains organisms (living things) interacting with one another and with their non-living environment

Forbs:
- Native wildflowers with deep roots

Forest ecosystem:
- Trees and other vegetation, wildlife, and non-living things such as soil and water

Grasses:
- Plants with hollow, non-woody stems and narrow leaves

Non-flowering plants:
- Mosses and other plants that do not have stems, roots, or leaves

Northern Divide:
- A north-south continental divide that runs through North Dakota

Nutrients:
- Substances that are necessary for living things to grow and maintain life

Renewable resource:
- A resource that can be used but does not get used up

Reservoir:
- A lake that is formed by the water held back by a dam

Riparian area:
- The area of vegetation that borders and is influenced by a stream
- Also called "riparian zone"

River:
- A natural stream of water that empties into an ocean, a lake, or another stream

River basins:
- The largest watersheds on the continent

River system:
- All of the streams and rivers that drain a river basin

Sandbar:
- A ridge of sand formed by the current of the water in a river

Saplings:
- Thin, young trees

Stream:
- A body of running water within a channel

Tributary:
- A river that flows into another river

Understory:
- Layer of vegetation below the canopy of a forest

Vines:
- Plants that twist along the ground or climb up shrubs and trees in order to reach sunlight

Watershed:
- An area of land that drains downward to the lowest point

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RIPARIAN AREAS WILDLIFE

Riparian Areas Habitats

Rivers, along with their woodland vegetation, provide habitat for significant numbers and kinds of wildlife. The waters are full of fish; and the trees, brush, grasses, and forbs that encourage growth of insects and other aquatic organisms serve as food sources and shelter for fish, amphibians, birds, and other wildlife.

A **habitat** is an environment that provides the food, water, shelter, and space for wildlife to make their homes. River and stream habitats are the most diverse water areas in the state of North Dakota, being home to the largest number of fish species.

Fish

North Dakota is home to nearly 100 different species of fish. Most are native (naturally occurring), but some have been introduced (brought in from somewhere else). Some of the fish species in North Dakota are large, but many of them are small. The minnow family makes up the biggest group of fish in the state.

Several species of gamefish are found in North Dakota. **Gamefish** are generally larger fish that are caught by **anglers**, or people who fish. Fishing is enjoyed by tens of thousands of people in North Dakota. The money taken in by license sales and fishing equipment purchased by anglers is used by the Game and Fish Department to manage fish habitat, stock fish, and create access for anglers.

The **northern pike** is a common species inhabiting North Dakota rivers and streams. Pike have long bodies, pointed

Figure 18. Riparian area vegetation, both terrestrial (land) and aquatic (water), invite the beginning of the cycle of life (food chain). Invertebrates and other small organisms flourish in the warm water, fallen timber, and vegetation. These creatures are eaten by small fish, amphibians, reptiles, and birds.

snouts, sharp teeth, and one **dorsal fin** (fin on the back) that is set near the tail. The northern pike is the official state fish of North Dakota. Its coloring is yellow-green with horizontal body spots. It can measure 4 feet in length and weigh over 30 pounds.

Northern pike are predators that hunt by sight in shallow water. They have large, strong jaws with sharp teeth used to catch and eat other fish such as perch. Northern pike have many common names used by anglers. Very small northern pike are referred to as "hammerhandles" because of their size and shape. In Canada, they are referred to as "jacks." Pike are a great-tasting fish. Bones are one of the biggest reasons that some anglers do not like pike, but there are techniques anglers can use to remove the bones.

Several species make up the **perch family** of gamefish. Perch are identified by two dorsal fins that are separated. The first dorsal fin has sharp spines, but the second one is soft. Walleye, sauger, and yellow perch are common gamefish in North Dakota. Walleye and sauger are common in riparian rivers and streams. Yellow perch prefer lake habitats.

Figure 19. Walleye are an important fish species in the Missouri River system and are sought by many anglers.

Figure 20. Sauger are a species found more commonly in the shallow rivers of North Dakota.

Walleye have an olive-yellow color with a white underside. These fish reach about 30 inches in length and weigh up to 15 pounds. They are often found in large reservoirs such as Lake Sakakawea and Lake Oahe, but are also found in riparian streams and rivers throughout the state.

Walleye have eyes adapted for hunting in dark, deep water. These fish are sometimes misnamed "wall-eyed pike," but they belong to the perch family. They are not related to the pike family.

Sauger resemble walleye but are generally smaller with a more slender "torpedo" shaped body. Their body

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is blotched with darker patches, and their dorsal fins are spotted. Sauger in North Dakota are found in the Missouri River system.

The **yellow perch** is yellow-green in color with 6 to 8 dark, horizontal bars on its body. It has the general body shape of its relative, the walleye. Yellow perch grow to 14 inches in length and up to 2 pounds in weight. Yellow perch can be found in rivers and streams, but the larger populations live in the large reservoirs.

The **Johnny darter** is a member of the perch family, but darters are too small to be gamefish. They generally measure less than 3 inches in length. The Johnny darter can be identified by the dark, w-shaped blotches on its sides. Darters live in swift-moving streams.

Most members of the **sunfish family** live primarily in North Dakota lakes. Sunfish have bodies that are generally wider from top to bottom than pike or perch. Members of the sunfish family have two dorsal fins with the first being spiny. The dorsal fins of sunfish are connected to each other. The smallmouth bass and the orange spotted sunfish can be found in rivers and streams.

Smallmouth bass resemble largemouth bass but have smaller mouths. Smallmouth bass have vertical bars on their sides and red eyes. The habitat of smallmouth bass is similar to that of the walleye. Neither the largemouth bass nor the smallmouth bass are members of the true bass family. The Sheyenne River in eastern North Dakota has a fair population of smallmouth bass.

Orange spotted sunfish are small fish that reach only 3 to 5 inches in length as adults. They are found in streams and small rivers that have moving water. Small fish like these provide food for larger fish.

Figure 21. Orange spotted sunfish are small, colorful fish belonging to the sunfish family. They reach a maximum size of 3 to 5 inches and live in shallow rivers and streams. The bluegill is also a member of the sunfish family. It prefers lakes and ponds as its habitat. *(Courtesy of Mark Runyan)*

The **white bass** is a member of the true **bass family** in North Dakota. It is a silver-gray fish that has rows of horizontal stripes on its body. This 18- to 20-inch bass averages 1 to 2 pounds in weight. White bass travel in schools and can be found in the Missouri River and its tributaries such as the Heart River.

The **freshwater drum** is the only member of the **drum family** in North Dakota. The drum family got its name from the sound these fish make by moving muscles against a swim bladder. A **swim bladder** is an air-filled sac that helps fish float.

Figure 22. The freshwater drum is a river species of the Red and Missouri Rivers and their tributaries. Drum feed near the bottom and put up a great fight on hook and line. The state record drum is over 25 pounds.

Figure 23. Channel catfish can be found in most rivers in North Dakota. They feed on the bottom using their whiskers (barbels) to aid in finding food. They eat almost any kind of prey they can find including frogs, salamanders, crayfish, minnows, and small fish.

All fish have small structures in their heads called "otoliths" that help maintain balance. Drum have the largest of these otoliths, sometimes called "stones."

The freshwater drum feeds primarily on the bottom. These fish are found in the Missouri and Red Rivers and their tributaries.

Members of the **catfish family** range from very small to very large. Catfish do not have scales but instead have smooth skin covering their bodies. A catfish can be recognized by the barbels located near the mouth of its large head. **Barbels** are sharp, whisker-like organs that catfish use to sense and taste their food.

The largest member of the catfish family in North Dakota is the **channel catfish**. This gamefish may live to be over 20 years old and can weigh more

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than 30 pounds. Channel catfish prefer river habitats. The best fishing for channel catfish is in the Red River and Missouri River systems.

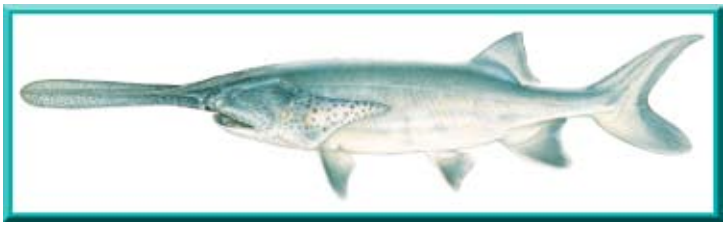

Figure 24. Paddlefish are a prehistoric fish found in the Missouri River system. Even though paddlefish can grow to weights over 100 pounds, they eat some of the smallest food of any fish in North Dakota. Paddlefish filter feed on small plankton-like organisms that are caught in their toothless mouth by a series of gill-rakers. *(Courtesy Joe Tomelleri)*

The **black bullhead** is a member of the catfish family. Bullheads look like catfish, but bullheads are smaller and stockier than their close relative. Bullheads have only a slightly notched tail compared with the channel cat's forked tail.

Figure 25. Small paddlefish are produced naturally in the Missouri River. However, with the construction of dams on the Missouri River system, the natural movement of spawning fish changed. Today, the Game and Fish Department manages these fish closely. The Garrison Dam National Fish Hatchery raises paddlefish, which the Game and Fish Department releases into the wild.

One of the most unique (you-Neek) (rare and unusual) fish in the world makes its home in North Dakota. This unusual species is the **paddlefish**. Fossil records show that paddlefish existed even before the time of the dinosaurs. The Missouri River, the Yellowstone River, and Lake Sakakawea are the only places in the state where paddlefish are found. The only place open to paddlefish fishing in the state is at the confluence (joining point) of the Yellowstone and Missouri Rivers.

The paddlefish was named for its very long and flattened snout, or "paddle," which measures about half the length of its body. Paddlefish may reach lengths of 7 feet and weigh over 100 pounds.

The paddlefish does not have bones. Instead, its skeleton is composed of cartilage. Cartilage is hard tissue such as is found on the outside of the human ear. Paddlefish have smooth skin, and their only scales are located on the upper part of the tail.

Paddlefish feed by sifting plankton out of the water. **Plankton** are the very tiny organisms (living things) that float in water. Plankton and other small aquatic organisms that fish rely on for food require clean water in which to survive. Special restrictions are in place for paddlefish fishing so that the species is not over-harvested.

The **sturgeon family** is another group of primitive (ancient) fish. They also have skeletons made of cartilage. Sturgeon have shovel-like snouts, a very long tail, and no teeth. Both paddlefish and sturgeon have barbels.

The **pallid sturgeon** is the largest sturgeon in North Dakota, reaching lengths of 6 feet and weighing up to 80 pounds. This species is on the federal (United States) endangered species list. This means that the species is in danger of becoming extinct and is protected. The main reason that the pallid sturgeon population has declined is because of human activity such as building dams and reservoirs. Dams transformed wide, warm, and murky rivers into cold and clear habitat not preferred by pallid sturgeon. Also, creation of reservoirs from the construction of dams restricted the migration of these fish.

Even though pallid sturgeon may live to be 50 years old, they often go many years without having young. If pallid sturgeon are caught by anglers, they must be released immediately.

A more common sturgeon in North Dakota is the **shovelnose sturgeon**. This small sturgeon usually weighs less than 5 pounds and is less than 2 to 3 feet in length. Both species of sturgeon in the state are found in the Missouri River system.

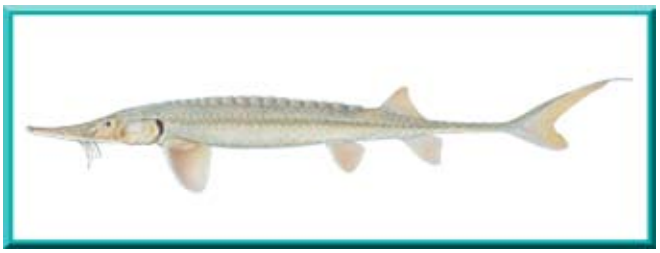

Figure 26. Sturgeon, like paddlefish, are prehistoric fish. Two species inhabit the Missouri River system. One is the pallid sturgeon, which is on the endangered species list. The other is the shovelnose. Both species feed on the bottom of the river with a mouth that protrudes like a tube. Whiskers, or barbels, aid in locating prey. *(Courtesy Joe Tomelleri)*

Several species of the **trout family** inhabit North Dakota waters, but they are all introduced species. Trout do not reproduce successfully in North Dakota waters; therefore, fish hatcheries are used to increase the trout populations. A **fish hatchery** is a place where fish eggs are fertilized and hatched. After the eggs hatch, the fish are released into rivers or lakes. This release is called "stocking."

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Stocking is used in certain locations where fish such as trout do not reproduce; however, the best answer to a healthy fishery is to maintain good habitat and water quality in which fish can reproduce naturally.

Figure 27. Although good habitat and clean water is best for fish to live in, some species such as those in the trout family do not reproduce in warm-water rivers and streams like the ones we have here in our state. Trout and salmon must be raised in hatcheries and then "stocked" back to lakes and rivers. Other fish like bluegill are sometimes stocked to start a fishery in a new lake or enhance an existing opportunity for anglers.

The **rainbow trout** originally came from the Pacific Coast and has been stocked in several North Dakota waters, including the Missouri River. The coloring of these fish varies somewhat depending on where they came from, but they all have pinkish streaks on their sides and small, black spots on their sides, fins, and tail.

Brown trout have spots that are more colorful than those of the rainbow trout. The spots may be black, brown, orange, or red. These fish have been stocked in the Missouri River system. **Cutthroat trout** have also been stocked in the Missouri River system. These fish got their name from the reddish-orange marking on the lower jaw.

Species of the **sucker family** are native to North Dakota. They can be identified by their sucker-like, toothless mouths with large lips. These fish suck tiny organisms from the bottom of slow-moving streams and lakes. The largest member of the sucker family in the state is the **bigmouth buffalo**.

The **white sucker** is probably the most common of the sucker family, and like the carp, it can over-populate waters very quickly. The high population of white suckers competes with other fish for food and space. It is illegal for anglers to use the white sucker for a bait fish because of the possibility of introducing this unwanted species to new waters.

Other members of the sucker family in North Dakota include the **quillback carpsucker**, the **river carpsucker**, and the **blue sucker**.

Two members of the **mooneye family** live in North Dakota—the **mooneye** and the **golden eye**. Both these fish are similar in appearance, and the names come from their large eyes that have a gold or silver shine. They are found in the Red River and in the Missouri River system.

Only one member of the **cod family**, the burbot, inhabits the waters of North Dakota. The **burbot** looks almost like an eel. It reaches a length of over 2 feet and can weigh over 10 pounds. It has a large head with small eyes. Its scales are so small that they can be seen only with a magnifier.

Burbot are also referred to as "ling" since they are related to the lingcod. They are great predators that feed near the bottom for anything edible, including small fish and crayfish. The largest population of burbot is found within the Missouri River system.

Figure 28. Burbot, or ling, are found in the Missouri River system. They are unique and colorful members of the cod family. Their appetites are much like the catfish since they will eat almost anything they can find living in the water.

Figure 29. Shortnose gar live in warm backwaters of the Missouri River system. They can often be seen near the surface of the water "sunning" themselves. Gar have a slim snout with rows of very tiny teeth for grabbing minnows and small fish. *(Courtesy Joe Tomelleri)*

The **shortnose gar** is a primitive-(old) looking fish with a narrow body and pointed snout. Gar enjoy warmer backwaters of the Missouri River system where they often can be seen sunning themselves near the top of the water. This fish reaches a length of about 2½ feet. The gar eats small fish, which it grabs with its tooth-filled jaw.

The **minnow family** is the largest group of fish in North Dakota. Over 30 species of minnows inhabit the waters of the state. Minnows have one dorsal fin. They are an important food source for gamefish, birds, and other wildlife. Some species of minnows are used as bait for catching gamefish, whereas others are nuisance fish that should not be introduced into other waters.

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Carp are minnow species that were introduced from Germany. These fish are considered aquatic nuisance species. **Aquatic nuisance species** are non-native plants or animals that have been introduced into an aquatic (water) environment and have a harmful effect on that environment. They multiply rapidly, compete with other species for space, and can cause damage to aquatic habitat.

Carp tear up aquatic vegetation and muddy the water. This can cause problems for gamefish and waterfowl. Carp also compete with other fish for space. A body of water can support only a certain number of fish. The number of fish that can be supported is called "carrying capacity." If a lake is filled with carp, there is no room for other fish.

A species of carp that people sometimes release into the wild is the **goldfish**. When released into rivers or lakes, the goldfish can reach lengths of 1 foot or more. Goldfish in the wild cause the same problems as the other carp. These exotic fish should never be released into the wild.

The **fathead minnow** is one of the more familiar minnow species because it is found statewide and is commonly sold as a bait fish. Unlike carp, fathead minnows never get bigger than a few inches long; therefore, they do not create the competition for food and space that carp do. Fatheads are an important species of prey in water where they live.

Figure 30. The fathead minnow is one of the most familiar minnow species in North Dakota. It is small and is often used as bait. Carp are also members of the minnow family but grow to weights of over 30 pounds. *(Courtesy US Fish and Wildlife Service)*

Many other small fish in the minnow family can be found in North Dakota rivers and streams. Small river and stream habitat is unique and attractive to species such as the **creek chub** and the **northern redbelly dace**. These small minnows can be affected by environmental changes and may be important indicators of the health of a stream. They are sometimes referred

Figure 31. The northern redbelly dace is a minnow species that is found in small rivers and streams. It is a colorful fish that is not often observed and may be one of those species that is an indicator of a healthy riparian system.

to as "indicator species." Indicator species are those species that are sensitive to habitat damage and the first to die when habitat conditions are degraded.

The **brook stickleback** belongs to the **stickleback family**. These small fish usually do not reach over 3 inches in length. They got their name from the sharp spines on their backs. These fish survive in shallow streams where few other fish can live.

North Dakota has three species of crayfish, but only one species, the **northern crayfish**, is common. Crayfish are not fish but crustaceans (krus-Tay-shuns). **Crustaceans** are aquatic animals that have an exoskeleton and a body segmented into three parts. An **exoskeleton** is a skeleton on the outside of the body.

Figure 32. The brook stickleback is not a member of the minnow family even though they do not reach lengths of over 3 inches. They are a member of the stickleback family of fish and got their name from the row of spines across the top (dorsal side) of their body. *(Courtesy Joe Tomelleri)*

Figure 33. Crayfish are aquatic creatures belonging to the family of crustaceans and are related to saltwater crabs and lobsters. They have pincers (claws) for catching prey. Many mammals, birds, and fish utilize them for prey. They quickly propel themselves backward to escape from being eaten.

Crayfish have two pairs of antennae (sensory organs), large eyes supported on stalks, and eight legs. They also have a pair of pincers for capturing food, cutting, grasping, and defense. The pincers are often referred to as "claws." To escape danger, crayfish walk or swim backwards to a hiding place.

Crayfish are important in the aquatic food chain because of what they eat and what eats them. The crayfish is an **omnivore**, which means it is an animal that eats both plants and animals. Its food sources include tadpoles, snails, fish, and plants.

Crayfish are a source of food for fish, as well as for mammals such as the mink, raccoon, and river otter. Birds such as the black-crowned night heron and great blue heron also eat crayfish.

Water conditions can be determined by crayfish because they are an indicator species. If the water is polluted, the crayfish will die.

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Comprehension

1. How many species of fish are found in North Dakota waters?

2. Which fish family got its name from the sound the fish make by moving muscles against a swim bladder?

3. How does the outside covering of catfish differ from other fish?

4. Which fish existed before the time of the dinosaurs? Where in the state is it found? Where is the only place in the state where anglers may fish for this species? What is unusual about its skeleton?

5. Which North Dakota fish is on the endangered species list?

6. What is the largest family of fish in North Dakota?

7. What is a species called that is sensitive to environmental changes and may provide clues to the health of a system?

Critical Thinking

1. If someone asked you to identify whether a fish was a pike, a perch, or a sunfish, what feature would you look at, and how would you determine the family by this feature?

Mussels

Freshwater **mussels** are shellfish with two hard, outer shells that protect their soft, inner parts. These aquatic (water) animals are often referred to as "clams." The shells of a mussel protect the soft tissues of the animal and provide protection against predators.

Mussels have no eyes and no mouth. They cannot swim or walk. Unlike most animals that must travel in search of food, mussels wait for their nourishment (food) to come to them. Their food source is plankton, a microscopic food, which floats in the water. The mussel's system filters the plankton out of the water by a pumping action, which brings in water through one siphon and expels it through another. Oxygen is obtained through the gills.

Figure 34. Freshwater mussels are shellfish protected by two hard shells lined on the inside by a substance called "mother of pearl." Since they are protected by two shells, they are categorized as bivalves.

Mussels do not move very much, but they do have a strong muscle called a "foot," which they use to burrow into the streambed. This foot also anchors them so that they do not drift with the current of the stream.

Mussels are classified into two types: marine mussels and freshwater mussels. "Marine" refers to the sea; therefore, marine mussels are those that live in saltwater habitats such as the ocean.

Figure 35. There are over a dozen different types of freshwater mussels in North Dakota rivers and streams. All the species look a little different but are truly unique. Some live to be over 50 years of age.

Freshwater refers to water that is not as salty as that found in oceans. Ocean water is salty, whereas water in rivers and lakes is called "freshwater." North Dakota mussels are freshwater mussels.

Freshwater mussels serve as a food source for various species of wildlife.

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They also help purify water by their filtering action. Freshwater mussels can often be found in "beds" which are areas where a lot of mussels are bunched together on the bottom of a river. This congregation of mussels can help stabilize the river bottom.

The lifespan of freshwater mussels averages from 20 to 50 years. A growth ring, similar to a tree ring, is added each year of the mussel's life.

More than a dozen species of freshwater mussels live in North Dakota rivers and streams. Some species commonly inhabit the Red River, with several also found in the Sheyenne River. These include the **Wabash pig toe**, the **maple leaf**, the **three ridge**, the **black sandshell**, the **pink heel splitter**, and the **pocketbook**. The pocketbook is also found in the Knife River.

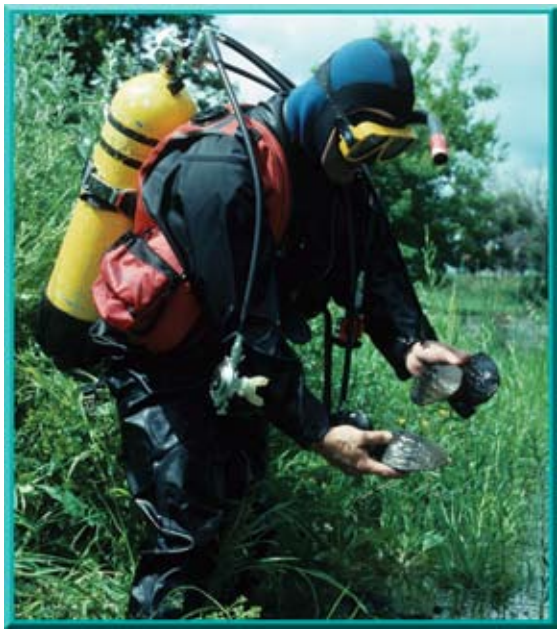

Figure 36. Freshwater mussels had not been managed by the state before the 1990s. Commercial harvesting of these creatures for their shells prompted the Game and Fish Department to survey and study their populations. A decision was made to protect these important aquatic resources from being commercially harvested.

The most common freshwater mussel found throughout North Dakota is the **floater**. The **fat mucket** and **white heel splitter** are found in most rivers of the state. The **cylindrical paper shell** is found in small rivers and creeks in many parts of the state.

Before plastic became commonly used, mussel shells were used to make buttons. People also harvested mussels in order to make pearls for jewelry. Biologists determined that freshwater mussels were being overharvested; therefore, in 1991, collecting and harvesting mussels became illegal (against the law) in North Dakota.

Aquatic Insects

Aquatic insects are insects that hatch or live in the water. Millions of these insects serve as major food sources for fish, amphibians, reptiles, waterfowl, songbirds, and other wildlife. For example, migrating birds rely on the hatch of aquatic insects early in the spring for energy to complete their migrations.

Figure 37. A freshly hatched dragonfly and the case from which it emerged is shown above. There are many different types of dragonflies, and they are all important components of riparian areas. Dragonfly larvae provide an excellent food source for amphibians and fish, while adult dragonflies eat millions of small insects such as mosquitoes.

Figures 38 & 39. Damselflies are a common insect species of riparian areas. The green one shown above is a variety called the western dark-winged damselfly. **INSET The familiar bluet** may have gotten its name from the fact that it is one of the most commonly seen damselfly species.

Besides being a food source, aquatic insects also carry out other important roles. Some of them help keep the rivers and streams clean by eating dead animal and plant material in the water. Others filter out particles from the water, which helps keep the water clear.

A number of aquatic insects are predators that prey on other invertebrates (animals without backbones). The **dragonfly** and **damselfly** are two predatory insects that lay their eggs in ponds, streams, and other wetlands. The eggs hatch into larvae (Lar-vay), which live in the water. These larvae will eat just about anything they can grab. Adult dragonflies and damselflies help control the population of harmful insects such as mosquitoes.

The **caddis fly** constructs nets with which to catch plankton and other tiny animals, which it then eats. Countless water beetles,

Figure 40. Caddis fly larvae are just one example of invertebrates that provide food in the food chain. The larvae build food-catching nets in hollow-shaped tubes and are important food for fish. They are indicators of clean water.

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mayflies, and other insects spend their lives in bodies of water. Swarms of big-eyed bugs called **water boatmen** use their legs like tiny oars to propel themselves through the water. Some spider-like insects are so lightweight that they can walk on the surface of water without sinking. Other insects live their entire lives on the bottom of the channel.

Amphibians and Reptiles

Riparian areas are significant habitats for many species of amphibians and reptiles. Most of them do not live directly in the river or stream but often in the side channels, backwaters, or in oxbows formed by the river or stream as it changed course over time.

Both amphibians and reptiles are ectotherms (Ek-toe-therms). An **ectotherm** is an animal whose body temperature changes with the temperature of its surroundings. Ectotherms are also called "cold-blooded" animals.

Amphibians lay their eggs either in the water or else on moist land near the water. They have gills and live in the water during their tadpole (larva) stage but develop lungs for their adult stage on land. Amphibians in North Dakota include frogs, toads, and salamanders.

The **northern leopard frog** is the most common frog in North Dakota. It is found throughout the state in almost any body of water. These amphibians have powerful legs that enable them to swim fast and jump in 6-foot leaps. The smallest frog in the state is the **western chorus frog**. This common amphibian reaches a length of only about 1 inch. It has a very loud call that can be heard at a great distance.

The **American toad** is a large toad that is found in eastern North Dakota. The **mudpuppy** is a salamander that spends its entire life underwater. The mudpuppy is also found in eastern North Dakota.

Figure 41. Western chorus frogs are small frogs usually found in close proximity to backwaters. These frogs have a very loud song that can be heard for long distances, so they are often mistaken for a larger bird or mammal.

Turtles are common reptiles of riparian areas. The **smooth softshell turtle** is found in the Missouri River system. Its nearly round, soft shell is covered with a leathery type of skin. These turtles are also known as "leatherbacks." They eat prey such as crayfish and small minnows.

Snapping turtles and western painted turtles are both commonly found throughout North Dakota. **Snapping turtles** average 8 to 30 inches in length and can reach a weight of 65 pounds. When threatened, the snapping turtle opens its beak-like mouth and strikes. Snapping turtles have very powerful jaws that they use to eat aquatic plants, fish, amphibians, other turtles, small mammals, and young birds. They feed by patiently waiting for prey to swim by them. Then they grab the prey with their very fast-moving head and powerful jaws. Snapping turtles like shallow, warm, muddy creeks and rivers.

Figure 42. Smooth softshell turtles are found in the more southern reaches of the Missouri River system. They have a leathery-like shell and prefer habitats with warm water where prey can be found. There is another closely related species called the "spiny softshell."

Western painted turtles are the most common turtles in the United States. They were named for their brightly colored bodies and shells. They feed on worms, minnows, and aquatic insects.

Figure 43. Snapping turtles can be found in almost any river or creek in the state. They can live to be 50 years old and weigh over 50 pounds. Turtles are fairly slow on land; therefore, they spend most of their lives in the water.

Figure 44. Adult snapping turtles use the soft sand of a river or stream bank in which to deposit their eggs in the spring. The eggs are about the size of a ping-pong ball. After the nest is covered, the adult female leaves and never comes back. The eggs hatch in response to the heat of the ground over a period of about 3 months.

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Comprehension

1. What do mussels eat? How do they obtain it?

2. What is the average lifespan of a mussel? How is the age determined?

3. Why is it illegal to collect or harvest mussels in North Dakota today?

4. Why are aquatic insects so important?

5. Name two predator insects. They help control the population of what insect pest?

6. What is the most common frog in North Dakota?

7. Which salamander spends its entire life underwater?

8. Which unusual turtle is found in the Missouri River system? What is the most common turtle in the United States?

Critical Thinking

1. Do you think the most common mussel in North Dakota has a fitting name? Explain.

Mammals

Several riparian mammals are furbearers. A **furbearer** is an animal that is harvested for its fur. During the 1800s, fur trading companies were established in northern Dakota for the purpose of making a profit (money) by selling furs. At that time, furs were widely used in the garment (clothing) industry. Today, artificial fabrics have replaced the need for fur in the clothing industry.

Riparian areas of North Dakota provide habitat for the largest rodent on the continent of North America—the **beaver**. **Rodents** are gnawing or nibbling mammals such as rats, mice, voles, and ground squirrels.

Beavers are noted for their thick, beautiful fur. French fur trappers came to riparian areas of North Dakota in the 1800s to trap beavers. The population of beavers in North Dakota dropped significantly during that time because there were no regulations to manage their numbers.

The beaver is a bulky animal that can weigh up to 60 pounds. Its back feet are webbed for swimming, and its large tail is flat. The tail is used as a rudder to help the beaver steer when it is swimming. When a beaver senses danger, it sounds an alarm by slapping its tail loudly on the water. Beavers have special adaptations that protect their eyes and close their nostrils while swimming.

Figure 45. The beaver is a member of the rodent family that lives in rivers and streams around the state. It is most active at night. Beavers have all kinds of adaptations for living in an aquatic environment including webbed feet, a flat tail, waterproof fur, and membranes that protect the eyes and keep water out of the nose.

Beavers are nocturnal, mostly working at night. These animals have the ability to change the landscape by building dams across rivers. With their sharp teeth, they cut down trees, which they drag to the river. They use their front paws to carry mud, stones, and other building materials. The dams constructed by beavers block the flow of water, and the backed-up water forms a small reservoir, or pool. This pool provides habitat for fish and other wildlife. It also results in cleaner water downstream because toxins (poisons) and other pollutants are broken down in this wetland, and sediment is trapped there.

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Beavers build their lodge, or home, from cut branches and mud. The lodge has underwater entrances, which makes it almost impossible for predators to get in. Otters, bobcats, wolves, and coyotes prey on beavers.

Beavers also build another structure called a "cache" (cash). A cache consists of small tree branches, which are stored in the water over the winter so that beavers have a food source of tree bark under the ice.

The diet of beavers consists of tree bark and some aquatic plants. Their favorite trees are quaking aspen, cottonwood, and willow. Even though beavers are an important part of the ecosystem, at times they cause damage to valuable trees, and sometimes their dams result in unwanted flooding of the land.

Mink are **carnivores** (meat eaters) that prey on muskrats. They either catch muskrats by swimming after them, or they dig into muskrat huts. Mink also eat fish, birds, turtles, frogs, snakes, mice, and other small animals.

Mink are members of the weasel family. They have long, slim bodies covered with shiny, dark fur and a white patch under the chin. The mink's feet are partly webbed. They are good swimmers, fast runners on land, and tree climbers. They make dens in holes,

Figure 46. Beavers spend much of their time chewing on trees. On the far shore of this photo is a lodge where the beavers live. It is made out of branches, logs, and mud. On the shore is a dam that the beavers built to hold back water. They may spend much of their time in this water. A cache can be seen out in the water between the lodge and the dam. A cache is a pile of freshly cut branches that the beaver can use for food during the winter.

Figures 47 & 48. Mink are members of the weasel family and are excellent predators. When mink live in prairie sloughs, they eat mostly muskrats. Mink that live along rivers and streams eat fish, frogs, crayfish, and freshwater mussels. Their home is a den with an entrance hole usually close to the water's edge. **INSET The powerful and thin body** of the mink allows it to be a great tree climber. Mink will also eat small birds and their eggs.

tree cavities, abandoned beaver or muskrat lodges, or hollow logs. Sometimes they have an additional den where they store food.

The **river otter** is a close relative of the mink but is about twice as large. The river otter was once abundant in riparian areas throughout North Dakota, but overharvesting for its fur nearly caused its extinction in the late 1800s. Today, river otters are starting to make a comeback in the Red River and its tributaries. It is hoped that they will again inhabit the Missouri River system.

Figure 49. River otters are found primarily in the rivers of eastern North Dakota. They have a similar body shape as the mink but are much larger. Otters are great swimmers and prey mostly on fish but will also eat freshwater mussels, crayfish, and frogs.

River otters have webbed toes for swimming. They can close their nose and ears to keep them dry when they are underwater. Their fur is also waterproof. Fish are the favorite food of river otters, but they also eat frogs, toads, crayfish, and mussels.

River otters are playful animals and one of the few animals that play as adults. Their play includes games such as tag and catch. They also playfully slide down riverbanks and in the snow.

Figure 50. Raccoons live near riparian areas because rivers and streams provide food as well as tree cavities where they make their homes. They also live in abandoned buildings and eat agricultural crops such as corn.

Another mammal and furbearer that can be found in riparian areas is the **raccoon**. This animal can easily be identified by the black "mask" of fur around its eyes. It has a long, bushy tail with four to ten black rings on it.

Raccoons have front paws that look a little like human hands, and they are very good at opening freshwater mussels. Raccoons are omnivores that also eat fruit, berries, and other plants. The raccoon population in North Dakota is healthy and has been

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helped by agriculture providing foods such as corn that is a favorite of theirs.

Fox squirrels are found throughout most of North Dakota. They live in forests and **urban** (city) areas where mature trees are present. From nose to tail, the fox squirrel measures about 20 inches and weighs about 1½ pounds. The tail is very bushy and makes up about half the total length of the squirrel.

Figure 51. Fox squirrels are woodland rodents that live in the canopy of trees. Riparian forests along rivers provide good habitat for this species.

Fox squirrels are good jumpers that can leap 15 feet from branch to branch. They spend more time on the ground than the other tree squirrels, and they often bury nuts in various places on the ground. Some people like to put out food for fox squirrels, but others think of them as "tree rats" that rob bird feeders. When an intruder enters the territory of a fox squirrel, the squirrel responds by flicking its tail and calling out with loud "chatter barks." Fox squirrels are considered small game animals and can be hunted for food.

Figure 52. Shrews are the smallest mammals in North Dakota. Their heart beats over 800 times per minute, making their metabolism (body function) one of the highest on Earth. They must eat almost continuously during the day and night to survive.

The **masked shrew** is the smallest and most common shrew in North Dakota. Shrews are small mammals that resemble mice; however, shrews are not rodents. The masked shrew has a very sharp-pointed snout, tiny eyes, and a long tail. This small animal has a heartbeat of about 800 beats per minute.

Masked shrews can be found in riparian areas and may be active both day and night. They nest in cavities of tree stumps, fallen logs, or under rocks or other materials.

Figure 53. This eastern red bat is one of 10 species of bats found in North Dakota. Bats roost (rest) during the day by hanging upside down in a cool, shaded, and protected area.

The masked shrew is noted for its large appetite and eats its own weight or more in food every day. The diet of this insectivore (in-Sek-tah-vor) consists of beetles, flies, ants, crickets, grasshoppers, spiders, and moths. An **insectivore** is a carnivore that eats only insects and spiders.

Bats are mammals that live in riparian areas because these areas have good insect populations that bats require for food. Trees provide places for bats to roost during the day. There are 10 species of bats in North Dakota. They are important in controlling insect populations.

White-tailed deer are found throughout the state and are common in riparian forests. They are **herbivores** (plant eaters) that eat most vegetation including green plants, leaves, shrubs, twigs, bark, and berries.

Birds

Riparian areas provide ideal habitat for countless species of birds. The forests, grasslands, and other vegetation provide nesting areas, while the stream itself attracts waterfowl. **Waterfowl** are migratory wetland birds that may be hunted. They have webbed feet and water-repellent feathers. Ducks, geese, and swans are the waterfowl of North Dakota.

Wood ducks are one of the waterfowl species associated with riparian areas since they require cavities within dead and dying trees for nesting. The wood duck is a dabbling duck, which means it feeds in shallow water or on land. Wood ducks are also "perching" ducks that spend time out of the water perched on tree branches. These ducks have strong feet and large, gripping claws. The claws allow the wood ducks to reach the hollow cavities of trees where they nest. A **cavity** is an open space in a dead or dying tree where wildlife raise their young.

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Mergansers are ducks that dive into the water to catch fish. The **hooded merganser** is a cavity-nesting bird found living in riparian areas. Males have brilliant spring feathers, including a "hood" used in the courtship display.

Figure 54. Hooded mergansers are fish-eating waterfowl that nest in cavities of dead and dying trees. That is why riparian areas are attractive to these birds. The male bird shown here has a bunch of feathers on top of its head called a "hood" that it fluffs up during breeding season to attract females.

Shore birds are common in riparian areas, especially in rivers and streams with sandbars or exposed mudflats or shorelines. These small- to medium-sized birds generally have long legs, thin bills, and use flat, open areas such as sandbars for feeding. A sandbar is a ridge of sand in a river that was formed by the current, or flowing action, of the water.

Figure 55. Sandbars on the Missouri River system are formed from sediments eroded from the riverbanks. Sandbars create warm, still water pockets where small fish can feed. Waterfowl can rest on sandbars, and sandbars without vegetation are important areas for shore birds to feed on insects.

The **piping plover** is a shore bird that nests and raises its young on sandbars or gravelly beaches. It eats insects that it finds along the edge of the water. The piping plover is a threatened species on the endangered species list. Animals that are in danger of becoming extinct (all of them dead) receive special protection under a law called the **Endangered Species Act**. This protection includes maintaining their habitats. The piping plover is protected by this law because its population has declined to low levels.

Another bird that can be found on sandbars and beaches of the Missouri and Yellowstone Rivers is the least tern. The **least tern** is the smallest member of the tern family in North Dakota. Terns look similar to gulls, but terns are smaller

and have forked tails. The least tern measures about 8½ inches in length and has a wingspan of about 20 inches. It dives into the water for its prey, which consists mainly of small fish.

Figure 56. Least terns are members of the wildlife community that have very specific habitat requirements. That is different from animals like the white-tailed deer and the coyote that are adaptable and can live in all kinds of habitats. Least terns would not survive without the bare sandbar habitat of the Missouri River system.

Figure 57. Wild turkeys are upland game birds of woodland habitats like those found along rivers and streams. Woodlands provide overhead cover as well as tall trees in which turkeys roost at night in order to avoid being eaten.

The least tern is also on the endangered species list. Unlike animals such as coyotes and white-tailed deer that can live in many different types of habitats, the least tern has a very specific habitat requirement. It requires bare sand found only on sandbars on the Missouri River system.

North Dakota has six species of non-migrating upland game birds. **Upland game birds** are non-waterfowl birds that may be hunted. One upland game bird that is commonly found in riparian forests is the wild turkey.

The **wild turkey** is the largest game bird in North Dakota. This large, ground-dwelling bird searches the forest floor for insects and berries. At night, it roosts in the tops of tall trees such as cottonwoods. Wild turkeys have excellent hearing and eyesight. They can fly almost 60 miles per hour.

Raptors are predator birds that hunt animals for food. They are also called "birds of prey." Raptors have an important role in helping to maintain the balance of nature. By hunting and catching prey, these carnivores control the population of rodents.

The **bald eagle** inhabits the riparian zone of the Missouri River system and

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can also be found along the Red River and other streams next to woodlands. The adult bald eagle has a white head and tail. It measures about 3 feet in length and has a wingspan of up to 7 feet. The long wingspan enables these birds to soar long distances without flapping their wings. The primary food of bald eagles is fish. They also eat rodents, rabbits, birds, and carrion (dead animals).

Bald eagles build their nests high in trees. A foundation is constructed with sticks, and the nest is lined with mosses, grasses, feathers, and other soft materials. Every year, more lining is added to the nest. Bald eagle nests can be huge, measuring 7 to 8 feet across, 12 feet deep, and weighing hundreds of pounds. One to three eggs are laid each spring. The young are not able to fly out of the nest until they are about 2½ months old.

Figures 58 & 59. The tall cottonwood trees along the Missouri River make perfect nesting sites for bald eagles. The river also provides a source of fish, which is their preferred food. They will also eat waterfowl such as geese and carrion (dead animals) such as road-killed deer. **INSET The bald eagle** is the national symbol. This bird has made a dramatic comeback since the pesticide DDT was banned in the 1960s. DDT made the egg shells thin, which caused them to break under the weight of the incubating adult.

The bald eagle is the national symbol of the United States and is protected by law. It is illegal (against the law) to possess (own or have) an eagle feather or other body part. If convicted (found guilty) of this crime, a person could be fined up to $10,000 and could serve up to 10 years in prison. There is an exception to this law, however. Members of America Indian tribes may possess eagle feathers to use in

Figure 60. Screech owls are small owls that live in wooded areas across the state. They nest in tree cavities, feed at night, and make an eerie call that may sound frightening. *(Courtesy Ed Bry)*

Figure 61. Turkey vultures are often considered "ugly" because of their flesh-like red head, but they are a very important part of the ecosystem. Vultures are scavengers that clean up carcasses of wildlife that have died. The vultures in this photo are drying their wing feathers in the tops of cottonwood trees along the Missouri River.

their traditional religious ceremonies, if they have the proper permits.

The **eastern screech owl** is common to riparian areas. It resembles the great horned owl but is much smaller. This nocturnal raptor catches insects, mice, pocket gophers, snakes, frogs, fish, and small birds.

Some raptors are scavengers, which means they are carrion-eaters. **Carrion** is dead animals that have been killed by other animals, by vehicles, or from other accidents. Scavengers are part of the process of recycling animal remains.

A scavenger that inhabits riparian areas of the Little Missouri and Missouri Rivers is the **turkey vulture**. This bird can be identified by its bright red head, neck, and legs. The rest of the body is brownish-black.

The head of a turkey vulture is nearly bald. This enables the bird to stick its head into a carcass (dead body) without picking up disease-causing bacteria that would stick to feathers.

Turkey vultures have 6-foot wingspans and can soar long distances. They have a highly developed sense of smell, and they use this sense for locating carrion.

Turkey vultures do not build nests. They lay their eggs on the ground or in

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caves, mammal burrows, hollow logs, or under fallen trees. Usually, two eggs are laid. When the young hatch, they are so helpless that they cannot even hold up their heads. The parents feed the young by regurgitating (re-Gur-jah-tay-ting), or bringing up partly digested food, that they themselves have eaten and swallowed.

Figures 62 & 63. The belted kingfisher may have gotten its name because it is truly one of the "kings" of fishing. This bird can be found very close to water where it is often seen perched on a tree branch over water. Here, it patiently waits to spot a fish which it can pursue and eat. *(Courtesy US Fish and Wildlife Service)* **INSET Kingfishers** nest in an odd location. They lay their eggs in a burrow, which is excavated in the side of a river or creek bank.

The **belted kingfisher** is a solitary (usually seen by itself) bird often seen perched on a tree limb that hangs over a river, creek, or stream. This bird has a stocky body, short legs, and a heavy, powerful bill that it uses for grabbing fish, tadpoles, frogs, freshwater mussels, and crayfish. It has a unique type of nest, which consists of a burrow dug in the bank of a creek or river.

Several species of cavity nesters inhabit riparian forests. Among the many cavity nesters are members of the woodpecker family such as the **downy woodpecker**, the **hairy woodpecker**, the **red-headed woodpecker**, and the **northern flicker**.

A woodpecker has a strong, stiff tail that it uses as a brace as it clings to a tree. Its tongue is long and barbed to help pull insects from tiny places. Woodpeckers drum on trees, not only to make holes and find insects, but also to announce their territory. Most woodpeckers do not migrate.

Songbirds are small, perching birds that sing a variety of songs. Some nest near the stream channel in shrubs or willow trees, while others are found deeper in the riparian forests.

The **black-and-white warbler** is striped like a zebra. It is about 5 inches long. This insectivore moves headfirst down tree trunks and looks for insect eggs in the bark

of large trees. It builds its nest hidden under dead leaves on the ground or at the base of a tree.

A songbird that nests along rivers and streams in the western part of the state is the **lazuli bunting**. It has a turquoise-colored head, back, and tail. The chest is light red, fading to white on the underside. Its diet consists of insects and seeds.

The **black-headed grosbeak** is a common inhabitant of riparian forests. The male and female birds do not look alike, as do other forest birds such as the black-capped chickadee and white-breasted nuthatch. Grosbeaks were named because of their unusually heavy and short bill, which is used for cracking open seeds.

The **blue jay** is called the "alarm of the forest" because of its practice of screaming loudly at any intruders in the woods. The blue jay is a large, bright blue bird with a black necklace and a crest. A crest is a long tuft of feathers on the head.

Dozens of other species of songbirds are found in riparian habitats. Among them are the **mountain bluebird**, the **eastern bluebird**, the **black-capped chickadee**, the **white-breasted nuthatch**, the **tree swallow**, the **cedar waxwing**, the **pine siskin**, and the **red-winged blackbird**.

Figure 64. Grosbeaks got their name from their heavy, short bill used for cracking open seeds. The male black-headed grosbeak (right) is more brightly-colored than the female (left). Males are brightly colored for breeding purposes, and females are dull and drab for staying hidden on nests. In some bird species, both the male and the female look alike.

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Comprehension

1. Why did the populations of many furbearing animals decline so much in the 1800s?

2. What two adaptations does the beaver have for swimming?

3. How can beavers change the landscape?

4. Where are the entrances to the lodges of beavers and muskrats?

5. What is a primary prey of the mink?

6. How does a river otter keep water out of its nose and ears? How are adult river otters different from most adult animals?

7. Which mammal has a fur mask and rings around its tail?

8. What two adaptations for water do waterfowl have?

9. Where does the piping plover nest and raise its young?

10. How are terns different from gulls?

11. What is the largest gamebird in North Dakota?

12. How do raptors help maintain the balance of nature?

13. What enables eagles and turkey vultures to soar long distances?

14. Which bird is called the "alarm of the forest"? Why?

Critical Thinking

1. Which mammal would you most enjoy observing in its natural habitat? Explain.

2. In a few North Dakota cities, wild turkeys are gaining in population and becoming a nuisance. How would you advise the city council to deal with this problem?

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Riparian Areas Wildlife in a Nutshell

- North Dakota has almost 100 fish species with most being native.
- Pike species have long bodies, pointed snouts, sharp teeth, and one dorsal fin.
- Perch species have two separated dorsal fins, and sunfish have two connected dorsal fins.
- Largemouth bass and smallmouth bass are members of the sunfish family, not the bass family.
- Catfish have smooth skin and wide heads with needle-like whiskers called "barbels."
- Paddlefish and sturgeon are ancient fish that have skeletons made of cartilage rather than bone.
- Lakes are sometimes stocked with fish from fish hatcheries.
- Mussels have no eyes or mouth, and they cannot swim or walk.
- Millions of aquatic insects serve as a food source for fish, amphibians, reptiles, birds, and other wildlife.
- All amphibians and some reptiles, such as turtles, require water habitats.
- Several furbearing animals almost became extinct from overharvesting in the 1800s.
- Beavers build dams across rivers; they also build lodges with underwater doors.
- River otters almost became extinct in the late 1800s, but they are beginning to make a comeback in the Red River and its tributaries.
- Ducks, geese, and swans are the waterfowl of North Dakota.
- The piping plover and the least tern nest on sandbars and beaches.
- Turkey vultures feed their young by regurgitating food they have swallowed.

Riparian Areas Wildlife Vocabulary

Anglers:
- People who fish

Aquatic insects:
- Insects that hatch or live in the water

Aquatic nuisance species:
- Non-native plants or animals that have come into an aquatic environment and have a harmful effect on that environment

Barbels:
- Sharp, whisker-like organs found on catfish and a few other fish species
- Used to sense and taste food

Carnivores:
- Meat eaters

Carrion:
- Dead animals that have been killed by other animals, by vehicles, or from other accidents

Cavity:
- Open space in a dead or dying tree where wildlife raise their young

Dorsal fin:
- Fin on the back of a fish

Ectotherm:
- Animal whose body temperature changes with the temperature of its surroundings
- Also called "cold-blooded"

Endangered Species Act:
- A law that gives special protection to animals that are in danger of becoming extinct

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Exoskeleton:
- A skeleton on the outside of the body

Fish hatchery:
- A place where fish eggs are fertilized and hatched

Freshwater:
- Water that is not salty

Furbearer:
- An animal that is harvested for its fur

Gamefish:
- Fish that are caught by anglers

Habitat:
- Environment that provides the food, water, shelter, and space for wildlife to make their homes

Herbivore:
- Plant eater

Insectivore:
- Carnivore that eats only insects and spiders

Mergansers:
- Ducks that catch and eat fish

Mussels:
- Shellfish with two hard, outer shells
- Also called "clams"

Omnivore:
- An animal that eats both plants and animals

Plankton:
- The very tiny organisms that float in the water

Raptor:

- Bird of prey
- Predator bird

Rodents:

- Gnawing or nibbling mammals such as rats, mice, voles, and ground squirrels

Songbirds:

- Small, perching birds that sing a variety of different songs

Swim bladder:

- An air-filled sac that helps fish float

Upland game birds:

- Non-waterfowl birds that may be hunted

Waterfowl:

- Migratory wetland birds that may be hunted

Other Vocabulary I Want to Know:

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THE IMPORTANCE OF RIPARIAN AREAS

Streams of Life

Riparian areas have been called "streams of life" because they are among the most productive and diverse ecosystems in the world. An ecosystem is an area that contains organisms (living things) interacting with one another and with their non-living environment. If one part of the ecosystem is changed or destroyed, it has an effect on everything else in that community. Each species has its own habitat within the ecosystem.

Figure 65. Riparian areas are one of the most productive and diverse ecosystems in the world. Many of them have been damaged by humans. People need to be aware of the importance of riparian areas and take better care of them.

Riparian areas provide habitat for countless species of wildlife. They also serve many other important functions. Soil and other materials that are washed from the land are trapped by both living and dead riparian vegetation. This helps purify water by preventing sediments and other pollutants (things that pollute) from flowing directly into the river. Aquatic plants and animals such as mussels also filter the water.

Figure 66. Riparian areas are important to wildlife but may be more so to humans. Healthy riparian areas with adequate vegetation help maintain clean drinking water supplies. They store water to prevent flooding of farmland and cities. They help prevent soil erosion.

The leaves of trees filter the air we breathe by removing dust

and other particles. These particles are washed to the ground when it rains. Leaves also absorb pollutants from the air. When on the ground, leaves trap moisture, keeping the water available for trees and other plants. When the leaves decompose, they add richness to the soil. This results in more plant growth.

Fallen leaves are the base of the food chain for aquatic organisms (living things) in streams and rivers. Logs, twigs, and other woody material called "snags" that have fallen into the stream creates habitat for invertebrates, amphibians, and small fish.

Trees along riverbanks provide shade. This helps keep the water from becoming too warm for fish and other aquatic life. Cool water is able to hold more oxygen than warm water.

Backwaters along rivers, creeks, and streams store water during heavy rains and spring snowmelt. This prevents all of the water from being carried into major rivers which can flood farmland and cities. Flood danger is also reduced by riparian plants because they absorb water. Plant roots hold soil in place to prevent erosion.

Trees and other vegetation along rivers support the riverbanks and keep them from washing away. This bank stability along the river helps to maintain good water quality by preventing soils from washing into the water.

Figure 67. "Snags" are what biologists call trees, logs, and branches that have fallen into rivers and streams. Snags can aid in stabilizing the riverbank as well as in providing excellent habitat for aquatic invertebrates, amphibians, birds, and fish.

Tourism is the second-largest industry in North Dakota, after agriculture. Millions of dollars are spent in the state every year by people who take advantage of outdoor recreational opportunities in the riparian areas of North Dakota. Activities include fishing, boating, canoeing, kayaking, swimming, hunting,

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camping, picnicking, bird-watching, viewing wildlife, sight-seeing, and taking photographs.

Riparian forests and other woodlands are important in the oxygen cycle. When people and animals breathe air, they take oxygen into their lungs and breathe out carbon dioxide. Trees and other green plants absorb carbon dioxide and produce oxygen that is necessary for life.

Figure 68. Since riparian areas are full of all types of wildlife, outdoor recreational activities that include wildlife are plentiful. Hunting and fishing are ways to learn about wildlife, and people can enjoy the foods which are gathered. Viewing wildlife and taking photographs are also great ways to see and learn about the great diversity of riparian areas.

Threats to Riparian Areas

During the last century (100 years) or so, thousands of acres of riparian area have been destroyed in North Dakota. Habitat destruction has resulted in the decline of wildlife, but maybe more significantly, in an overall decline in the health of our water resources. For example, a government report stated that half of the small watersheds that provide water to the Red River Basin are in need of restoration. The fertile farmland in that region has resulted in many agricultural fields being planted directly up to the edge of the water. This is unhealthy for the river or stream.

Figure 69. North Dakota is an agricultural state, and farming is an important way for many people make a living. If farming is done without caring about riparian areas, damage can be done. Riparian zones act as vegetative buffers near rivers and streams to prevent erosion, improve water quality, and provide habitats for all levels of life.

Human activity is responsible for major changes in riparian ecosystems. In the United States, it is estimated that 70 to 90 percent of the natural riparian ecosystems are gone. Agriculture has contributed to over half of these mature systems being damaged. Other causes

include hydrologic (water) modifications such as dams and vegetation removal for such things as housing developments.

Both the Garrison and Oahe Dams on the Missouri River destroyed thousands of acres of riparian habitat when the waters of their reservoirs flooded the land. Cottonwood trees need to be flooded from time to time in order for the seeds to sprout. The dams on the Missouri River now prevent the flooding needed for maintaining cottonwood tree populations.

Many smaller dams have also been built throughout the state. These dams have negative effects on aquatic wildlife such as preventing fish from moving freely from one part of the river to another.

One of the greatest threats to the rivers themselves is pollution that threatens water quality. When runoff from rainfall or snowmelt moves over the ground, it can pick up pollutants such as pesticides (chemicals for killing insects and other pests), fertilizers, and sediments. As the runoff enters a river or stream, these substances are deposited into the water. Fish and other aquatic wildlife may be harmed or killed by these pollutants and sediments.

Cattle grazing in riparian areas can cause problems if this activity is not managed properly. Heavy grazing on grasslands near rivers can result in soil erosion if not enough grass is left to hold the soil in place. Soil washed into the rivers causes a buildup of sediment in the river. This can harm fish habitat. Exposed soil also allows weeds, or unwanted plant species, to take over the area. Riparian forests can also be damaged by grazing cattle that eat and trample the understory.

Figure 70. Trees and other vegetation associated with a healthy riparian zone have taken years to establish. Removing the mature tree canopy can be the beginning of the end of a riparian zone. The pressure to convert a riparian area to something else is always there. Conservation agencies need to work with private landowners in order to maintain these areas in a natural state forever.

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Housing developments in riparian areas result in habitat loss. Several acres of wildlife habitat are destroyed for each home or business that is built beside a river. Also, when houses are located near riverbanks, fertilizers used to keep lawns green and oil from roadways can be washed into the river. Sometimes streams are even drained or filled to make room for new homes.

Figure 71. Livestock can do damage if left in riparian areas to graze. Trampling and grazing damage existing trees and prevent new ones from becoming established. Animal herds walking in the river or creek uproot vegetation, increase silt and sediment levels, and contaminate the water with body wastes.

Figure 72. Development, such as housing, in riparian areas can be damaging. Most of the mature trees are removed to allow for houses, driveways, and other structures. Maintaining mowed and manicured lawns generally means people use insecticides, weed killers, and fertilizers. Harmful chemicals wash from lawns into the river because there are no riparian buffer zones to absorb them.

The building of new roads and driveways requires removing trees and other vegetation that provides natural habitat. Also, fluids such as oil and other chemicals may wash off roads and pollute waterways. Roads also break up habitats and form barriers to many forms of wildlife movement. Each year, thousands of animals are struck by vehicles as they attempt to cross roads.

Pets that are allowed to run loose can be threats to wildlife. Dogs may chase wild animals, and cats can be destructive to bird populations.

Some riparian threats result from natural forces such as disease and invasion of unwanted species. Humans, however, can attempt to control these conditions. **Dutch elm disease** threatens the state tree of North Dakota, the American elm. The disease is carried from tree to tree by the elm bark beetle. Dutch elm disease has caused significant damage in the riparian forests of the Red, Sheyenne, and James River Valleys. The chance of spreading tree diseases can be minimized by not moving firewood or other infested tree materials from one location to another.

Aquatic nuisance species (ANS) pose a major threat to rivers and other wetlands. Aquatic nuisance species are non-native plants or animals that have come into an aquatic environment and have a harmful effect on that environment. One aquatic nuisance plant is **purple loosestrife**. This plant crowds out food and shelter for wildlife.

The **zebra mussel** is an aquatic nuisance species that has crowded out native mussels in some locations. Zebra mussels reproduce at a tremendous rate. They take over the food supply of native mussels, and the native mussels starve to death. Zebra mussels cause other problems, too. They plug water-supply pipelines and attach to objects such as boats and docks. The shells of these nuisance mussels have razor-sharp edges that can slice into skin, causing injury to people who touch or step on them.

Figure 73. Purple loosestrife is an aquatic nuisance species (ANS). This plant rapidly spreads in aquatic habitats competing with beneficial plants for space. ANS are species that have been introduced here from other places. They are also called "exotics."

Carp are aquatic nuisance species that compete with gamefish for space and oxygen. They also lower water quality by stirring up mud and other sediments from the bottom where they feed.

Some of the aquatic nuisance species that inhabit North Dakota waters were brought to the area accidentally by anglers, boaters, and animals. Others were brought by people who did not know that the non-native invading species would cause problems. Some people release goldfish or other fish into bodies of water. These fish can become aquatic nuisance species; therefore, they should not be released.

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Habitat destruction has caused declines in the populations of some riparian wildlife species. Some of the plant and wildlife species that inhabit riparian areas are threatened. The river otter is an example of an animal that almost became extinct because of overharvesting in the late 1800s. Today, river otters are slowly beginning to make a comeback in the state, but their greatest threat is habitat destruction.

The population of pallid sturgeons in the state has fallen so much that they are seldom seen today. The main reason for their decline is loss of habitat, resulting from human activities. The building of dams has had a significant effect on the habitats of both pallid sturgeon and paddlefish.

Figure 74. Carp are a minnow species that were introduced from Europe. They are one of the more familiar aquatic nuisance species (ANS) in our state since they are found in so many waters and seen by so many anglers. Carp can grow very large and compete with gamefish for space. Water can only hold a certain quantity of any fish (carrying capacity). If carp take up too much space, other fish species will be limited.

Paddlefish were abundant at one time in North Dakota. Because of changes to the rivers, their population has declined. A major factor in this decline has been the building of dams. Dams built across the Missouri River block paddlefish migration to their spawning grounds. **Spawning grounds** are places where fish deposit their eggs. If fish cannot reach their spawning grounds, they do not deposit their eggs.

The eggs of sturgeon and paddlefish are sought after because they can be sold as a food product called **caviar** (Kav-ee-are). This is a delicacy sold at a high price.

When wild animal parts are worth money, they must be managed very closely. Some people do not follow the law and overharvesting can occur. A **poacher** is a person who hunts or fishes without following the law. Wildlife are a sustainable resource when managed correctly, but poachers hurt the resource for everyone.

Personal watercraft and motorboats may be particularly harmful to wildlife in some areas. Pollution from gas or oil and loud motor noise may harm wildlife. Boat wakes (waves) can cause erosion to riverbanks and disturb the nesting of birds that have floating nests among water plants.

Serious consequences can occur when riparian wildlife and habitats are misused or destroyed. These include flooding, pollution, poorer water quality, a decrease in wildlife populations, and interference with recreational activities. Steps can be taken to prevent these processes from continuing.

Preserving Riparian Areas

At one time, most people assumed that riparian areas would always have the same unlimited supply of wildlife and other natural resources that existed originally. Today, many people no longer take riparian areas for granted.

Conservation means preserving natural resources by careful use and management of the resources. Among conservation goals for riparian areas are maintaining good water quality (clean water), preserving stream banks and vegetation, enhancing wildlife habitat, and maintaining or increasing wildlife populations.

Figure 75. Quality riparian areas take on many different shapes and sizes, depending on the size and course of the river or stream. It is important to know that riparian areas naturally establish a certain width of vegetation zone. This width is likely a good indicator of the size of zone that is healthy for the stream or river system.

Farmers and other landowners can take steps to make sure that they are not engaging in practices that would harm riparian areas. Good management is needed so that tilling (plowing) land, grazing cattle, using fertilizers and pesticides, and other activities do not have negative effects on streams or riparian areas.

Conservation agencies can assist landowners in taking action. This might include fencing cattle out of riparian areas or maintaining buffer zones so that negative impacts to water resources are minimized.

Homeowners in riparian areas can stop using chemicals and instead keep

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lawns in a more natural state. Native riparian plants can be planted, and non-native plants can be removed. Non-native plants can overtake native plants, and many wildlife species are not adapted to live with them. Dead trees can be kept as important habitat, and the understory can be maintained.

Figure 76. Removal of trees along a river changes the natural state of the woodland and disturbs the vegetation and wildlife. Trees with an understory and healthy forest floor are removed and replaced by turf grass. Since people fertilize grass and spray for insects, these pollutants enter the water. This can negatively affect aquatic insects, amphibians, fish, and drinking water supplies.

Cities can help by limiting the amounts of oil, road salt, pesticides, and other chemicals which go directly from the streets to the rivers. Trash is an ongoing issue in rivers and streams. Some people think that throwing trash into a river or stream will take it away to some "hidden" place. That place is usually downstream in someone's favorite fishing or swimming hole. Towns can also be significant contributors to the trash problem in rivers and streams. Trash, spilled oil, and pesticides used in and around homes washes down streets and into the sewer system, ending up in our rivers and streams.

Figure 77. Rivers and riparian areas are places where trash should never be dumped or left behind. Some people believe that this garbage can simply be carried away or "hidden" by moving water. When riparian areas such as sandbars are accessible by ATVs and vehicles, more habitat damage and trash result.

The use of motorcycles and all-terrain vehicles (ATVs), or four-wheelers, has increased dramatically in areas that were once inaccessible. These vehicles can damage riparian habitats. They can also be disturbing to both humans and wildlife.

Everyone, no matter what age, can participate in protecting and managing riparian areas. Becoming educated about conservation practices is the first step in this

process. The **North Dakota Game and Fish Department** and other wildlife and conservation agencies have information available on opportunities for becoming involved in conservation activities.

The **North Dakota Wildlife Action Plan** is a state program set up for the purpose of conserving fish and wildlife species and their habitats. An important part of this program is the riparian wildlife. The program focuses on species that have received little management attention in the past. Most attention had been previously given only to those species hunted, fished, or trapped. The North Dakota Wildlife Action Plan is designed to help prevent North Dakota's rare or declining wildlife from becoming endangered.

Citizens, like you, can call or write to senators, representatives, and city, county, or state government leaders to express concerns about the practices that tend to destroy habitats. Being informed, being aware, using common sense, and taking action all help the conservation effort.

Riparian areas contain a good portion of the woodlands in North Dakota. Some of these forested lands are open to the public (all the people) for hunting and outdoor recreation. They contain hiking trails, picnic areas, campsites, and fishing areas. Others are owned by private landowners, and access to these places needs to be requested by asking permission from the landowners.

Figure 78. Riparian areas can be severely damaged by all terrain vehicles (ATVs). This aerial photograph of a "designated" off-road vehicle area shows the result of what can occur to a riparian area after years of heavy vehicular use.

When participating in recreational activities, it is important to respect wildlife and their habitats as well as respecting the owners of these areas. Your knowledge of the importance of these areas can be passed on to these landowners.

Riparian habitats are fragile. The key to managing wildlife is protecting their habitats and the quality of the environment. The delicate balance between human activities and nature needs to be maintained.

The riparian areas of North Dakota are extremely valuable resources. These "streams of life" need to be improved and preserved!

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Comprehension

1. Why have riparian areas been called “streams of life”?

2. Name some important functions of riparian areas.

3. What has resulted in the significant decline of wildlife over the past century?

4. Which two large dams on the Missouri River destroyed thousands of acres of riparian habitat in North Dakota?

5. How can pets be a threat to wildlife?

6. Which aquatic nuisance species has crowded out native mussels, plugged pipelines, attached to boats, and caused injury to people?

7. Why do poachers steal paddlefish eggs?

8. What are some consequences that can occur when riparian wildlife and habitats are misused or destroyed?

9. What are some conservation goals for riparian areas?

10. How can homeowners in riparian areas help preserve wildlife habitat?

11. Who can participate in protecting and managing riparian areas?

12. Where is much of the state forest land of North Dakota located?

13. What is the key to saving wildlife?

Critical Thinking

1. What can you, as an individual, do to help save riparian areas?

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The Importance of Riparian Areas in a Nutshell

- Riparian areas are among the most productive ecosystems in the world.
- If one part of an ecosystem is changed or destroyed, it has an effect on everything else in that community.
- Riparian areas provide habitat, purify water, create oxygen, filter the air, serve as a food source, provide shade, reduce floods, and provide recreation opportunities.
- Numerous recreation and tourism activities occur in riparian areas.
- Habitat destruction in riparian areas has resulted in significant declines in wildlife.
- Thousands of acres of riparian land was destroyed by the building of two large dams on the Missouri River.
- Pollution is one of the greatest threats to rivers.
- Road building and housing developments result in habitat loss.
- Dogs and cats can be serious threats to wildlife.
- Both plant and animal aquatic nuisance species threaten riparian habitats.
- Some aquatic nuisance species entered North Dakota waters accidentally, and some were brought by people who did not know any better.
- Pallid sturgeons are so rare that they are seldom seen today.
- Dams across the Missouri River prevent paddlefish from reaching their spawning grounds.
- Riparian area conservation goals include maintaining clean water, preserving stream banks and plants, improving wildlife habitat, and increasing wildlife populations.
- The North Dakota Game and Fish Department and other agencies have information available on helping to preserve riparian habitats.
- Much of the state forest land is in riparian areas and is open to the public.

The Importance of Riparian Areas Vocabulary

Caviar:

- Eggs of paddlefish or sturgeon sold as a food product at high prices

Conservation:

- Preserving natural resources by careful use and management of the resources

Poacher:

- A person who hunts or fishes illegally

Spawning grounds:

- Places where fish deposit their eggs

Other Vocabulary I Want to Know:

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NORTH AMERICAN MODEL OF WILDLIFE CONSERVATION

Best effort to conserve and manage wildlife that the world has ever seen.

"The nation behaves well if it treats the natural resources as assets...

...which it must turn over to the next generation increased, and not impaired, in value."

— Theodore Roosevelt

Through history, countries in Europe evolved into systems of hunting and fishing where the public did not have access to wildlife. Hunting in North America is being threatened today and may potentially lead toward a European system benefiting only the wealthy. The following ***7 concepts*** *of the North American model are the basis upon which the North American system of hunting and fishing evolved.*

1. Wildlife is Held in Public Trust

Wildlife in North America is public property. North Dakota law further clarifies that the North Dakota Game and Fish Department manage the wildlife resource for the public.

2. Eliminating Commerce in Dead Wildlife

In the past, some hunters killed wildlife for personal profit. This led to the rapid decline of many wildlife species. Eliminating the marketing of dead game animals is one of the most important policies of wildlife conservation.

3. Allocating Wildlife Use Through Law

Every citizen in good, legal standing – regardless of wealth, social standing or land ownership – is allowed to participate in the harvest of wildlife within guidelines set by the public and lawmakers.

4. Hunting Opportunity for All

In North America, all citizens have the opportunity to participate in harvesting wildlife. Because of this opportunity, citizens feel a connection with wildlife and work toward conserving the resource for future generations.

5. Wildlife May Be Killed Only for Legitimate Reasons

Wildlife can be killed only for a good purpose and in a fair chase manner that provides sustainable populations. Legitimate reasons to harvest include food, fur and protection of life and property.

6. Wildlife is an International Resource

Wildlife is an international resource to be managed cooperatively by states. This policy is basic to international wildlife treaties as well as the broad-based, continental cooperation between professionals and conservation organizations. Cooperation is very important in managing wildlife such as waterfowl which use several countries in their migration.

7. Science is the Basis for Wildlife Policy

Science is the proper tool for managing wildlife rather than politics or popular opinion. This assures that public wildlife is managed by trained biologists and favors a hands-off policy by elected or appointed officials.

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