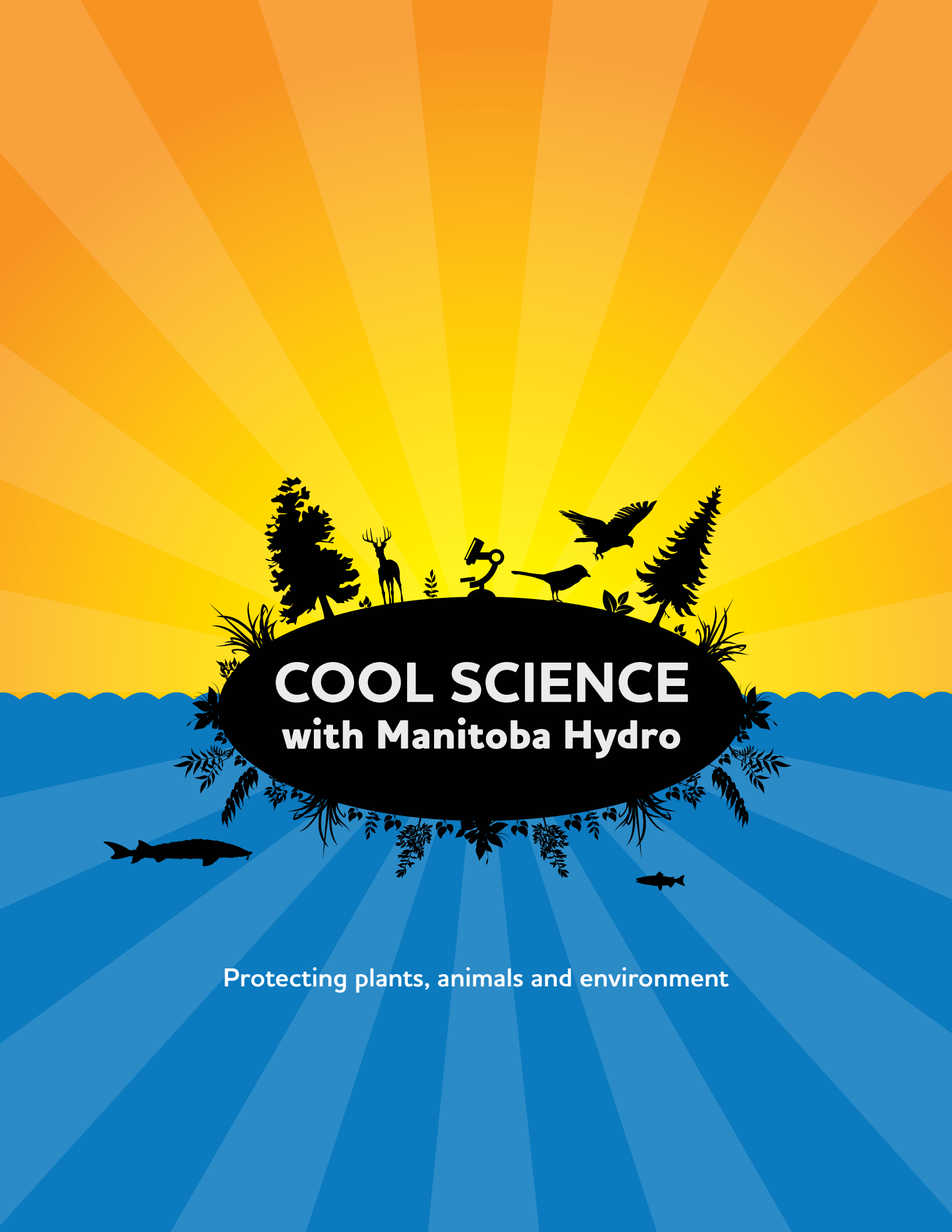




COOL SCIENCE **with Manitoba Hydro**

Protecting plants, animals and environment

Being an environmental leader means doing your homework

Manitoba Hydro is the province's only producer of **hydroelectric** power. This power is generated using flowing water. Manitoba Hydro is dedicated to maintaining healthy and sustainable habitats for bird, fish, mammal and plant species throughout Manitoba. Sustainability means acting responsibly so the resources on the planet will be able to support future generations. We can all do more to care for our planet.

We strive to be responsible leaders now so future generations can enjoy a healthy environment for years to come. In order to do this, we do research and take precautions to make sure we respect and protect wildlife.

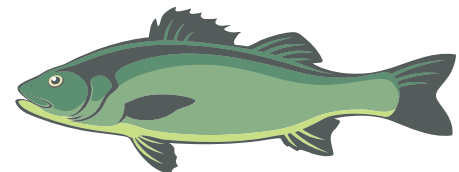
Here are a few examples of environmentally responsible practices

Planting trees: Manitoba Hydro funds tree planting projects for communities in Manitoba through its **Forest Enhancement Program**. Does your community or school need trees? Visit hydro.mb.ca and search Forest Enhancement to see if your project is eligible for funding.



Protecting wildlife: To produce and transmit electricity we use land and water. Manitoba Hydro works to protect **habitat** (the natural environment of plants and animals) from the effects of these activities. One example of this is supporting research on woodland caribou and wolf populations. This research helps with the planning and design of future generation and transmission projects.

Monitoring lakes and rivers: Manitoba Hydro and the Province of Manitoba monitor the health of waterbodies on our generating systems. This helps us understand the effects on aquatic ecosystems.



How do we know so much about the environment?

Scientists are constantly learning more about the environment by examining wildlife, plants, water and how people and animals have used the land throughout history. The scientists listed below take data they find through research and use this information to educate others about important species, habitats and artifacts in the area. They also use this information to highlight issues our environment may be facing.

Draw a line to connect the scientist to the thing he or she studies:

Ecologists

(Study ecosystems)

Ichthyologists

(Study fish)

Ornithologists

(Study birds)

Archaeologists

(Study human history and prehistory)

Botanists

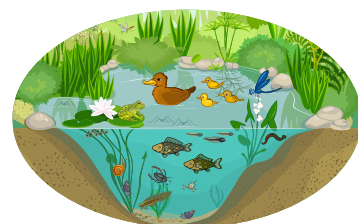
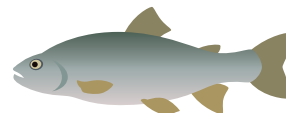
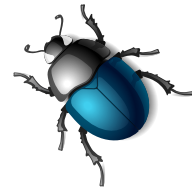
(Study plants)

Entomologists

(Study insects)

Limnologists

(Study lakes and rivers)

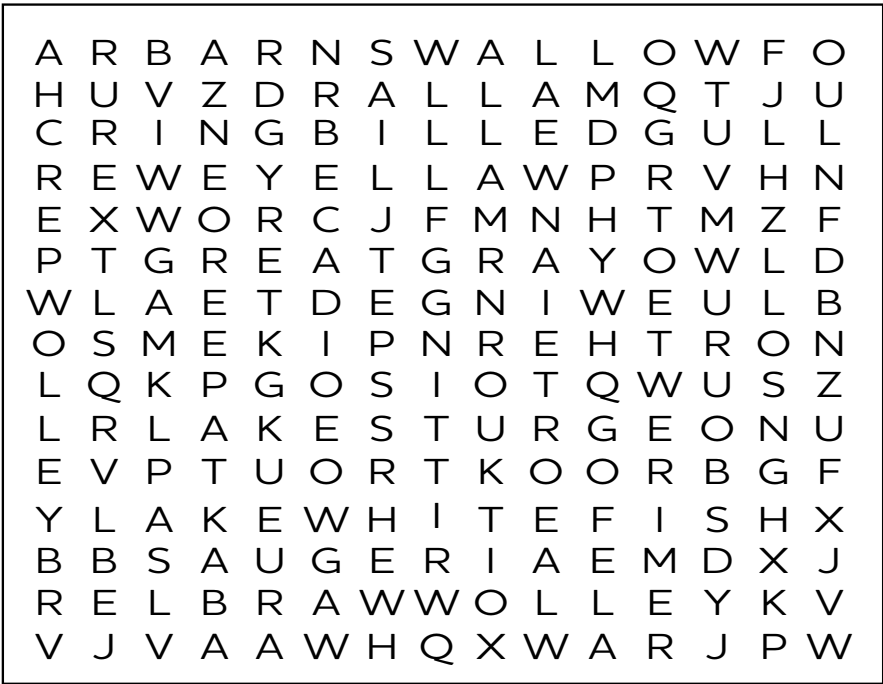


Monitoring methods

To get an understanding of the health and **biodiversity** (different types of plants and animals) of an area, scientists monitor many different things. These include:

- Monitoring the growth and distribution of trees and plants
- Measuring temperature, oxygen, pH, metal and nutrient levels in lakes and rivers
- Taking samples from aquatic environments to see what kinds of algae and bacteria are present
- Examining the movements of wildlife (like birds, caribou and sturgeon) with special tracking systems
- Analyzing the genetics of different species to see if they are related
- Making observations on the population size and activities of wildlife in an area

Word search



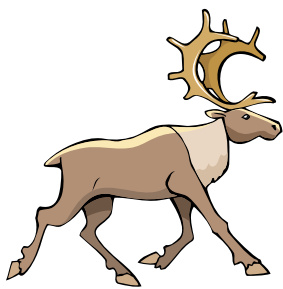
Can you find each of the different bird and fish species that are monitored by scientists in Manitoba? They may be written up, down, forwards or backwards.

Bird Species		Fish Species	
barn swallow	mallard	brook trout	sauger
blue-winged teal	ring-billed gull	lake sturgeon	walleye
crow	yellow warbler	lake whitefish	yellow perch
great gray owl		northern pike	

A-maze-ing movement

Tagging is a monitoring method that can help scientists track animal movements using special collars or tags that transmit signals. Tagging lets Manitoba Hydro see if hydroelectric development changes an animal's habits and show us the location of sensitive areas like breeding grounds, migration routes, calving areas, or places where animals come to eat. Collaring caribou has shown that some caribou move during the winter from the coast of Hudson Bay to the boreal forests. The forests protect them from the cold winds and provide a better food supply. With the information collected through tagging, sensitive areas can be protected.

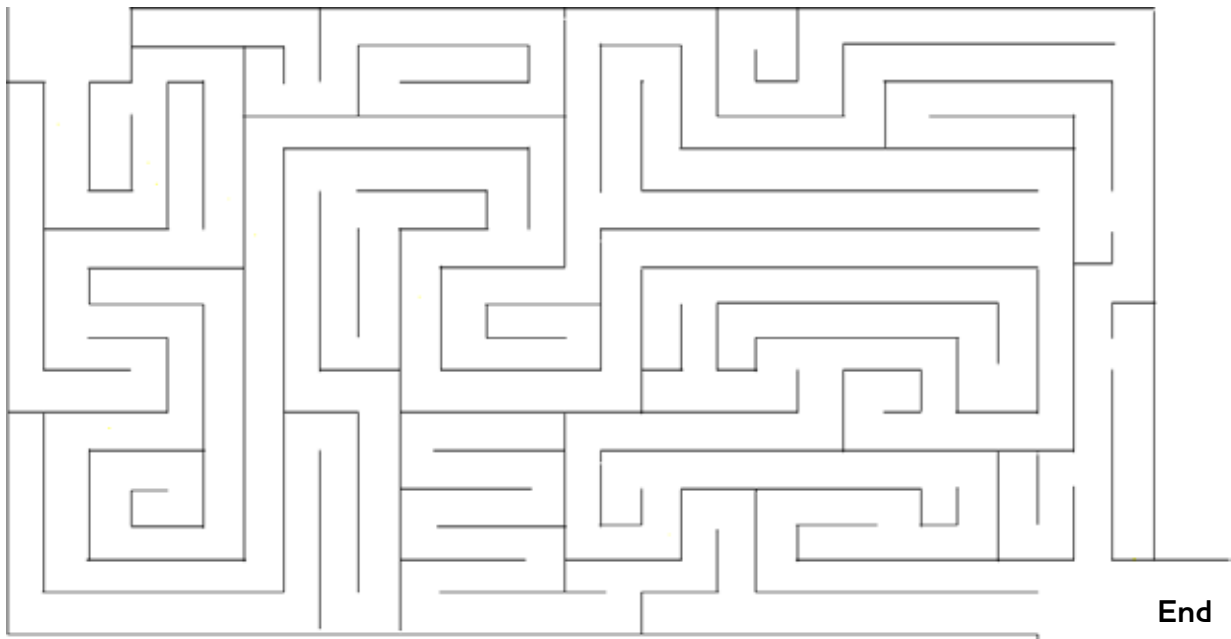
By examining animal movement patterns and habitat use, we can better understand how hydroelectric projects affect a species population, and how to manage these impacts in the future.



It's calving season. Help researchers track the movements of this caribou to her calving area.



Start



End

FUN FACT: Both male and female caribou grow antlers!

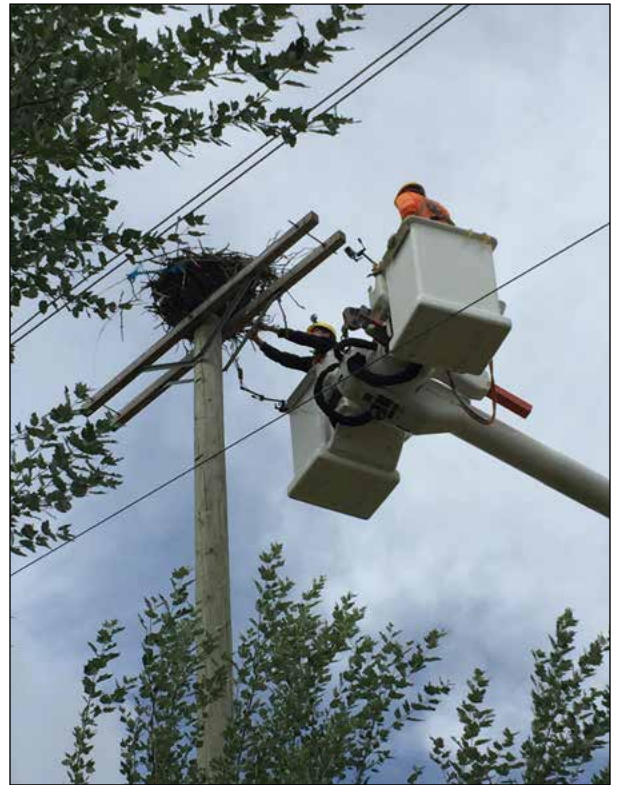


Birds, our feathered friends

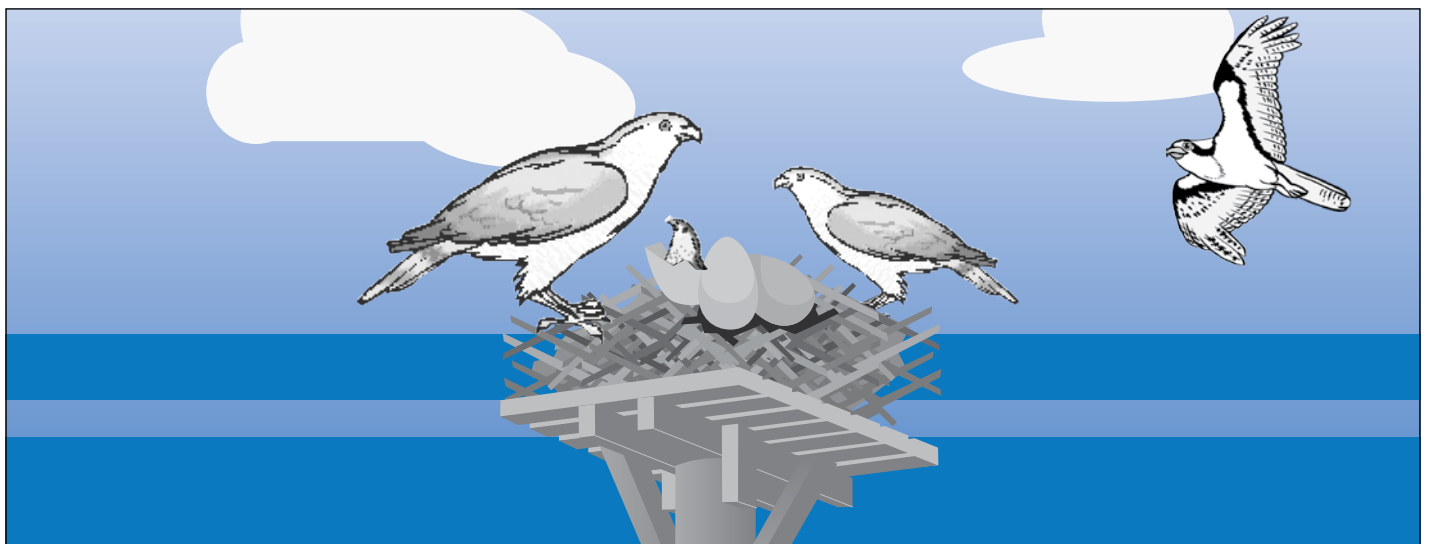
Have you ever noticed that we see some animals only during one season? Many animals move from one place to another at different times during the year. This is called **migration**. Animals migrate for various reasons. Some animals migrate for food, water, and protection. Birds like the yellow warbler or common tern migrate to stay warm in the winter. They may travel thousands of kilometres. It is remarkable that these birds are capable of coming back to the same place year after year.

Migratory bird species are protected by the Canadian government. In Manitoba, the bird nesting period may start as early as mid-April and last until late August. During that time, chicks and nests cannot be disturbed. Scientists examine bird use of an area before construction and suggest the best timing of construction or plant removal.

Birds of prey like osprey, hawks and eagles look for the highest point to build their nests. Sometimes, it is the top of a hydro pole. This can harm the birds, damage the pole, or interrupt electrical service for people.



Manitoba Hydro builds safe nesting platforms for birds, like the osprey, away from hydroelectric poles. Colour the ospreys.



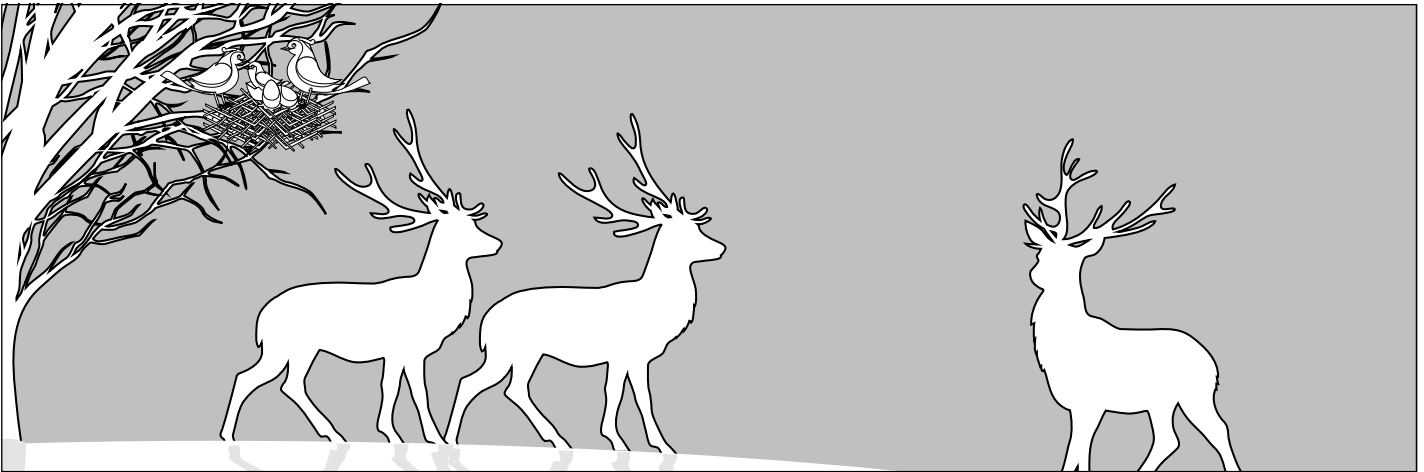
How does Manitoba Hydro help the environment?

There are many things we can do during construction which can help the environment stay healthy for years to come. Colour the examples of how Manitoba Hydro protects plants and animals during construction projects.

Build transmission lines and other facilities away from sensitive areas, where possible, and take precautions if working in these areas.



Schedule construction activities so they do not impact caribou calving or bird nesting, when possible.



Plant trees and vegetation to provide habitats for wildlife and to prevent shore erosion.



Forest rehabilitation

After hydroelectric development is complete, Manitoba Hydro plants trees and seeds in areas that were cleared for construction of these projects. Trees provide important habitat for animals and green spaces for people to use. Deciduous trees lose their leaves in winter. Coniferous trees have needle-like leaves that remain on the tree during winter.

Circle the deciduous trees.



White Spruce



Aspen
(Trembling Poplar)



Jack Pine



Black Spruce



Paper Birch



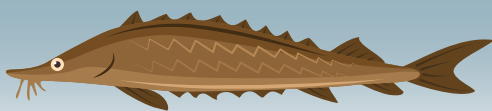
Bur Oak

Species spotlight: lake sturgeon

Although scientists study many different types of fish, one of the main species they research and monitor in Manitoba is lake sturgeon.

These fish are considered a heritage species because they are found only in specific areas, have unique life cycles, and are culturally important to the people and the history of Manitoba. Manitoba Hydro studies lake sturgeon because they can be affected by hydroelectric generating stations.

What makes lake sturgeon special?



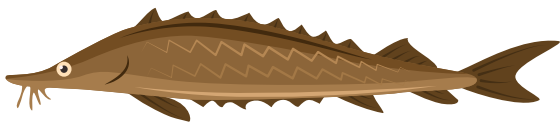
Today's lake sturgeon are descendants of a prehistoric fish and look similar to fossils from over 100 million years ago (back when dinosaurs roamed the earth).



Lake sturgeon are the largest freshwater fish in Manitoba. They can grow up to 2.5 m long and weigh over 140 kg. Although their average life span is 50 to 80 years, some lake sturgeon can live to be over 150 years old.



One of these lake sturgeon is different than the rest. Can you find which one?



Lake sturgeon have physical traits that set them apart from other fish. When they are young they have black splotches and bony modified scales called **scutes** on their sides. These markings help them camouflage with the lake bottom and the scutes make it hard for larger predators to swallow them when they are young.



Food for thought

Lake sturgeon do not have teeth. They suck up food like a vacuum cleaner with their tube-like mouths. Because of the location of their mouths, lake sturgeon are bottom feeders. This means that they primarily eat leeches, worms, mollusks, crustaceans, insects and other small fish found near the bottom of lakes and rivers.

This lake sturgeon is hungry

Circle the different sources of food scattered along the river bottom.



Small pieces of sand and silt called **sediment** can travel downstream from hydroelectric construction sites and form a layer at the bottom of rivers. Lots of sediment can be bad for fish habitats and can disrupt the growth of plants and algae which many animals feed on.

Manitoba Hydro uses techniques to help stop sediment from entering waterways and can create a safe environment for fish to **spawn** (lay eggs) and feed.

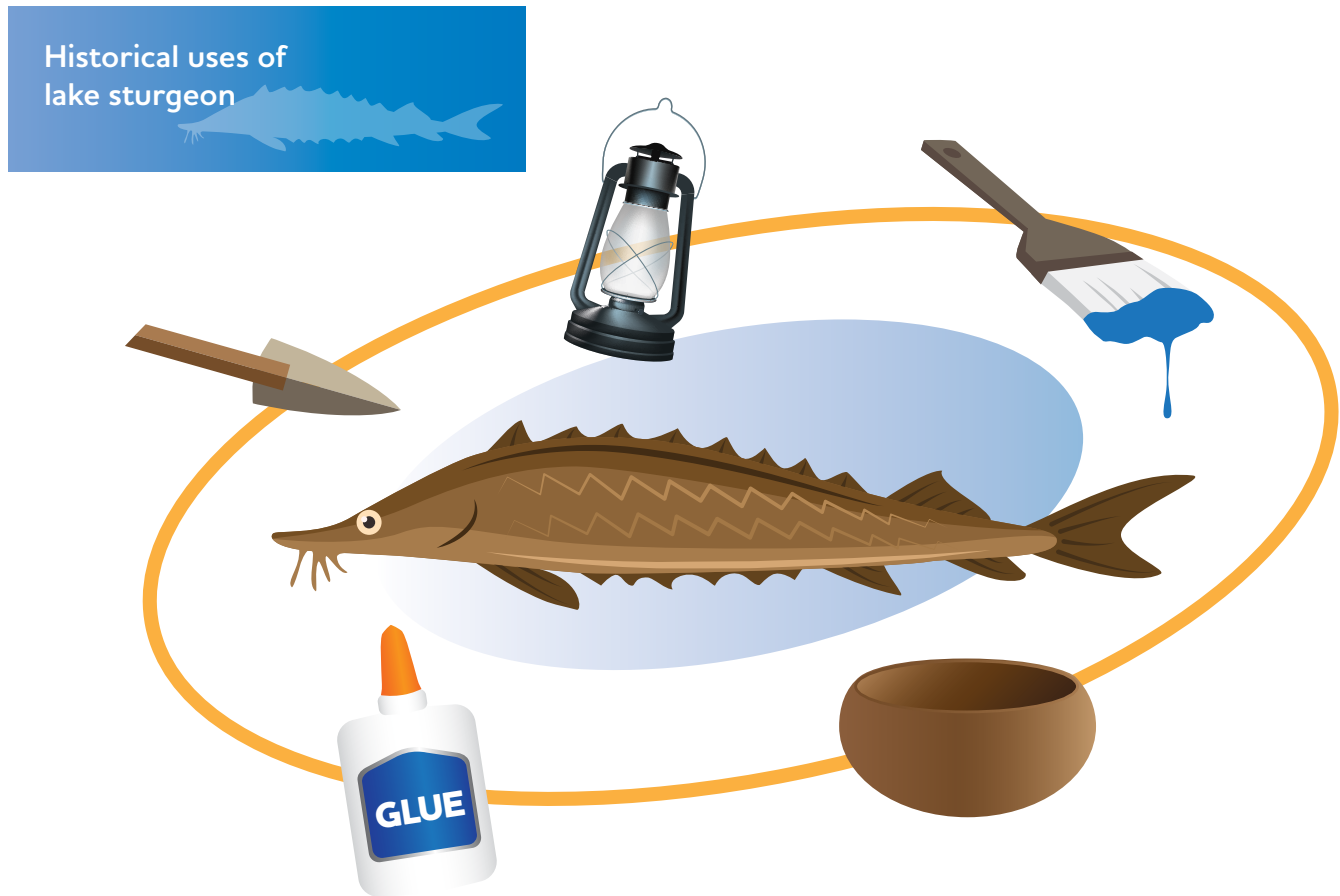
Lake sturgeon have fleshy whiskers called **barbels** located at the tip of their snout. These fish live in habitats where the water is murky, so they use these sensory barbels to locate food.



Historical and cultural importance

For centuries, lake sturgeon have held cultural importance to Indigenous communities. As part of many ceremonies and gatherings, Indigenous people would come together to harvest these fish from the lakes and rivers.

Lake sturgeon were an important food source for Indigenous communities. Tools, spearheads and arrowheads were made out of bones and cartilage from lake sturgeon. Other products like oil, glue, paint and containers were also made using parts of the fish body.



As more people immigrated to North America in the mid-1800s, there was a demand for a food called **caviar** (sturgeon fish eggs) and **isinglass** (a substance in a sturgeon's swim bladder used to make adhesive products). Due to commercial overfishing, the lake sturgeon populations decreased. Hydroelectric development has affected their habitat. Today, there is a small number of lake sturgeon left.

Recreational fishing is limited to catch and release to conserve what is left of the lake sturgeon populations. Sturgeon may only be harvested for food by Indigenous people.

Protecting the environment

Things like pollution, loss of habitat, loss of food and a lack of clean water supply can seriously affect the populations of both animal and plant species in the environment. If a species' habits change too drastically or if environmental conditions do not improve, the species may be at risk of becoming **endangered** over time.

This outcome can be changed. Using the information gathered through monitoring and research, we can develop ways of protecting the environment before, during and after the construction of generating stations and transmission lines.

Use these words to complete the story below:

rivers
minimize
grow
big

scientists
low
brine shrimp
habitats

at risk
fish hatchery
eggs
released

To help _ _ _ _ _ the impact that hydroelectric projects have on fish spawning areas, the Grand Rapids _ _ _ _ _ works to collect and fertilize _ _ _ _ _ from lake sturgeon and walleye (otherwise known as pickerel).

When the fish hatch, _ _ _ _ _ raise them on a diet of _ _ _ _ _ (also called "sea monkeys") until they are too _ _ _ for their tanks. Then the fish are _ _ _ _ _ back into lakes and _ _ _ _ _ where the fish populations are _ _ _.

That way, populations of these fish can _ _ _ _ _ naturally in new _ _ _ _ _ and are no longer _ _ _ _ _.



Zebra mussels: the aquatic hitchhiker

Zebra mussels are an Aquatic **Invasive Species (AIS)** in Manitoba. This means that they are not originally from Manitoba. In fact, they originate from western Russia, and were brought to Canada by ships that travelled across the Atlantic Ocean. Zebra mussels are now found across North America, including in some lakes and rivers in Manitoba. Invasive plants and animals can have negative impacts on local habitats.

The name “zebra mussel” is used to describe this animal because they are striped like a zebra. Zebra mussels are about the size of your fingernail. Females can produce up to 1 million eggs every year. This means that the number of zebra mussels in a waterbody can increase very quickly.



Zebra mussels are hard to remove because they have special threads which help them attach to hard objects in the water. These are surfaces such as boats, trailers, rocks, gravel, metal and other species of mollusks. To learn more about zebra mussels and cleaning your boat or watercraft visit Manitoba.ca/StopAIS.



Circle the objects that a zebra mussel might attach to:



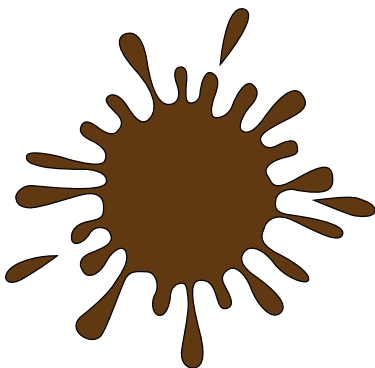
Rocks



Sand



Boat & Trailer



Mud

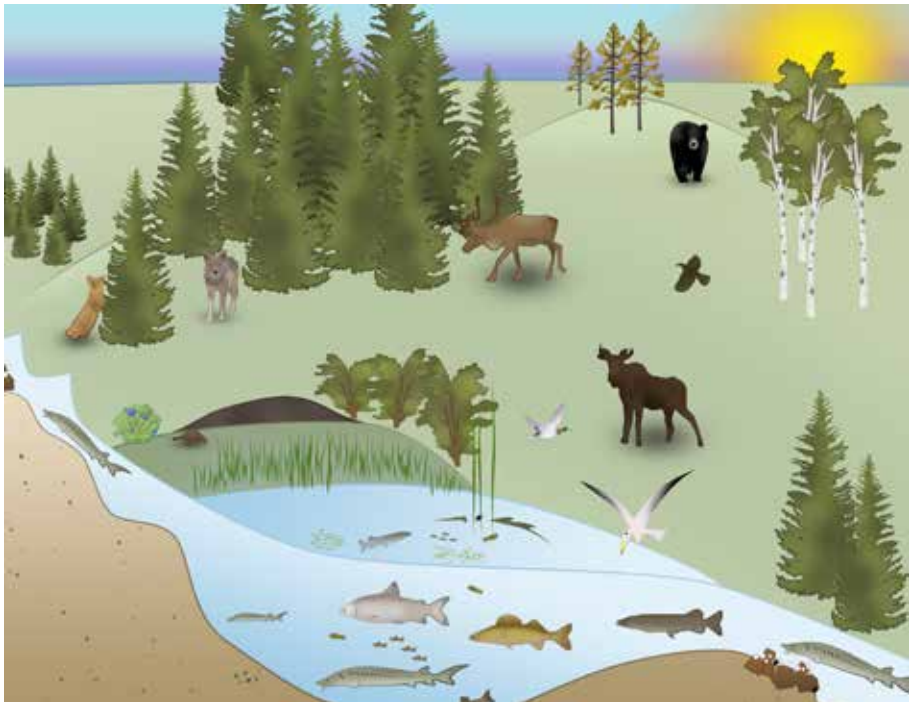


Shell



Shoes

Word puzzler



We know a lot about our environment thanks to the hard work of scientists and the monitoring they do. However, there is still a lot to be learned. We must always make an effort to respect and protect the wildlife and nature around us.

A	B	C	D	E	F	G	H	I	J
1	2	3	4	5	6	7	8	9	10

K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Match the number found under each blank space to the corresponding letter above. Fill in each of the blank spaces until the secret message is complete:

_20_8_5 **S** _3_9_5 **N** _3_5 _23_5 **D** _15 _20_15_4_1_25 _8_5 **L** _16 **S**
 _21 **S** _2_5 _2_5 _20_20_5 **R** _5 **N** _22_9_18_15 **N** _13_5 **N** _20_1 **L**
 S _20_5_23_1_18 **D S** _20_15_13_15 **R R** _15_23 **!**

Answer key

How do we know so much about the environment?



Botanists
(Study plants)



Archaeologists
(Study human history and prehistory)



Ecologists
(Study ecosystems)



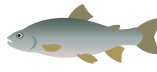
Entomologists
(Study insects)



Ornithologists
(Study birds)

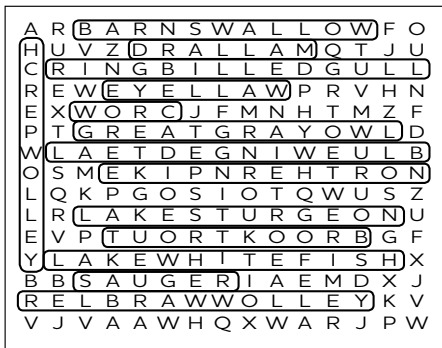


Limnologists
(Study lakes and rivers)

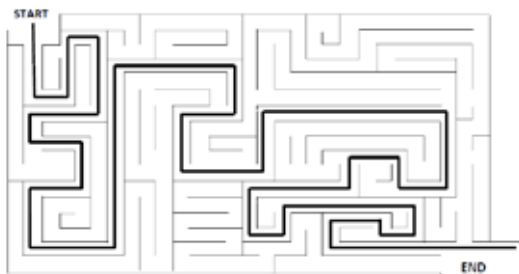


Ichthyologists
(Study fish)

Word search



A-maze-ing movement



Forest rehabilitation

Deciduous trees:



Aspen



Paper Birch

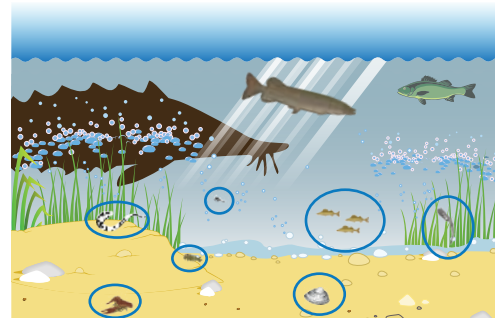


Bur Oak

One of these lake sturgeon is different than the rest



Food for thought



Protecting the environment

To help **minimize** the impact that hydroelectric projects have on fish spawning areas, the Grand Rapids **fish hatchery** works to collect and fertilize **eggs** from lake surgeon and walleye (otherwise known as pickerel).

When the fish hatch, **scientists** raise them on a diet of **brine shrimp** (also called "sea monkeys") until they are too **big** for their tanks. Then the fish are **released** back into lakes and **rivers** where the fish populations are **low**.

That way, populations of these fish can **grow** naturally in new **habitats** and are no longer **at risk**.

Zebra mussels: the aquatic hitchhiker

Zebra mussels can attach to:



Rocks



Boat & Trailer



Shell

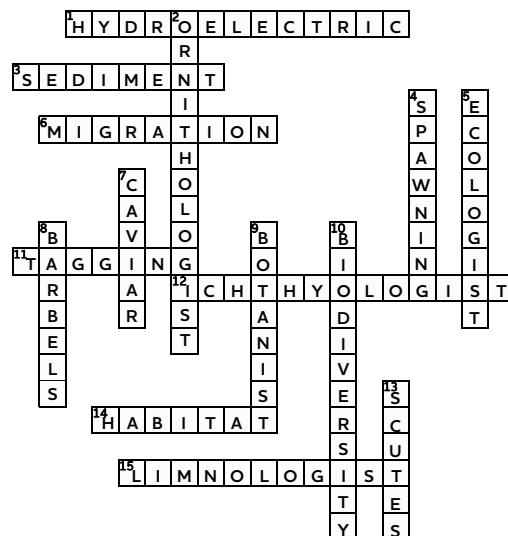


Shoes

Word puzzler

THE SCIENCE WE DO TODAY HELPS US BE BETTER ENVIRONMENTAL STEWARDS TOMORROW!

How much do you remember?



How much do you remember?

Complete the crossword below using terms from this booklet.



Across

1. The type of power Manitoba Hydro generates using water
3. Small pieces of sand and silt
6. Animal movements from one place to another
11. Monitoring method to keep track of an animal's movement
12. Someone who studies fish
14. The natural environment of a plant or animal
15. Someone who studies lakes and rivers

Down

2. Someone who studies birds
4. How aquatic animals, like fish, lay eggs
5. Someone who studies ecosystems
7. Edible sturgeon eggs
8. Sensory whiskers on a lake sturgeon's snout
9. Someone who studies plants
10. Different types of plants and animals
13. Modified scales on a lake sturgeon