Wild Migrations

From the icy waters of the High Arctic to the isthmus of the Panama Canal, wildlife species make incredible journeys across North America to survive.

Together, Canadian Geographic Education and the Canadian Wildlife Federation (CWF) now have the unique opportunity to present students with our first ever giant floor map of North America, studying 20 migratory species at risk in Canada.

Wild Migrations shows examples of each species' migration route, including seasonal movements as well as nesting, mating and feeding grounds. Please note that some of those routes were created using GPS data of tracked animals while other routes are simply representative of a species migrations. Ten (10) curriculum-linked learning inquiries allow students to explore how and why animals migrate, learn about species classification and understand conservation methods. Kindergarten to Grade 12 students will also discover North America's diverse geography, including ecozones and settlement patterns and their relationship to North American migratory species at risk.

Canadian Geographic Education and the Canadian Wildlife Federation are proud to make this innovative educational resource available to schools across the country. Comments on your experience with the map are welcome at info@cgeducation.ca and education@cwf-fcf.org.

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The Activities

In this guide, you will find 10 curriculum-linked activities designed for all Canadian students at the elementary and secondary levels.

1. On the Map

Students will discover North America from a political, physical and spatial viewpoint.

2. Moving On

Students will learn how, when and why different North American species migrate. Students will also examine factors that influence human migration and make connections to the migration of North American species at risk.

3. Classify This!

Students will learn how and why species are classified as extinct, extirpated, endangered, threatened or of special concern. Students will look for patterns and trends between species classification and habitat.

4. Canadian Conservation

Students will explore endangered species in Canada and what is being done to protect them. Students will investigate successful conservation projects and determine the role Canadians can play at a local, provincial/territorial, national and international level.

5. Working Together

Students will explore different international organizations that work together to protect species at risk. Students will learn about the complex decisions that must be made when trying to balance conservation and development on a local, national and international level.

6. Disaster Factor

Students will explore natural disasters that occur in North America, how they influence animal migration routes and investigate the connections between migration routes and natural disaster locations.

7. How Much is Too Much?

Students investigate impacts of human activity on migratory species. Students will learn about population growth and how it affects migratory species.

8. The Three Gs: GPS, GIS and Geography

Students explore the technology used to create the giant floor map and plot species' migration routes. Students will learn about different types of geography and connect them to the concepts of geographic thinking.

9. Who's Hungry?

Students will take a closer look at species at risk and explore their food sources. Students will learn about the factors that affect food sources and connect humans' interaction with the environment to food sources for species at risk.

10. Discovering the Oceans

Students will examine aquatic species that migrate in and around North America. Students will discuss factors that affect migration of aquatic species and the role they can play to protect these species.

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Contributors

The Royal Canadian Geographical Society

Paul R. Ruest
President

John G. Geiger
Chief Executive Officer

Connie Wyatt Anderson
Chair, Canadian Geographic Education

Mary Jane Starr
Director, Strategic Partnerships

Ellen Curtis
Education Program Manager

Sara Black
Education Program Coordinator

Nancy Kelly
Educational Consultant

Thomas Hall
Editorial Support, Education Materials

Adriana Cote
Writer

Canadian Geographic Enterprises

Gilles Gagnier
Chief Operating Officer and Publisher

André Préfontaine
Vice-President, Strategic Partnerships and Custom Content

Mike Elston
Director, Production

Michela Rosano
Associate Editor

Kendra Stieler
Production Coordinator

Grace Walker
Designer

Stephanie Small
Copy Editor

Jenny Chew
Designer

Martin Abran
Translator

Chris Brackley
Cartographer

Canadian Wildlife Federation

It is our mission to help conserve and inspire the conservation of Canada's wildlife and habitats for the use and enjoyment of all. Both the Canadian Wildlife Federation and Canadian Geographic Enterprises are proud to be a part of your wildlife education experience today.

1 On the Map

Learning objectives

- Students will discover North America from a political, physical and spatial viewpoint.
- Students will examine and compare different political regions in North America.
- Students will learn about physical regions in North America.

Time required

40-60 minutes

Grades

K-12

Materials

- Coloured pylons (20)
- Coloured chains (20)
- Hand-held legends (4)
- Flag cards (10)
- Species cards (20)

Set-up

Read over the cards and ensure the required materials are present. Independently explore the map to locate main political and physical features before introducing the lesson to your students.

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Introduction

Allow time for students to explore the map independently. Encourage them to use the hand-held legends to investigate the different land features, migration routes and countries labelled on the map.

Have your class identify political boundaries. Explain that a political map outlines both international borders and those within a country, such as provincial, territorial and state borders. Discuss the differences by asking students to stand on a state, province, territory and country. Test students' knowledge of Canadian geography by saying a province, territory or capital city and instructing your students to stand on it.

Arrange students in small groups and give each group a flag card. Have each group read the information on the back of the card, locate their country on the map and stand in it. As a class, discuss and compare its characteristics with other countries labelled on the map. Ask questions based on the information on the back of each flag card.

Development

Highlight North America's physical features on the map by instructing students to stand in what they feel is a different physical region of North America. Have students examine the colours used on the map to describe what the physical geogaphy of this region would look like. Explain that physical geography does not follow political borders; it is created by geological processes such as plate tectonics, receding glaciers and climate change.

Explain that North America can be divided into five main physical geographical areas: the Western Cordillera, the Canadian Shield, the Great Plains and Central Lowlands, and the Appalachians. Ask students to locate each area on the map and discuss the features of this landscape.

Next, have your students locate the smaller regions identified on this map such as the Gulf Atlantic Coastal Plain, Mississippi Delta, Isthmus of Panama, Davis Strait, Great Basin and Yucatan Peninsula. Test their geographic knowledge by having them search for more than one of the same geographic feature (e.g., lake, island, peninsula, basin, etc.).

Conclusion

Now draw students' attention to the examples of animal migration routes depicted on the map. Explain to students that these lines represent the migration routes of North American species at risk. Have students brainstorm what migration means, what it means to be classified as a species at risk and connections between the two. (For an in-depth look at migration, complete activity two, "Moving On." For more information on how species are classified, complete activity three, "Classify This!")

Give each student a different species card and have them locate their species' migration route on the map. Using the information on the back of the card and on the map, have students investigate the different physical and political regions their species travels through.

Extend your geographic thinking

Use the coloured chains provided in the trunk to label the equator (0° latitude), the Tropic of Cancer (23.5°N) and the Arctic Circle (66.33°N). Connect these locations with the different climates of each region. Introduce how seasons are connected to Earth's latitude by explaining the role of the sun during the summer and winter solstices in the Northern and Southern hemisphere.

Have students locate their hometown on the map, identify its latitude and make connections to how latitude affects the climate of that region.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Personal directions
- Maps as representations of local and distant places
- Map elements
- Latitude, longitude and the global grid

Essential Element 2: Places and Regions

- Physical and human characteristics of neighbourhood and community
- Physical and human characteristics of places and regions in Canada and the world

Essential Element 3: Physical Systems

- Basic components of Earth's physical systems
- Concept of an ecosystem at different scales
- Climate types
- Physical processes shape patterns in the physical environment
- Global patterns of wind and water
- World climate regions

2 Moving On

Learning objectives

- Students will learn how, when and why different North American species migrate.
- Students will examine factors that influence human migration and make connections to the migration of North American species at risk.

Time required

60-90 minutes

Grades

4-12

Materials

- Coloured pylons (20)
- Coloured chains (20)
- Teacher information card (1)
- Species cards (20)

Set-up

Read all the cards and ensure you are familiar with the map's scale and legend.

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Introduction

Ask students to locate and stand on different migration routes depicted on the map. If there are more than 20 students in your class, have some students get into pairs. Discuss the definition of migration and ask why a species might migrate. Explain that migration occurs when a species travels from one location to another, either seasonally or annually. Explain that the lines on the map showing species migration routes are not actually visible. Discuss with your students how animals know where to go and what they may experience when they stop along the way.

Have students discuss how they think their species learns how to migrate and how it knows where to go each time. Once students have shared their hypotheses, explain that different species learn to migrate in different ways. For example, the whooping crane is taught where to migrate by other cranes, while monarch butterflies are genetically programmed to follow their route. Others use internal compasses, which sense magnetic fields, such as the North Pole, or follow ocean currents and stars.

Ask students to highlight the three different symbols depicted on each species migration route and what each symbol means. Have students explore the geography of the places their species stops to nest or give birth, mate and feed, and discuss how these are reasons for a species to migrate. For example, explain that a species' summer habitat may get too cold in the winter, not have enough food or not be the ideal location for breeding. Ask your students to list other factors, using the map as a guide.

Have students talk about their species' migration with the class. Once all students have shared, give each an accompanying species card and compare what they said with the information on the card.

Development

Have students use the chains provided in the trunk or a body part, such as their hand or foot, to measure the approximate length of their species' migration route. For older students, have them use the scales on the corner of the map to calculate the approximate length in kilometres. Ask students which species travels the farthest, how species travel (walk, fly or swim) and how species are influenced by seasons.

Bring attention to a species' status, labelled on the back of your students' species cards. Have students get into groups based on their species' status (endangered, threatened or special concern). Ask students to discuss their species with their group. Have each group share their ideas with the class, and have a class discussion on the threats that species might encounter along their migration route.

Conclusion

Now that your students know some of the reasons why species migrate, ask them to relate this concept to humans and describe how humans migrate. Divide the class into new groups and have each mark Canada's provincial and territorial capitals with a pylon. Using the teacher information card, read the human migration scenarios and have students migrate on the map based on the scenario. For each migration, have students explain why they chose their destination. Connect and compare how, and where, humans migrate with the conclusions your class made earlier for the migration of species at risk.

Extend your geographic thinking

Once the map has left, have your students develop a list of North American species that do not migrate. Ask students to describe how these species adapt to their environment, where they live and why they do not migrate. Students can research these answers on the Canadian Wildlife Federation's website, www.cwf-fcf.org, and share them with the class.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Physical and political maps of the province, Canada and the world
- Latitude, longitude and the global grid
- Map types

Essential Element 2: Places and Regions

- Perceptions of places and regions
- Regions defined by multiple criteria
- Physical and human characteristics of places and regions in Canada and the world

Essential Element 4: Human Systems

- Patterns and processes of migration past and present
- Human settlement patterns and land use
- Regional development in Canada and the world
- Impact of human migration

3 Classify This!

Learning objectives

- Students will learn how and why species are classified as extinct, extirpated, endangered, threatened or of special concern.
- Students will look for patterns and trends between species classification and habitat.

Time required

40-60 minutes

Grades

4-12

Materials

- Coloured chains (20)
- Coloured pylons (20)
- Species cards (20)
- Teacher information card (1)

Set-up

Read over the cards and review the different classifications according to the Species at Risk Act on the government of Canada website (laws-lois.justice.gc.ca/eng/acts/S-15.3/page-5.html#h-9 and www.cosewic.gc.ca/eng/sct5/index_e.cfm). Ensure that the required materials are ready.

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Introduction

Give each student a species card. Have them locate and examine their species' migration route on the map. As a class, discuss any patterns and trends that exist between all species that are highlighted on the map. Next, ask students why, out of all the animals that live in North America, are these species highlighted? Explain that these species were selected by the Canadian Wildlife Federation because they are all classified as at risk, they all migrate and they are all found in or around Canada.

Discuss how migration can pose a risk to a species' survival. It is important to note that although certain species may experience similar stresses (climate change, urban sprawl, etc.), each species adapts differently. Some species can adapt quickly, some may take time, and others cannot adapt to environmental changes at all. As a result, Canada has legislation to help protect endangered or threatened organisms and their habitats, the Species at Risk Act (SARA). This act designates the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to identify and assess species conservation statuses. There are five classifications for species at risk:

Species of special concern: lives in the wild but may become threatened or endangered

Threatened species: lives in the wild and is likely to become endangered if steps are not taken to address factors threatening them

Endangered species: lives in the wild but is facing imminent extinction or extirpation

Extirpated species: no longer lives in the wild in a particular place, but does live in the wild somewhere in the world

Extinct species: no longer lives anywhere in the world

Development

Have students gather in groups based on how their species is classified (endangered, threatened, or special concern). Have each group discuss their classification, determine what it means and brainstorm potential reasons for why their species has this classification, focusing on when and whether they think human and/or environmental impacts are the cause. Refer to the teacher information card to highlight the many reasons why a species has this classification.

Have students locate the migration route for one of the species in their classification group and use the coloured pylons to highlight nesting/birthing, mating and known significant feeding grounds. While they are examining each route, ask groups to also examine the physical landscape, major cities and any familiar geographical features. Once groups have examined their species' habitat and migration route, ask each group to present three reasons they believe their species is classified in this way and to propose how its at-risk status could be addressed.

Conclusion

Explain that animals do not obey international borders when migrating or establishing habitats. To best protect all species, many different organizations (national and international) and governments must work together. Have each group brainstorm the types of organizations that have to work together to protect these species. What can students do to help? Allow time for each group to share their ideas.

Ask your students to define extinction and try to determine the causes of extinction. Ask your students what they can do to ensure their species doesn't become extinct. Visit the Canadian Wildlife Federation (cwf-fcf.org) and the COSEWIC (www.cosewic.gc.ca) websites for more information.

Extend your geographic thinking

Bring the focus back to your classroom and school. Look at a species that lives in, near or migrates through your community. Ask your students to think of ways they can help protect this species. Some ideas might include limiting the amount of human interaction with the species or planting certain types of vegetation for it to eat. Ask each group to think of a two-, five- or ten-year plan to protect their species.

Links to the Canadian National Standards for Geography

Essential Element 2: Places and Regions
- Perceptions of places and regions
- Regions defined by multiple criteria
- Physical and human characteristics of places and regions in Canada and the world
- Interdependence of places and regions

Essential Element 4: Human Systems
- Human settlement patterns and land use
- Types and patterns of human settlement
- Impact of human migration

Essential Element 5: Environment and Society
- Environmental issues
- Perceptions of and reactions to extreme natural events
- Limits and opportunities of the physical environment for human activities
- Global effects of human modification on the physical environment
- Global effects on the human environment by changes in the physical environment

4 Canadian Conservation

Learning objectives

- Students will explore endangered species in Canada and what is being done to protect them.
- Students will investigate successful conservation projects and determine the role Canadians can play at a local, provincial/territorial, national and international level.

Time required

40-60 minutes

Grades

4-12

Materials

- Coloured chains (20)
- Coloured pylons (20)
- Species cards (20)
- Ecozone cards (30)
- Conservation project cards (6)

Set-up

Ensure all required materials are in the trunk. Familiarize yourself with the cards. If possible, have students explore : cwf-fcf.org/en/explore-our-work/conservation.

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Introduction

Have your students stand around Canada on the map and identify the country's provinces, territories, major cities and physical features. Place a pylon on all the provincial and territorial capitals. Next distribute an ecozone card to each of your students. Have students examine the information highlighted on the card and locate their ecozone on the map. Ask students to share their ecozone's key characteristics with the class.

Distribute the species cards and have students examine their species' migration route and highlight nesting/birthing, mating and known significant feeding grounds. Ask your students to connect the migration route to Canada's ecozones and landscape, and ask them to identify any patterns they see between these species' migration routes and human settlement patterns, focusing on the major urban centres (pink areas) and Canada's capital cities. Discuss the types of human activities that may occur around their species' migration route and how this might influence their species (e.g., wind turbines, hydro electric lines, roads, pipeline corridors, etc.).

Development

Divide your class into six groups and give each a conservation project card. Have each group read the information on their card and locate the project on the map, highlighting the area with coloured pylons or chains. Give each group time to explore their project, examine the species that the project focuses on and its migration route, and then share what they learned with class. After each group has presented, discuss patterns and trends in each of the projects and why some require larger areas than others.

Conclusion

Students will now expand their focus to the rest of North America. Explain to students that because species do not follow political borders, it is important for Canadians to support efforts that happen outside the country and maintain a relationship with international organizations when addressing species at risk.

Using the same groups as before, have students choose a new species highlighted on the map that migrates outside Canada. Have each group brainstorm a cross-border conservation project to protect it. Give students time to share their ideas with the rest of the class. Pose questions to the students such as: Why did they choose that particular area for the conservation project? Does or could the conservation project involve more than one species? How much human interaction do they think will be necessary to ensure this project is successful? Students can place a pylon to mark where the cross-border conservation project exists and use chains to outline its area. For older students, encourage them to use the scale on the map to calculate the area their conservation project covers.

Extend your geographic thinking

A great connecting lesson is activity five, "Working Together," which examines how different international organizations work together to protect species at risk.

Once the map has left, have students choose one of the species at risk in their province or territory and brainstorm ways they can take action on a local level. Encourage students to research a local, provincial or territorial organization and participate in an initiative.

Links to the Canadian National Standards for Geography

Essential Element 2: Places and Regions

- Regions defined by multiple criteria
- Physical and human characteristics of places and regions in Canada and the world
- Factors that influence people's perception of places and regions
- Interdependence of places and regions
- Political and historical characteristics of regions
- Regional analysis of geographic issues and questions

Essential Element 5: Environment and Society

- Environmental issues
- Human adaptation to the physical environment
- Limits and opportunities of the physical environment for human activities
- Use and sustainability of resources

5 Working Together

Learning objectives

- Students will explore different international organizations that work together to protect species at risk.
- Students will learn about the complex decisions that must be made when trying to balance conservation and development on a local, national and international level.

Time required

30-45 minutes

Grades

6-12

Materials

- Coloured chains (20)
- Coloured pylons (20)
- Perspective cards (4 x 5 cards)
- Scenario cards (4)
- Inflatable globe (1) (optional)

Set-up

Place four pylons (one of each colour) and one pile of perspective cards on each corner of the map.

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Introduction

Review the major concepts of migration, conservation, development, areas of high diversity and species at risk with your class. Ensure that all students understand each term, how they work together and the patterns and trends that exist among them. Have students spread themselves out on the map, choose one location and examine what the landscape is like. Next, have students contemplate how their selected area is connected to the migration routes of certain species, urban areas or areas of high diversity. Use the inflatable globe and toss it to each student, allowing them to share their thoughts with the class on why their selected area is important. After sharing, have that student toss the ball to another student until everyone has shared their ideas. Another activity to test your student's understanding would be "Simon Says".

Development

Reintroduce and define the term conservation and remind students that it refers to the preservation and protection of a natural environment. If there is a conservation area in your community, use it as an example to help define this term.

Divide your class into four groups and assign each a different corner of the map. On each corner they will find four pylons (red, blue, green and yellow) and a set of perspective cards. Tell students that each pylon colour represents a different environmental issue in North America. Green represents a forest-related issue, red a pollution issue, blue a freshwater issue and yellow a marine issue. Have students place each coloured pylon on an area that they think experiences each type of issue. Once all pylons have been placed, discuss any patterns and why groups marked these specific locations. Connect the highlighted places with the migration routes and ask students how we can ensure the protection of these species.

Conclusion

Have students gather their coloured pylons and head back to their corner. Explain to students that each group will tackle a fictional conservation issue in North America and develop a plan of action that addresses multiple points of view equally. Give each group a different scenario card and a set of perspective cards.

Have each group read over their conservation issue, locate their highlighted area on the map using pylons or chains and define their problem. Explain to each group that they now must create a conservation action plan that provides a solution to their issue. This plan must try to satisfy the needs of the multiple viewpoints of the individuals highlighted in their perspective cards.

Have each group present their scenario, perspectives and proposed solution to the rest of the class, using the map to illustrate their ideas. All other groups must ask at least one question to the presenting group. Once all groups have presented, discuss how effective each strategy is and how students feel about the process of trying to appease all viewpoints. Ask groups to explain what they think happens when all viewpoints are not heard and respected. Be sure to touch on the international aspect of conservation negotiations and how this may complicate discussions.

Extend your geographic thinking

Once the map has left, research how organizations such as the Canadian Wildlife Federation work to advocate for species at risk. Explore the CWF's educational programs and ask your students to think of another way in which an organization could help wildlife conservation and awareness efforts.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Distribution of major human and physical features at country and global scales
- Major cities of the province, Canada and the world
- Map projections

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions in Canada and the world
- Concepts of formal, functional and perceptual regions
- Critical issues and problems of places and regions
- Regional analysis of geographic issues and questions

Essential Element 5: Environment and Society

- Limits and opportunities of the physical environment for human activities
- Global effects of human modification of the physical environment
- Global effects on the human environment by changes in the physical environment

6 Disaster Factor

Learning objectives

- Students will explore natural disasters that occur in North America.
- Students will investigate the connection between species' migration routes and the locations of natural disasters locations.
- Students will explore how human development affects animal migration routes.

Time required

60-75 minutes

Grades

4-12

Materials

- Coloured pylons (20)
- Coloured chains (20)
- Species cards (20)
- Natural disaster cards (8)
- Migration impacts quiz (1)

Set-up

Ensure that all of the required materials are in the trunk. Familiarize yourself with the cards and the quiz.

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Introduction

Discuss how humans interact positively and negatively with the environment. Ask your class questions, such as: How can human activities such as building roads, pipelines, hydro-electric dams and high-rises affect the environment? How can these things affect migration routes? What are some human activities that influence migration either directly or indirectly?

Next, ask your students questions from the migration impacts quiz. Have students show their answers on the map using pylons or by standing in the correct location. Discuss each answer and how it may affect a migratory species. Ask students to think about the development that happens in order for humans to live comfortably. Students should mention things such as the expansion of railways, roads and other infrastructure (industries, farms, etc.). Next, ask students to brainstorm ways that natural phenomena can influence a species' migration, such as a flood, drought or ice storm, and identify potential disaster locations on the map. Ask them: Where would tornadoes occur? What about hurricanes? What about forest fires and drought? Ask students whether these natural occurrences would have more or less of an impact than human development on species at risk.

Development

Divide students into eight small groups and give each a disaster card. Each card identifies a different type of natural disaster that can occur in North America. Be sure to remind students that the disasters examined in the cards are not the only kind of natural disasters that occur in North America. Using the coloured chains and pylons provided, ask each group to read the information on their card and outline an area where they think their disaster would occur. Have them explain their decision.

Next, bring attention to the species migration routes depicted on the map and give each group a different species card. Have students read their card, locate the species' habitat on the map and review how and where it migrates. Ask each group whether their species' migration could have been affected by any of the disasters outlined on the map (all groups should say yes) and explain the potential impacts. Remind students that some of these routes are just representative of a species migration and even if a disaster doesn't occur on a specific route, it can still affect a nearby migratory species. For example, a natural disaster could have caused a decrease in food supply, destroyed breeding grounds, affected movement, etc. Again, remind students that the species on the map are at-risk and have them focus on what that means.

Conclusion

Now that students have explored the ways in which natural disasters can negatively affect migratory routes, ask your class to brainstorm ways in which people can help species at risk recover after a natural disaster. Divide students into pairs or small groups, and have each group choose a different species at risk and stand on its migration route. Have each group choose one location on their species' migration path and identify the role humans can play in helping to protect their species from potential natural disasters at that location. Allow time for each group to share their information with the class. Although the species are different, ask students if some groups had similar action plans and what role students can play locally.

Extend your geographic thinking

Over the millennia, the Earth's climate has undergone numerous natural changes. Today, human activity and natural processes are drastically changing the climate, causing temperatures to rise and weather patterns to change. Using the map, have your students brainstorm and discuss the role of climate change and its effects on the natural environment and animal migration patterns (e.g., rising water temperatures can impact fish species, more frequent and intense flooding can impact habitats, declining sea ice can impact northern species). Ask students how natural disasters will change and if new disasters may arise with continual climate change.

Links to the Canadian National Standards for Geography

Essential Element 2: Places and Regions

- Perceptions of places and regions
- Regions defined by multiple criteria
- Physical and human characteristics of places and regions in Canada and the world

Essential Element 3: Physical Systems

- Climate types
- Extreme natural events
- Physical processes shape patterns in the physical environment
- Causes and patterns of extreme natural events

Essential Element 4: Human Systems

- Patterns and processes of migration past and present
- Human migration patterns

7 How Much is Too Much?

Learning objectives

- Students investigate impacts of human activity on migratory species.
- Students will learn about population growth and how it affects migratory species.

Time required

60 minutes

Grades

4-12

Materials

- Coloured chains (20)
- Coloured pylons (20)
- Species cards (20)
- City cards (7)

Set-up

Read all cards and familiarize yourself with the content. Locate the seven highlighted cities on the giant floor map.

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Introduction

Have students stand on a city they have visited. Ask them to describe how the city was organized and how this city preserved the surrounding environment. Next, ask students to stand on one of the top six most populous cities in Canada (Toronto, Montreal, Calgary, Ottawa, Vancouver and Edmonton) and note any patterns or trends they notice about the location of these cities (most are located near the U.S. border and are highlighted in pink).

Standing on their Canadian city, have students imagine what would happen if the city's population suddenly grew by 10,000 people. Discuss what would be needed to accommodate an increased population and what issues might arise. Introduce the concept of overcrowding and discuss how the number of people who live in one space has an input on the infrastructure needed to support them. Next, connect overcrowding to wildlife and plant species. Ask your students to list any impacts that higher human populations can have on species, particularly those already classified as at risk. Consider issues such as light pollution, waste disposal, recreational development, infrastructure development, etc. Explain to students that many species at risk in Canada are located near densely populated areas.

Development

Divide your class into seven groups and give each a city card. Instruct each group to find their city on the map and take note of the species found near it. Next, tell each group that their cities have recently seen a huge increase in population, 500,000 new residents, and must accommodate this. Using the guidelines on the back of their city card, have each group act as city planners and determine the best way to accommodate these new residents while doing their best to preserve the surrounding environment. While groups are doing this, ensure that they keep in mind the effect their plan will have on the species at risk in the area and how the physical features of the landscape will affect construction. When all groups are ready, have each present their plan to the rest of the class, using the map to demonstrate.

Once all groups have presented, discuss the additional resources needed to facilitate the growth of these cities. Ask students to consider the additional energy resources and building materials required to support this type of growth. Have students stand around the border of Canada and see if they can locate the areas responsible for the country's primary industries (e.g., energy, timber, minerals, agriculture, etc.). Have your students roughly outline these areas with coloured chains. Discuss how increased populations in their cities would increase the area affected by natural resource development. With a different colour of chain, ask your students to increase the size of these resource areas to better reflect the needs of their larger cities.

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Conclusion

Highlight the other countries in North America and have students connect which countries have similar industries to Canada. Ask students to choose a different species at risk, trace its migration route and determine which industries and human development activities may influence its route.

Discuss what will have to be done to ensure that, if the human population in North America continues to grow, their species at risk does not become extinct. Finally, discuss whose responsibility it is to ensure that species are protected. Focus on the critical role that international collaboration plays in the protection of at-risk species.

Extend your geographic thinking

The current global population is around seven billion. Within 50 years, Earth's population is expected to exceed nine billion people. Use these facts as a starting point to discuss the importance of protected areas and how governments can work together to ensure that current species at risk do not continue to decline. Have your class research how areas become protected and propose a new protected area.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Location of major human and physical features on Earth
- Distribution of major human and physical features at country and global scales

Essential Element 4: Human Systems

- Population characteristics of the province and Canada
- Human settlement patterns and land use
- Population density, distribution and growth rates
- Types and patterns of human settlement
- Regional development in Canada and the world

Essential Element 5: Environment and Society

- Human modification of the physical environment
- Environmental issues

8 The Three Gs: GPS, GIS and Geography

Learning objectives

- Students will be able to plot points, identify land features, calculate locations using longitude and latitude coordinates, and find the distances between destinations and along species migration routes.
- Students will learn about the technology used to create the giant floor map and to plot species migration routes.
- Students will learn about different types of geography and connect them to the concepts of geographic thinking.

Time required

60-75 minutes

Grades

6-12

Materials

- Coloured chains (20)
- Coloured pylons (20)
- Teacher information card (1)
- Geography perspective cards (4)

Set-up

Place four pylons of the same colour on each corner of the map and review the teacher information card.

.../continued

Introduction

While students are exploring the map, ask them: How are maps made? What must you consider when making a map? What are the five key elements of every map, and can you locate them (title, scale, north point, legend and border)? Ask students how maps were used in the past and today. Use this as the starting point for a discussion about the use of GIS in map-making.

Use the teacher information card to define GIS and list some of the ways that geographers use it. Ask students what various occupations use GIS daily. Next, define GPS and discuss with your students the differences between GPS and GIS, using the teacher information card as a guide. Using various props from the trunk, have students gather into small groups and use a prop to highlight an additional layer on the map. This layer can be a personal layer (where they live, where a family member lives, etc.) or a factual layer (longest river in Canada, largest mountain, etc.).

Development

Have your class explore the map and locate an area of high diversity (i.e., high traffic areas, common feeding or breeding grounds, etc.) related to the 20 highlighted species. Some focal areas can be the Bay of Fundy, Vancouver Island, southern Ontario, the Mackenzie Delta and the Caribbean. Explain to your class that the Canadian Wildlife Federation has done extensive research using GPS to track the movement of different species and has developed a greater understanding of the migration routes of species at risk. Highlight the caribou migration route and point out how its path is more angular than that of the marine animals displayed on the map. This is because researchers were able to track the exact locations of the caribou using GPS technology.

Next, divide students into four groups. Each group is to plot information on the map related to a different geographic subject using the coloured pylons. Together, each colour will act as a different layer, similar to how GIS technology is used to make maps. Distribute a geography perspective card to each group, allowing time for students to read about their type of geography subject and plot key areas of interest on the map.

The Three G's: GPS, GIS and Geography

8

Conclusion

Have each group select a spokesperson to present their geographic perspective and share what they have learned with the class. Have each group define their type of geography and explain why they placed their pylons in their selected locations. What conclusions can students draw from these additional layers added to the map? Ask students to look for connections between each subject and layer and have a class discussion highlighting the main concepts of geographic thinking: spatial significance, patterns and trends, interrelationships and geographic perspective.

Extend your geographic thinking

GPS tracking is used extensively for wildlife research. Introduce Project Noah (projectnoah.org) and iNaturalist (inaturalist.org) to your students. Explain that these are tools that encourage people to document wildlife and become better connected with the natural world. After the map leaves, have your students become free members of the organizations and use their new understanding of GIS and GPS to learn about the natural world, connect with the global community and explore.

For additional mapping projects you can do with your class, go to the Canadian Wildlife Federation website (cwf-fcf.org) and take part in Geocache, Track Your Walk for Wildlife and much more.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Distribution of major human and physical features at country and global scales
- Locational technology (including remote sensing, GPS, GIS)
- Map projections for specific applications

Essential Element 3: Physical Systems

- Physical processes shape patterns in the physical environment
- Ecozones
- World climate regions
- World patterns of biodiversity

9 Who's Hungry?

Learning objectives

- Students will take a closer look at species at risk and explore their food sources.
- Students will learn about the factors that affect food sources.
- Students will connect humans' interaction with the environment to food sources for species at risk.

Time required

40-60 minutes

Grades

2-8

Materials

- Coloured pylons (20)
- Coloured blocks (100)
- Species cards (20)

Set-up

Read over the required cards and ensure that all the materials are ready. Explore the map to locate its main political and physical features before introducing it to your students.

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Introduction

Review the concept of migration with your students, highlighting the migration routes on the map and discussing any patterns and trends they see. Explain that migration occurs for many reasons and in many ways, but one driving factor in all migratory species is the search for food. Divide your class into small groups, give each a species card and have each group locate their species' migration route on the map. After reviewing the information on the back of their card and on their migration route, have students locate a feeding ground for their species and discuss any patterns they see in relation to other species at risk displayed on the map.

Next, ask groups to line up from west to east on the map based on the size of one animal in their species (the smallest animal on the west and the largest on the east). Ask students to take one step forward if they think their animal eats the most food. Now have students take a step forward if they have a migratory species that migrates in groups. Bring attention back to the migration paths of each species at risk and have a class discussion on how even very small species, such as the monarch butterfly, require a relatively large amount of food while migrating.

Development

Ask students how human interaction with the natural environment can affect the food source of a species at risk. Distribute the coloured blocks evenly to each group. Have groups locate the starting point of their migration route and follow it, paying special attention to the distance travelled, number of animals that travel together and how long it takes to migrate or how often the species migrates. While students are examining their species' migration route, ask them to discuss areas where human interaction may alter its food supply. Things to consider that could be researched off the map would be fisheries, hydro dams, and large scale agriculture. Using the coloured blocks, have students trace their migration route, placing blocks where they feel humans intersect with their species' migration and affect their food source. Have students place one coloured block where there is a minor impact, two blocks for medium impact and three blocks for high impact. Students can highlight as many places along their route as they

choose.

Conclusion

Once all groups have finished highlighting their human impact areas, have each group share their migration route and their key points of concern with the class. Highlight major patterns and trends. As a class, select five species that pose the greatest concern (i.e., for which species at risk has human interaction caused the greatest threat to their food source?). Finally, discuss how humans can contribute to the protection of species' food sources.

Extend your geographic thinking

Many jurisdictions are working to protect the food supply of species at risk. For example, New Jersey, a key stopping point for red knots, has made it illegal to harvest horseshoe crab, the species' primary food source. After the map leaves, have your students research different initiatives to protect the food sources of migratory species at risk and discuss how your students can help.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms
- The globe as a model of Earth
- Map elements
- Spatial elements of point, line and area
- Location of major human and physical features on Earth
- Major countries of the world

Essential Element 3: Physical Systems
- Concept of an ecosystem
- Ecozones
- World patterns of biodiversity

Essential Element 5: Environment and Society
- Human modification of the physical environment
- World patterns of resource distribution and utilization

10 Discovering the Oceans

Learning objectives

- Students will examine aquatic species that migrate in and around North America.
- Students will discuss factors that affect migration of aquatic species and the role they can play to protect these species.

Time required

40-60 minutes

Grades

4-12

Materials

- Coloured chains (20)
- Coloured pylons (20)
- Species cards (20)
- Ocean current card (1)
- El Niño and La Niña information card (1)
- Aquatic quiz (1)

Set-up

Familiarize yourself with the terminology in this activity and ensure all of the required trunk contents and materials are present. Separate the nine aquatic species from the species card set and place the remaining cards back in the trunk.

.../continued

Introduction

Allow time for students to explore the map independently, paying special attention to the aquatic migratory species. Divide your class into nine groups and give each an aquatic species card (American eel, leatherback sea turtle, North Atlantic right whale, sockeye salmon, bowhead whale, Atlantic salmon, basking shark, grey whale, eulachon). Have each group place a coloured pylon on the map where their species' migration route starts and finishes. Bring attention to the symbols labelled on the species' migration route and have students locate and identify their species' nesting or birthing, mating and feeding grounds.

Next, have students examine the size of one animal and the size of its feeding area and compare the feeding area to that of other aquatic species on the map. Is there a connection between the feeding area and an animal's size? What can students infer about where their species feeds? Have students look for patterns in where the species is located, its size and its connection to other species. Discuss the patterns and trends that students see. Do not forget to explain to students that these highlighted aquatic species are classified as at risk. Ask students how their species might be affected if another aquatic species were to deplete its resources or a feeding area were to become polluted. Discuss the important role of the food chain.

Development

Play the aquatic quiz with students using the card provided. With all props still on the map, review with your students the reasons that species migrate, paying particular attention to the highlighted aquatic species. Discuss the different factors that affect aquatic species' migration routes, such as ocean currents, temperatures, weather and pollution. Using the ocean current card, direct groups to plot the ocean currents on the map using blue chains to represent cold ocean currents and red chains to represent warm ocean currents. As a class, brainstorm how currents can affect species migration (e.g., some species travel with currents while others against them, currents can create habitat and bring food sources, etc.).

Using the information card provided, discuss El Niño and La Niña and how they affect the temperature of oceans and the atmosphere. Explain the role that these phenomena play in the lives of migrating aquatic species with respect to food supply and ocean currents. Students should think about how ocean currents, as well as ocean and atmospheric temperatures, affect food sources (e.g., if the water is too warm, it loses nutrients) and habitats (e.g., if the water is too cold, it may become inhospitable for certain species).

Conclusion

Ask students to consider factors that threaten aquatic species' migration routes (e.g., warming ocean temperatures, pollution, limited food sources, overhunting or overfishing, etc.) and think of a new location for a marine protected area. Explain that a marine protected area is like a national park in the water and provides a protected area for aquatic species to thrive. The weakness of a marine protected area is that animals don't see boundaries the way we do, and pass in and out of protected areas all the time.

Extend your geographic thinking

Introduce the concept of bioaccumulation: when contaminants get stored in an animal and then passed on as they are eaten by other animals. Contaminants become magnified the higher up the food chain you go since top predators ingest many contaminated prey.

After the map leaves, have students research ocean contaminants and how they impact aquatic food chains.

Links to the Canadian National Standards for Geography

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions within the province and Canada
- Concepts of formal, functional and perceptual regions
- Regional analysis of geographic issues and questions

Essential Element 3: Physical Systems

- Ecozones
- Global patterns of wind and water
- Global ocean and atmospheric systems
- World climate regions

Essential Element 4: Human Systems

- Human settlement patterns and land use
- Regional development in Canada and the world