THE MONOGRAPH

ONTARIO ASSOCIATION FOR GEOGRAPHIC & ENVIRONMENTAL EDUCATION
Volume 74 Issue No. 3 Winter 2023 CN ISSN 0048 1793

Le Nord c'est Nous

Icebergs in the Labrador Sea

EDITORIAL POLICY

The Monograph is the journal of the **Ontario Association for Geographic and Environmental Education** (OAGEE) and brings engaging geographic teaching resources to the membership.

The Monograph's readership includes geography and environmental teachers from Ontario's elementary and secondary panels.

The Monograph welcomes articles that:

- stimulate and improve the teaching of geography
- disseminate geographic teaching resources to its members
- explore teaching changes for the well being and progress of geography
- foster a critical and analytical approach to the subject
- make meaningful and substantive connections between everyday life and the physical and human environments in order to widen the interest in geography
- explore and develop opportunities to gain geographical insights from other disciplines and new and unusual resources.

Articles submitted to The Monograph should be one of the following types:

- **Articles** with a clear focus relating to the Ontario curriculum
- **Spotlight** ideas and approaches, resources and teaching strategies, and relevance and challenges for geography and geographic education
- **Reviews** of books, websites, and resources that advance the subject, provide insight, update readers, and challenge existing ideas
- **Supplementals** that enhance and expand previous topics in the Monograph.

For more information about writing for The Monograph see Basic Guidelines and contact the editor at rwilkie@lakeheadu.ca

Disclaimer

- While every effort has been made to identify and contact the original sources, we apologize if there have been any inadvertent breaches of copyright
- The authors alone are responsible for the opinions expressed in their articles
- All URLs are correct at the time of printing

The Monograph is published by OAGEE (https://oagee.org/en/), the subject association for all Ontario geography teachers and those individuals that have an interest in geography. Our mission is to further geographical knowledge and understanding through education. Our organization supports teachers and share their ideas and practices. OAGEE represents the views of geography teachers and plays a leading role in public debate relating to geography and education in Ontario.

EDITORIAL POLICY

WRITING for THE MONOGRAPH

BASIC GUIDELINES

If you have an idea that would fit any of the ideas listed below, we would like to hear from you.

Content

- *Crossing My Desk*: websites that would interest our teachers
- *Landscape Canada*: a focus on specific Canadian landscapes
- *Retro Lessons*: long standing activities that always have relevance
- *Feature Article*: a practical geographic teaching strategy
- *Infographic*: imagery and data visualizations with minimal text
- *Software*: strategies for analyzing, and visualizing geographic data
- *Grab & Go*: geographic tools and skills for immediate use
- *Careers*: to inform teachers/students of the major fields of Geography
- *Critical Reflection*: on the teaching of geography
- *Curriculum Innovation*: new trends in geographic research, current events, special projects unique to a Geography department, ...

Length

- articles should be 1 to 5 pages in length
- font size from 10 to 12 points and single spaced
- photos, maps, diagrams would increase the page length by 10 -15 pages

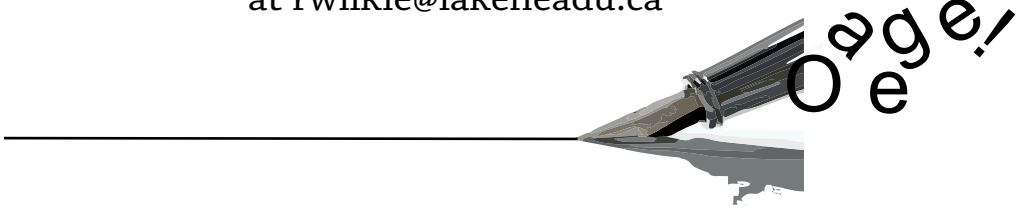
Format

- articles should be in a digital format including plain text and pdf produced in Microsoft Word or Pages (Mac)
- graphics in TIFF, EPS, PDF, JPG, PNG, PSD, GIF, or Adobe Illustrator format
- graphics in full colour
- embedded graphics separated from text

Submission Dates:	Publication Dates:
March 1st	May 1st
July 1st	July 1st
November 1st	December 1st

Bio: Please send a short Bio with a photo (head shot) to recognize your contribution.

Submit Articles in care of Randy Wilkie, Editor
at rwilkie@lakeheadu.ca



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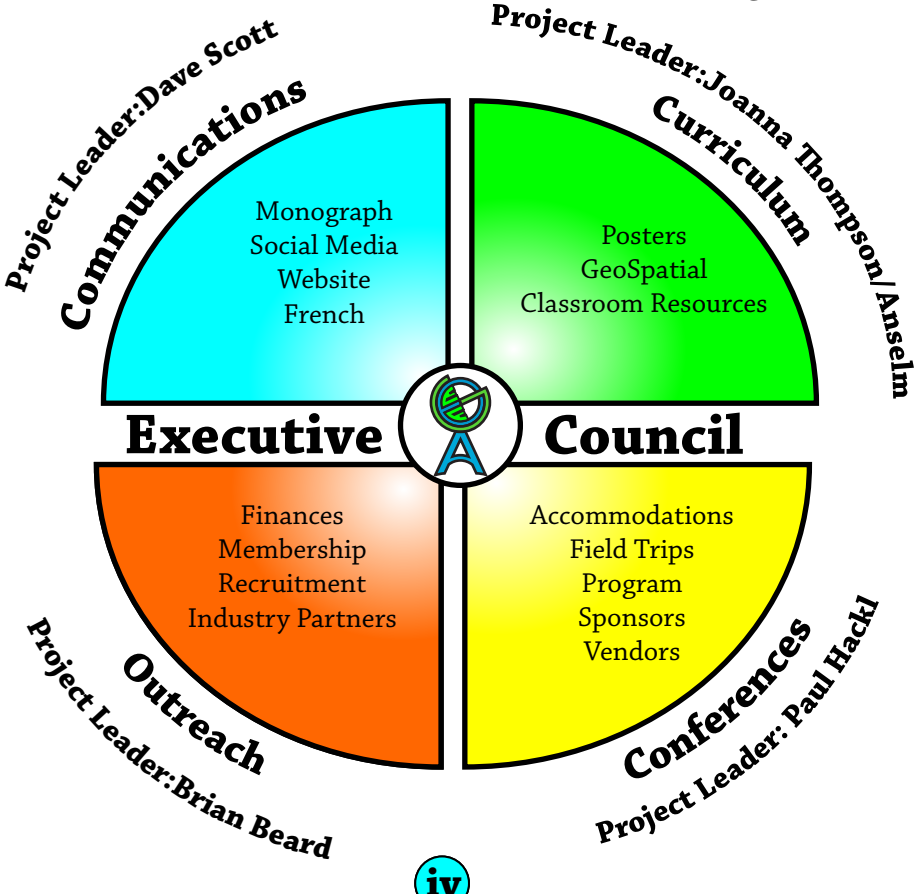


PRESIDENT'S MESSAGE

Another calendar year coming to a close! Hard to believe this issue of The Monograph marks the end of 2023. The end of any year is often marked with celebrations. OAGEE certainly has many reasons to celebrate this year.

To begin, this issue of **The Monograph** marks the completion of our first year with the new Monograph under the amazingly talented **Randy Wilkie** as our **Editor.** Congratulations Randy! We are all so fortunate to have had you agree to take on this important role/task. Thanks so much and look forward to what 2024 will bring.

At time celebrations include recognizing those who have contributed so much to our area of Geographic and Environmental Education. Sometimes those celebrations come in the form of ***In Memoriam.*** I want to personally acknowledge and celebrate Kim Wallace's long time contributions to our mission. The loss of Kim, will be felt for years to come. Thanks Randy for your ***In Memoriam*** feature dedicated to Kim.

This fall one of our strongest OAGEE supporters, Esri Canada's K-12 Program, received the prestigious Alex Trebek Medal for Geographic Education from the Royal Canadian Geographical Society. **Angela Alexander**, **Susie Saliola**, **Jean Tong**, & **Arabelle Sauvé**. Congratulations to a wonderful team!

The past few months have seen me "de-commission" my Geography Methods classroom at the Faculty of Education, Queen's University. During that process, I came across so many wonderful resources used over the years. One of which was a series of aerial photographs and stereoscopes. Pure gold as far as I am concerned! Fortunately, I have found a home for them!

While looking through this issue of The Monograph I could not help but smile at the feature on The Use of Aerial Field Trips in Geography. Take a look! Maybe an oldie but a goodie!

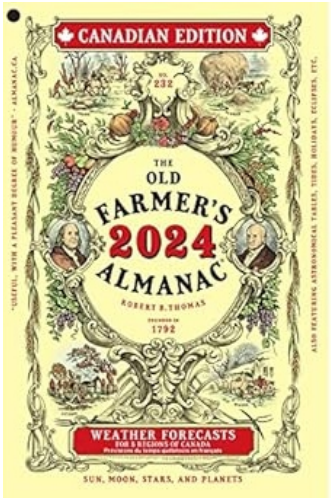
We are now entering the season of Holiday celebrations. Whichever holiday you celebrate, I wish you all a wonderful season with friends and family. Thanks for all your hard work in our classrooms over the past year, especially under challenging conditions.

"See" you in 2024!
Take care,
Anne Mansfield

EDITOR'S NOTES

Le Nord C'est Nous or ***We the North***, borrows a theme from the ***Toronto Raptors***, given the onset of winter and our northern locale.

From the **Old Farmer's Almanac**, Ontarians should expect "oodles of fluffy white" throughout the season. This will be coupled with seasonably chilly temperatures at or below normal. After three straight years of La Niña, El Niño has come on fast and furious in recent months and will be with us throughout the winter.

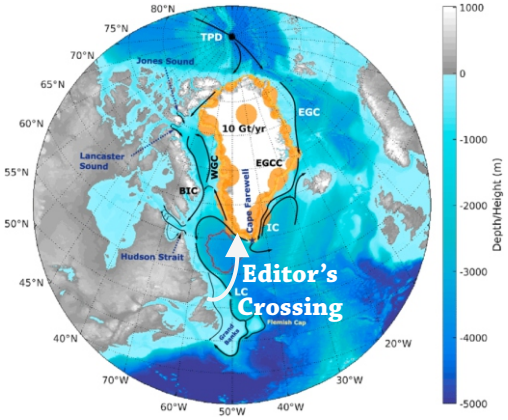


Blasts of arctic air increase the potential for colder temperatures. Easterly winds descending through the stratosphere above the equator should help dislodge the polar vortex at times this winter. The colder forecast depends on the magnitude of these cold pushes being intense enough to outweigh the magnitude of stretches of above-normal temperatures.

The cover photo of an iceberg in the Labrador Sea brings to the fore the idea associated with the climate change and the disappearance of the Greenland Ice Sheet. What does this mean for Newfoundland and Labrador's climate? What happens to the currents? rising sea levels? What are the environmental and human repercussions?

The final 2023 issue has articles dealing with Field Trips and First Nations (see the CDP and the Fall Poster articles). Many thanks to **Chelsea Caddo** and Claude Tremblay Brun del Re.

Otherwise, take advantage and enjoy the Christmas Break.



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CONTENTS

In Memoriam

Kim Wallace

April 25, 1957 - Sept 29, 2023

The geography community mourns the loss of ***Kim Wallace***, longtime resident of Burlington Ontario. Kim was a passionate and respected educator, author, and consultant who dedicated her career to advancing geographic education in Ontario and across Canada.

As a geography teacher in the ***Halton District School Board*** for many years, Kim later became the Curriculum Coordinator of Social Studies, Geography and History.

For twelve years beginning in 2006, Kim worked with ***Esri Canada K-12 group*** to judge the regional ***Skills Ontario*** geographic information system competition that she helped to organize. Kim, similarly, supported educators to integrate GIS into their teaching. She understood the value of using mapping technology to increase spatial literacy in the classroom.

From 2009-2013, Kim worked as an Education Officer at the ***Ontario Ministry of Education*** for the province's Canadian and World Studies Curriculum Review. During her tenure, she created a framework for the curriculum expectations for the Canada and World Studies Curriculum for grades 9-12. These courses embedded critical thinking, GIS, the GeoConcepts, and thinking skills.

Kim helped with the ***St. John's Declaration*** to make geographic education a priority in Canada.

Kim was active in the ***OAGEE***, the ***Ontario Geography Consultant's Association***, and was the Ontario representative on the ***Canadian Geographic Education*** executive. Here, she shared her facilitated workshops which fostered a deeper understanding of geographic thinking and skills.

During her career, Kim was recognized by a number of geographical organizations in Canada. She was a recipient of the ***Louie Kamookak Medal*** for her efforts to support the ***Royal Canadian Geographic Society's*** (RCGS) mission to "strengthen geographic education in the classroom and to increase public awareness of the importance of geographical literacy." She was elected to RCGS's ***College of Fellows*** in 2012 in recognition of her "outstanding contributions to geographic education at the classroom, school board, provincial, and national levels." In addition, Kim was awarded ***OAGEE's Award of Distinction*** for her "commitment and outstanding contributions to advancing, promoting and improving the quality of geographic education in Ontario."

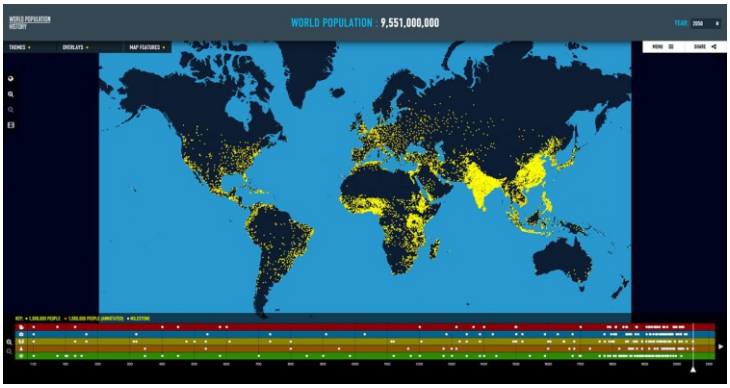
Kim worked in many areas of education, from writing and revising curriculum to co/authoring three textbooks: ***Canadian Geography: A Sense of Place***, ***Physical Landscapes of the Earth***, and ***This Earth***. She worked as a consultant for the book ***Teaching About Geographical Thinking***, a framework for critical inquiry and geographic problem solving.

On Sept 29, 2023 Kim lost her long battle with cancer. Donations in her memory to the Joseph Brant Hospital Foundation are greatly appreciated.

CROSSING MY DESK

encapsulates interesting websites. Forward any helpful websites to the editor.

World Popualtion History (https://worldpopulationhistory.org) is an interactive experience created by ***Population Education***. The website features various themes, such as health, people and society, science and technology, food and agriculture, and the environment. There are various overlays from human land use to fossil fuel emissions, fertility rates to life expectancy, and urbanization. A "how to menu" provides video explanations, use of the map and time lines, and other resources. The animated time line has implications for population geography.



Friends of the Mississippi (https://fmr.org/updates/stewardship-education/introducing-fmrs-cultural-landscapes-lesson). FMR provides ideas that can be adapted to Ontario courses. In their K-12 classroom lessons, topics range from watersheds, pollution, to erosion. FMR has a new Cultural Landscapes lesson, which enables students to reflect on cultural identities and relationships with land, water and stewardship. The lesson also affirms and honors the ancestral homelands of the Dakota people.

Check out **Cultural Practices & The Cultural Landscape** for Advanced Placement: Human Geography Unit 3 Topic 2 on YouTube (https://www.youtube.com/watch?v=sFcSqC_jpXE).

Classroom Resources for **Population Education** offers a variety of resources centered on population. Go to https://populationeducation.org/teacher-resources The filter enables the teacher to set the grade level, subject, and topic. Lessons can be selected by lesson plan, reading, curriculum, video, or a "tool".

The **Alfred Wegner Institute** (AWI) is a ***Centre for Polar and Marine Research*** located in Bremerhaven, Germany. It conducts research in the Arctic, the Antarctic, and the high and mid-latitude oceans. The institute was founded in 1980 and is named after meteorologist, climatologist, and geologist Alfred Wegener.
AWI operates the ***Polarstern***, one of the world's most advanced polar research ships. Follow the current expedition by going to https://www.awi.de/en/ By clicking on Focus on the toolbar, numerous topics (see below) can be accessed. There are excellent videos, photographs, satellite imagery, and explanations dealing with each topic.

The **Carbon Brief** (https://www.carbonbrief.org/WIAWI) is a UK-based website covering the latest developments in climate science, climate policy and energy policy. Articles are clear and data-driven with graphics to help improve the understanding of climate change, both in terms of the science and policy. There are links to the latest videos related to climate modelling, extreme weather events from wildfies to El Nino, ice situations from glaciers to the Arctic and Antarctica, food and farming, ocean acidification, ocean warming, and sea level changes. In the people category, risk and adaptation are possible curriculum topics to consider. National profiles, along with explanations provide current topics for further study.

CarbonBrief
CLEAR ON CLIMATE

Daily INFOGRAPHIC (https://dailyinfographic.com/) as the name suggests, provides numerous infographics that bear scrutiny. The people behind the website find the best and most interesting content and design for data visualizations. There is information to create infographics, as well as, the ability to submit infographics. The partial infographic, to the right, examines the *10 Delicious Ways To Enjoy Coffee Around The World*. Close to thirty categories are available.

RETRO LESSON

THE USE OF AERIAL FIELD TRIPS IN GEOGRAPHY

by Edward Devai Brock University

INTRODUCTION

The idea of using aerial field trips in the teaching of geography is not new. Various teachers throughout Ontario have experimented with aerial field trips to different degrees and successes.

The purpose of this article is to share with the reader some of my experiences in using the aerial field trip in introductory geography urban studies courses at Brock University. My description deals with conditions related to Ontario. You will find the aerial field trip a useful addition to your course.

THE PURPOSE OF AN AERIAL FIELD TRIP

It is only logical that before a teacher introduces an activity they should consider the usefulness of the activity in relationship to the time and costs involved. Both as a physical and social science, geography must obtain real world data.

Arm chair geography died with arm chair philosophy. Only through a careful examination of the various spatial phenomena, as these exist in the real world, can the geographer arrive at meaningful conclusions to geographic problems. It should be part of a geographer's training to examine and analyze spatial occurrences and phenomena with the intention of trying to discover inter-relationships, trends and spatial patterns. Part of this training involves an appreciation and understanding of maps and aerial photographs. Maps are two dimensional symbolic representations of specific occurrences and distributions as found in the real world at a specific time. Therefore, the map's accuracy is limited by the choice of the data and the date of the data survey. On the other hand, aerial photographs are actual representations of reality at a specific time.

Retro Lessons are timeless teaching strategies. Our dip into the past focuses on Monograph No.3 1970-1971. While this article was written by Edward Devai when he was at Brock University, no further information could be found. Keep in mind the dates and costs have changed significantly along with the use of the British system of measurement.

It would be interesting if one or more of our readers could follow up with a current approach to this teaching strategy. **Please contact the editor.**

Since the camera cannot be adjusted to distinguish between the entire real world and just those parts under study, aerial photographs can present some problems. By using stereo photographs, depth perception can be added. However, the photographs are still limited by factors of time, scale, and generality. In certain types of analysis, these same factors are very useful for obtaining data.

The ground field trip was developed by geographers to obtain information from reality. It is often a necessary part of producing maps and interpreting air photos. A serious drawback of the ground field trip can be scale, for the observer is limited to the immediate surroundings. Hence, standing on an esker or a meander scar without realizing, one can only sense part of an occurrence. Furthermore at such a scale, an observer would find it difficult to note any large spatial relationships. Maps, air photos, and ground field trips are useful geographic methods of obtaining and interpreting data. These methods all deal with reality with certain limiting factors.

The aerial field trip, on the other hand, can be a very useful teaching aid in the very aspect where these other methods fail. From an airplane, the student sees reality exactly as it is with spatial patterns which are both cultural and physical. The relationships between the various occurrences and distributions as a "whole process" and not as the "parts" can be observed. For the student, an aerial field trip is an experience in seeing the real world as it is and is not necessarily an analytical tool for study and research. Many text book concepts and illustrations become real.

Examples from Cultural Geography, include:
- the patterns of agricultural fields
- nodal points in settlement
- transportation and surrounding land use
- urban sprawl
- recreational areas
- industrial areas
- air and water pollution

Examples from Physical Geography include:
- the Niagara Escarpment
- glacial features
- beach features
- rivers, lakes, ponds, and marshes
- vegetation and morphometry
- forests

STEPS IN PREPARING THE TRIP

1. Before deciding on the area which you want to use for your aerial field trip, consider just what features or phenomena you would like the students to observe. This, of course, will depend upon the type of course which you are teaching. Some areas are more suitable for an urban course while others tend to be better for its physical features. In most parts of Southern Ontario, both physical and human aspects will be present.

2. Once you have decided on the factors which you would like the aerial trip to demonstrate, choose the study area. From experience, it has been found that the area in the vicinity of your school is the best to study for two reasons. First, from the organizational viewpoint, it is easier and cheaper to get students to a local airport than one further away. The second reason is even more important than the first. Most of the students going on the aerial trip will be flying in a small aircraft for the first time. For another large portion of your group, it could be their first airplane trip. Because of these reasons it is obvious that in a one hour trip, the distraction will be considerable. Therefore if

a completely strange area is used, the students may find it too difficult to orientate themselves and to recognize all the features which you intended them to see. Also by using the local area, the students will be able to compare the spatial arrangements of the features and phenomena from the air to the viewpoint to which they are accustomed to on the ground.

3. Having decided on your field area, take a ground tour of it. Note everything in the area which may be relevant to your trip. Later, you will also take a pre-trip flight over the area to compare your ground observations and to note any interesting relationships which the aerial trip may better demonstrate. Note these on a rough base map. You may later improve upon it and include in a handout.

4. Now, you are ready to choose the airport from which you will take the aerial trip. In most parts of Ontario you will find either a flying club and/or a small private flying company which provide the aircraft necessary. I have used both the St. Catharines Flying Club and Air Niagara. Both of these were eager to provide the service and to help in the preparations for the trip. You should base your decision on two factors. One is the type of aircraft available and the other is the cost per student. Experience has shown that small high winged aircraft are the best for this type of a trip. Why small? If you use a larger aircraft, such as a DC-3, you will find that the windows are too small. You can only see out on the one side and persons who are sitting in the aisle seats will not be able to see very much. Furthermore, larger aircraft fly faster and therefore may have to circle considerably over each part of the trip so that everyone has a chance to see. In so doing, the pilot must bank the aircraft continually and this may result in many passengers become nauseated. A smaller aircraft, such as a Cessna 172, flies slow enough to give the passengers plenty of time for observations. The smaller aircraft often do have much more window space all around the passenger. Why a high winged aircraft? High winged aircraft allow better downward visibility than the low winged type.

The cost factor may be more important to your decision. It is better to pay more and see something on the trip than to pay almost as much and see nothing. The rental cost of an aircraft depends on the time the aircraft will be used. A one-hour trip seems to be the best length of time. Over that time, students become saturated and do not gain much more. Below an hour too much time can be taken up with taxiing, take off, and landing procedures. What's a fair price for a one-hour trip? This may vary according to the variation in costs throughout the province to aircraft owners. At the present (Nov. 1, 1970) the best price I can get in the Niagara Peninsula is $7.00 per student for a one-hour trip and for a minimum of ten students. This price is for the rental of a CESSNA 172 and a commercial pilot. This price is considered to be the bare minimum. In most cases, there are no problems in getting the students to pay the entire cost. However, I do know of cases where the school board has subsidized aerial field trips.

5. Now that you have made your arrangements for the aircraft and for the location of the field area, prepare a brief handout. In the handout, set forth some reasons for the aerial trip and just what the student should concentrate on during the trip. It is very useful to include some maps showing the trip generally and the segments of the trip. For your base map, you may use topographic sheets and black ink to show the route and also to number any features which you want students to note. Arrange the handout to make it easier for the student to follow the route of the aircraft on the maps provided and to be able to quickly recognize any features in the notes. The best altitude for the aircraft to fly is between 1000 to 1500 feet and your notes in the handout should contain only those features which are clearly distinguishable from these heights.

6. Before you go on the aerial trip, you should spend about an hour briefing the students. In the briefing do not be afraid to fully discuss the trip and what the students are expected to see. Regardless of how thorough you are, you will not give away too much. There is a great deal more to actually flying than what you could put across in the classroom. There is a tendency to hold back in order not to spoil the trip (i.e. surprises). If the student is not well prepared they may miss most of the trip. If this is to happen, the result is that the students will consider the trip as a fun outing. In my briefings, I use both topographic sheets and aerial photographs. We do not take these on the trip. However, if your handout is well prepared, these will not be needed. At this stage it is also wise not to talk about the danger of heights or the chance of nausea. In most cases where a person is deathly afraid of aircraft or becomes sick, it is due almost entirely to talk and psychological fear.

WHEN TO TAKE THE AERIAL TRIP?

Each season affects the landscape in different ways. No particular season may be more advantageous than the others for illustrating the features or phenomena of your trip. For example, in the summer the vegetative growth is at its height. Because of the cover effect of vegetation, it may actually hide certain desirable features. On the other hand, vegetation can be useful for an aerial trip. Since plants vary in sizes, shapes and colours, an aerial trip may be very useful in the study of agricultural patterns and types. In the winter, the snowy landscape tends to be colourless - black and whites but has high contrasts to easily identify features. Winter is a better season as far as thermal turbulence is concerned. Fall is usually the best to see the landscape in its beauty but on

the whole resembles the summer. There is also a strong resemblance of spring to the winter landscape. Since the aircraft will be flying between 1000 and 1500 feet, thermal or ground turbulence may be encountered. This type of turbulence is not dangerous but does create some discomfort. The best time of the day to avoid turbulence is morning and late afternoon.

AFTER THE TRIP

It is wise to meet with your students as soon as possible after the aerial field trip since the memory tends to fade rapidly. With my own students, I have given them questionnaires right at the airport so that the fresh experiences and feelings can be recorded immediately. It is amazing to learn from these questionnaires and the post flight discussion, just how much geography was learned on the trip without the usual "prodding" process. Students are usually very quick to note such things as:

- the change in scale as the aircraft ascends
- the "map like shapes" of the real world
- the shapes and locations of settlements
- the interaction routes of these settlements such as road, major arterial routes, railways
- the relationship between the location of industry and routes (e.g. the QEW and Welland Canal)
- the various zones in cities
- the sources and areas of air, water, and sight pollution
- the relationship of physical features to settlement patterns.

CONCLUSIONS

I hope that you will find this article useful in convincing yourself or your principal of the usefulness of aerial field trips. I believe that just as the chemistry laboratory experiment is valuable as a lesson in science, the aerial field trip is a useful tool and a lesson in Geography.

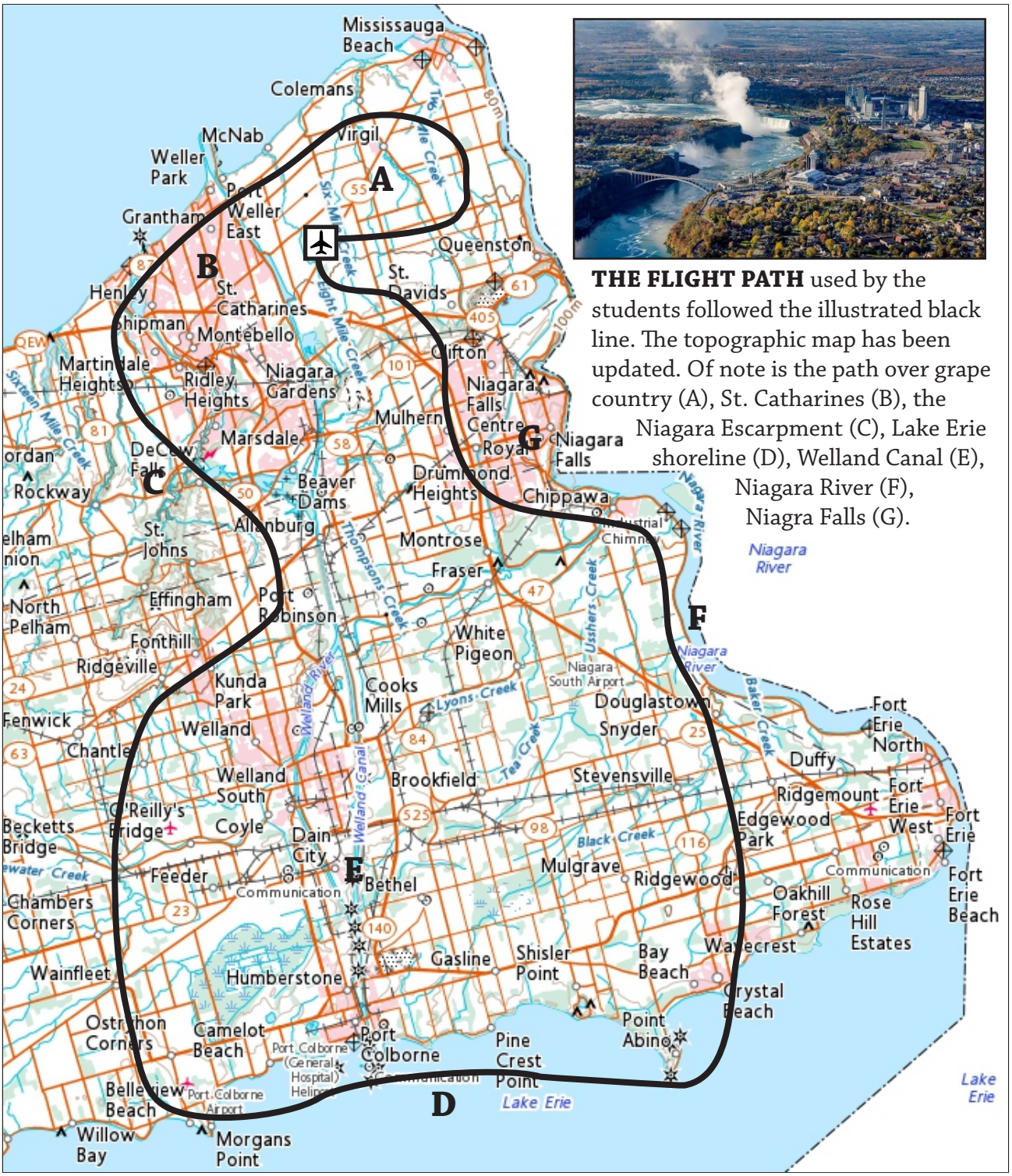
THE GEOGRAPHY LESSON

When the jet sprang into the sky,
it was clear why the city
had developed the way it had,
seeing it scaled six inches to a mile.
There seemed an inevitability
about what on ground had looked haphazard
unplanned and without style
when the jet sprang into the sky,

When the jet reached ten thousand feet,
it was clear why the country
had cities where rivers ran
and why the valleys were populated.
The logic of Geography
that land and water attracted man
was clearly delineated
when the jet reached ten thousand feet.

When the jet rose six miles high,
it was clear that the earth was round
and that it had more sea than land.
But it was difficult to understand
that the men on the earth found
causes to hate each other,
to build walls across cities and to kill
From that height, it was not clear why.

- Anonymous



THE FLIGHT PATH used by the students followed the illustrated black line. The topographic map has been updated. Of note is the path over grape country (A), St. Catharines (B), the Niagara Escarpment (C), Lake Erie shoreline (D), Welland Canal (E), Niagara River (F), Niagra Falls (G).

LANDSCAPE CANADA

is a continuing feature of Canada's landscape.

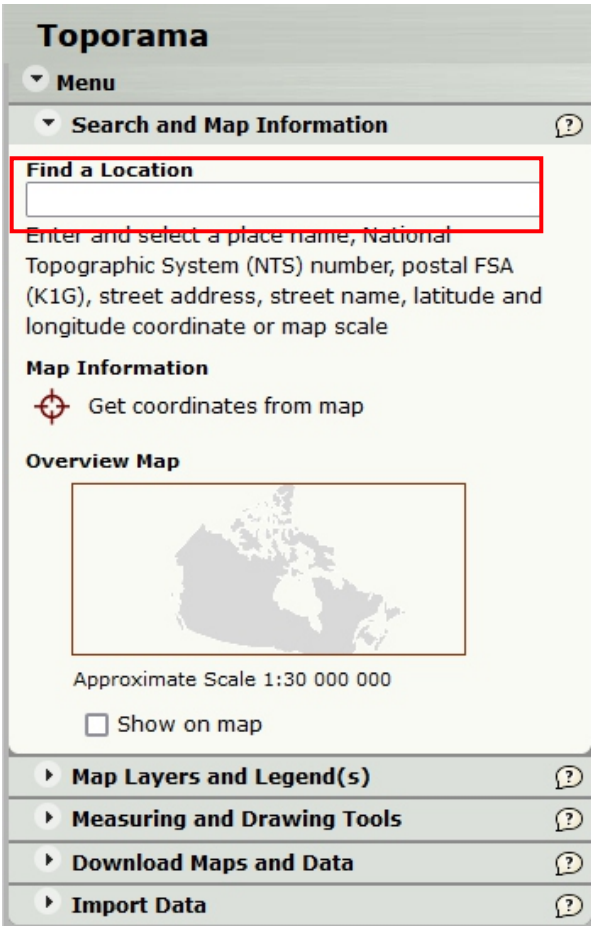
First, there is an overview of meteors, meteorites, and meteoroids with a locational map and information to supplement the activities.

Next, there is a description of the Pingualuit Crater and the theory behind a meteorite impact. Descriptions with a photograph and diagrams precede literacy and think exercises.

Third, an exercise deals with splatter diagrams. In other words, make your own impacts. A webquest reviews and provides next steps in the analysis.

Lastly, a series of topographic maps with map skills and questions adds to GeoThinking related to the Pingualuit, Lac a l'Eau Claire, and Manicouagan craters..

Google Earth or ***Google Earth Pro*** provide access to satellite photographs and can supplement this activity.



Topographic maps are available through **The Atlas of Canada -Toporama** (https://atlas.gc.ca/toporama/en/index.html). Toporama offers continuous map coverage for all of Canada available from local to regional and national scales. The dynamic map viewer offers features for searching place names, zooming and panning, measuring distances, getting coordinates and drawing tools, along with the ability to download maps and import data (See left).

Start at ***Find a Location*** and once the desired locale is found zoom in or out to find a desirable feature and scale. In this case, find ***Pingualuit Crater.***

Astroblemes: The Pingualuit Crater

Meteoroids hit the Earth's atmosphere everyday! However, all 33 metric tons of these meteoroids burn up due to atmospheric friction. **Meteorites**, those large bodies that can actually get through the atmosphere, do strike the Earth's surface.

Travelling between speeds of 20 km/sec (45,000 mph) to over 72 km/sec (160,000 mph), even a small meteorite can cause a large crater or **astrobleme.** NASA suggests a 5 kg meteorite can excavate a crater over 9 meters across and send 75 metric tons of soil and rock flying. See Fig. 1 for the locations of known Canadian impact sites.

The impact rate is estimated to be two per million years for meteorites over one kilometre in diameter. Meteorites larger than five kilometres probably impact once every ten million years. However, meteorites with diameters between five and ten metres hit once a year.

Over 175 astroblemes are recognized. Predictions suggest another seven hundred craters larger than one kilometre are probable. The exact number of impacts will never be known because of oceanic impacts. Other factors, such as erosion or the vaporization on impact can destroys any evidence. Collisions go back to the Earth's formation, so the exact number of impacts will never be known.

Since 1995, various organizations operating under *Spaceguard*, have been watching for potential impacts. As more organizations get involved or observation becomes more accurate the potential danger starts to become evident (See Fig. 5).

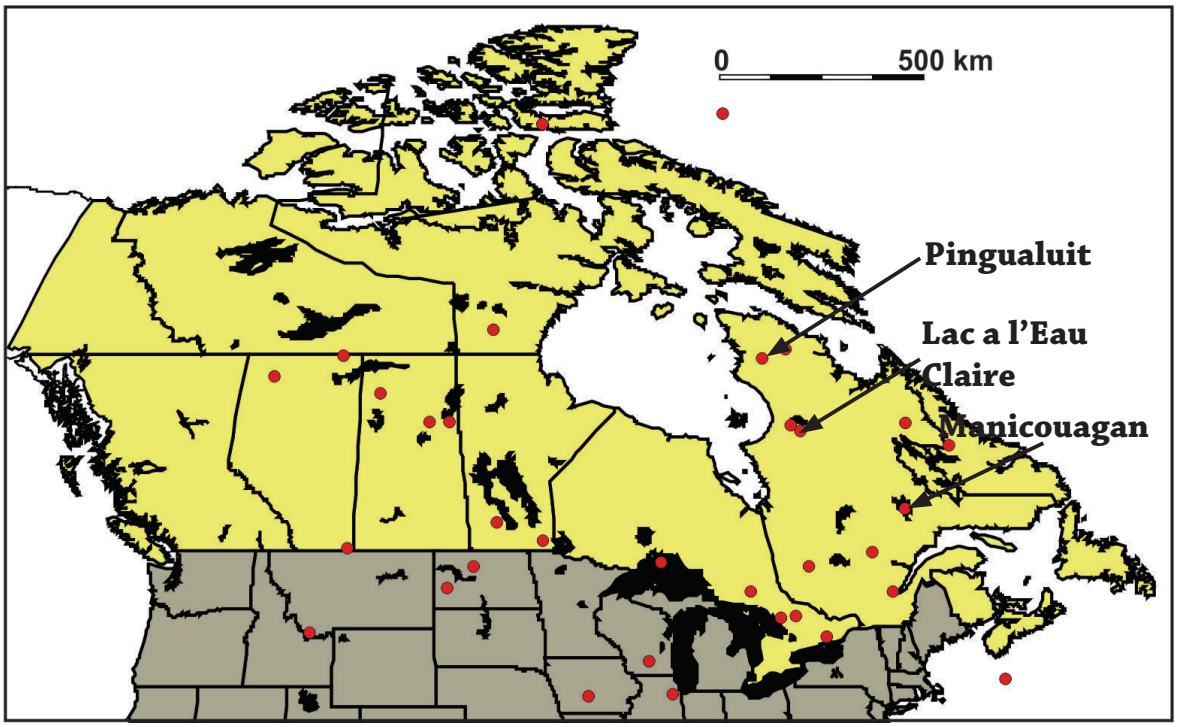


Fig. 1 The location of known Canadian astroblemes. Go to the Earth Impact Database at www.passc.net/EarthImpactDatabase/NorthAmerica.html to see more details.

Parc national des Pingualuit has as its focus an astrobleme 3.4 km in diameter. The impact is 1.4 million years old. Pingualuit, "the crystal eye of Nunavik", is 400 metres deep with a water depth of 180 metres (See Fig. 2. Since it sits fifty metres above the surrounding surface, no water is able to drain in or out of the lake. Precipitation alone filled the lake.

To the Inuit, the lake revitalized people. Since it takes the lake 300 years to change its water, the water is exceptionally clear and pure.

Lake sediments, through core sampling, reveal **paleo-climate** records extending back over several interglacial periods.

The *Canadian Foundation for Climate and Atmospheric Sciences* funded an international research project, the ***Pingualuit Crater Lake Project*** to investigate the climate record of this astrobleme site. Pingualuit is one of the few sites that contains a climate history of the Canadian Arctic over the past 1.3 million years. Pingualuit's data suggests this area has an unusual climate stability compared to similar latitudes. Other areas can be compared against Pingualuit to measure continental and global climate change. (See YouTube Preserving Pingualuit www.youtube.com/watch?v=A2pB4G0SvJQ).

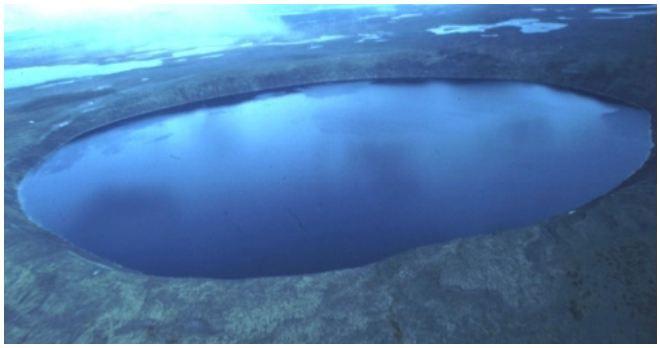


Fig. 2 The Pingualuit meteorite impact crater. GSC Photo Number: 2002-346.

GeoLiteracy: Drawing Conclusions

A meteorite creates a dramatic, complex landscape that depends largely on the speed and angle of impact. See Fig. 3 and link the text to the diagrams.

During initial contact, a **shock and projectile wave** pushes air in front of the meteorite. The wave combined with the meteorite's impact compresses, fractures, and fuses the rocks at the Earth's surface.

As the meteorite vaporizes, debris is ejected outwards and compression waves create an expanding cavity.

Once all the forces of the impact are absorbed by the Earth, decompression begins and the land rebounds (**isostasy**). Fallout rains on to the surface to create secondary craters. Smaller **ejecta** will slowly fall and cover the landscape. Dust may remain suspended in the atmosphere for years. The consequences can be monumental because the Pingualuit alone had an estimated force of 8500 Hiroshima-sized atomic bombs.

As the surface rebounds to its former position, a cavity remains while a dome may or may not appear due to isostatic rebounding.

During impact, the strike can be so large as to fracture the lithosphere completely. Magma can then move along fracture lines and infill parts of the crater. This zone of infilling, such as the Sudbury impact zone, is highly mineralized.

How does the ejecta of a meteorite impact compare to the material thrown out from a volcano?

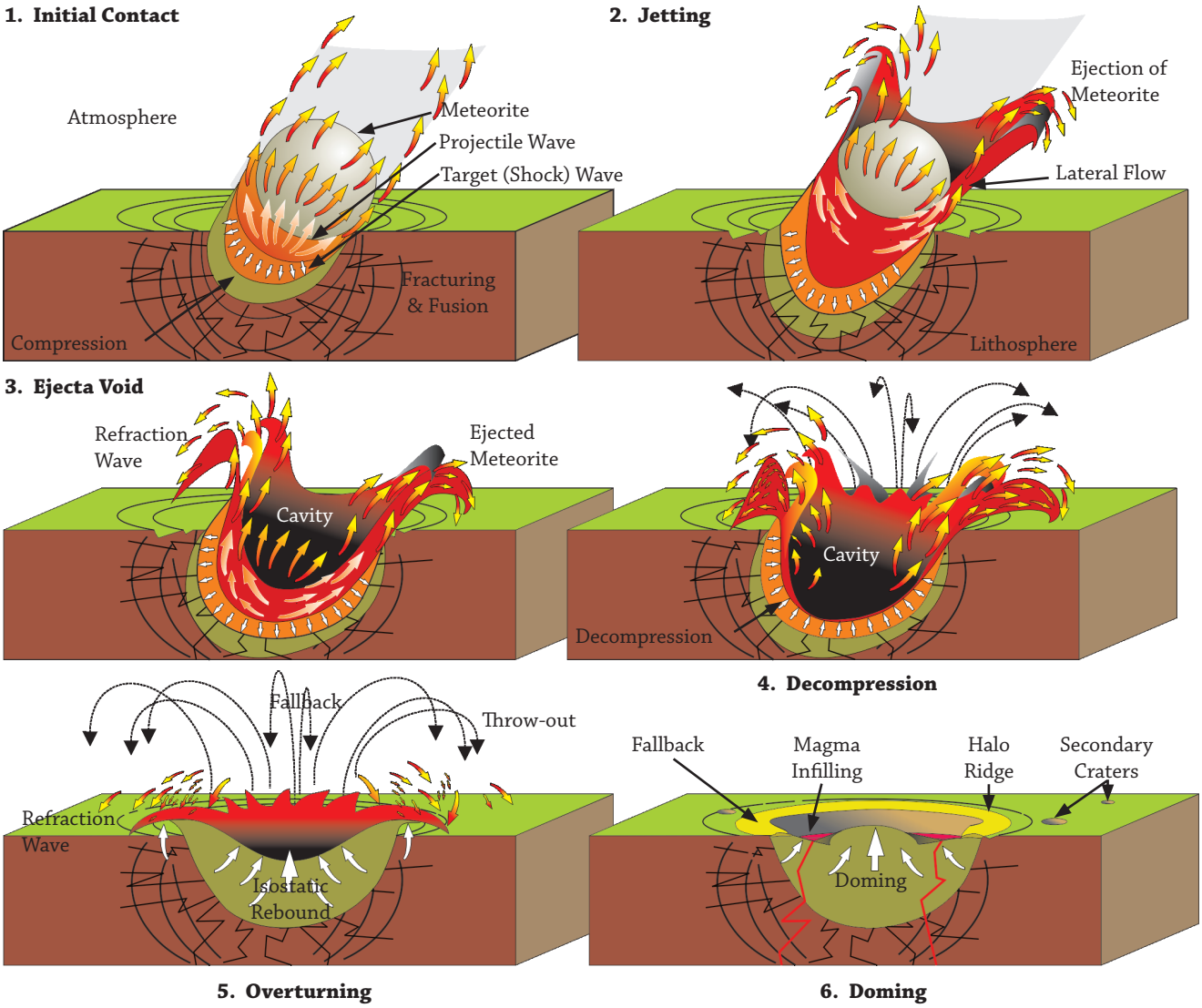


Fig. 3 Theoretical impact diagrams illustrate the formation of a complex astrobleme. A simple impact site would not have the isostatic rebounding associated with the last two phases of the sequence.

GeoSkills: Splatter Diagrams

Simulate a meteorite impact by making a series of splatter diagrams using one or all of the following procedures:

- With an eye dropper and India ink, drop an ink droplet on to a horizontal surface and onto surfaces varying at angles of 30 and 60 degrees. Release the droplet from heights of one and two metres
- With water balloons of various sizes and filled with flour and colored pebbles, drop the balloons from varying heights and from appropriate safe outside locations
- Within the lid of a paper box, lined with a trash bag, filled with flour within two centimetres clearance of the rim), some dry (powdered) tempra paint (red or blue), and some marbles, smooth and pack the flour, experimenting with the firmness. Place a dusting of the paint powder over the flour. Bombard the surface with one marble at a time

Analysis

After clean up and recovery of all materials, make a report of the results by examining, describing, and explaining:

- the splatter diagrams as meteorite ejection patterns
- cratering features, such as basin, raised rim, ejecta blanket, and rays
- the difficulties/limitations inherent in quantifying the processes and elements of the physical environment
- a comparison of craters formed by different angle of impacts, speeds of impact, and projectile sizes

WebQuest

Use a webquest to answer the following questions.

1. What is the difference between a comet, asteroid, meteor, meteoroid, and meteorite?

2.1 Refer to Fig. 4 and explain whether or not the map is illustrating a pattern or a trend.

2.2 Is the title, Bolide Event, correct if an asteroid disintegrates in the Earth's atmosphere? Refer to the terms in #1 above.

3. What was the impact of Near-Earth events, such as the Great Daylight 1972 Fireball and the 1908 Tunguska Event?

4. Suggest reasons why Near-Earth Objects (NEO) discoveries are increasing. See Fig. 5.

4.1 Determine whether or not collisions with Earth are likely to increase/decrease.

4.2 What is the risk to humans if an impact does occur?

4.3 How does an impact compare to a nuclear winter?

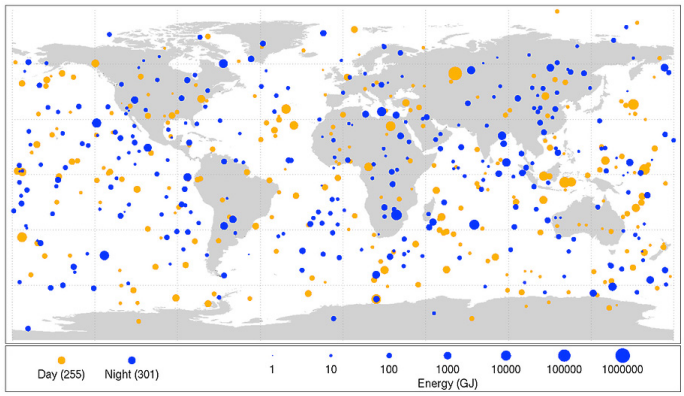


Fig. 4 Bolide Events small asteroids disintegrating in the atmosphere

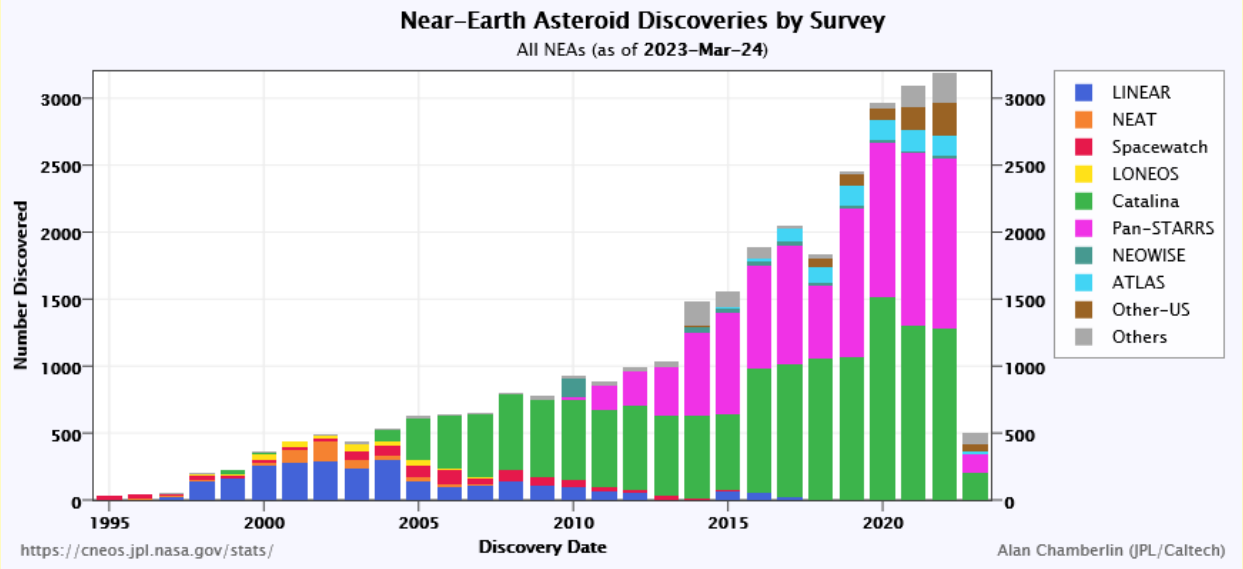


Fig. 5 *Spaceguard* illustrates the number of NEOs discovered since 1995. See www.spaceguarduk.com/

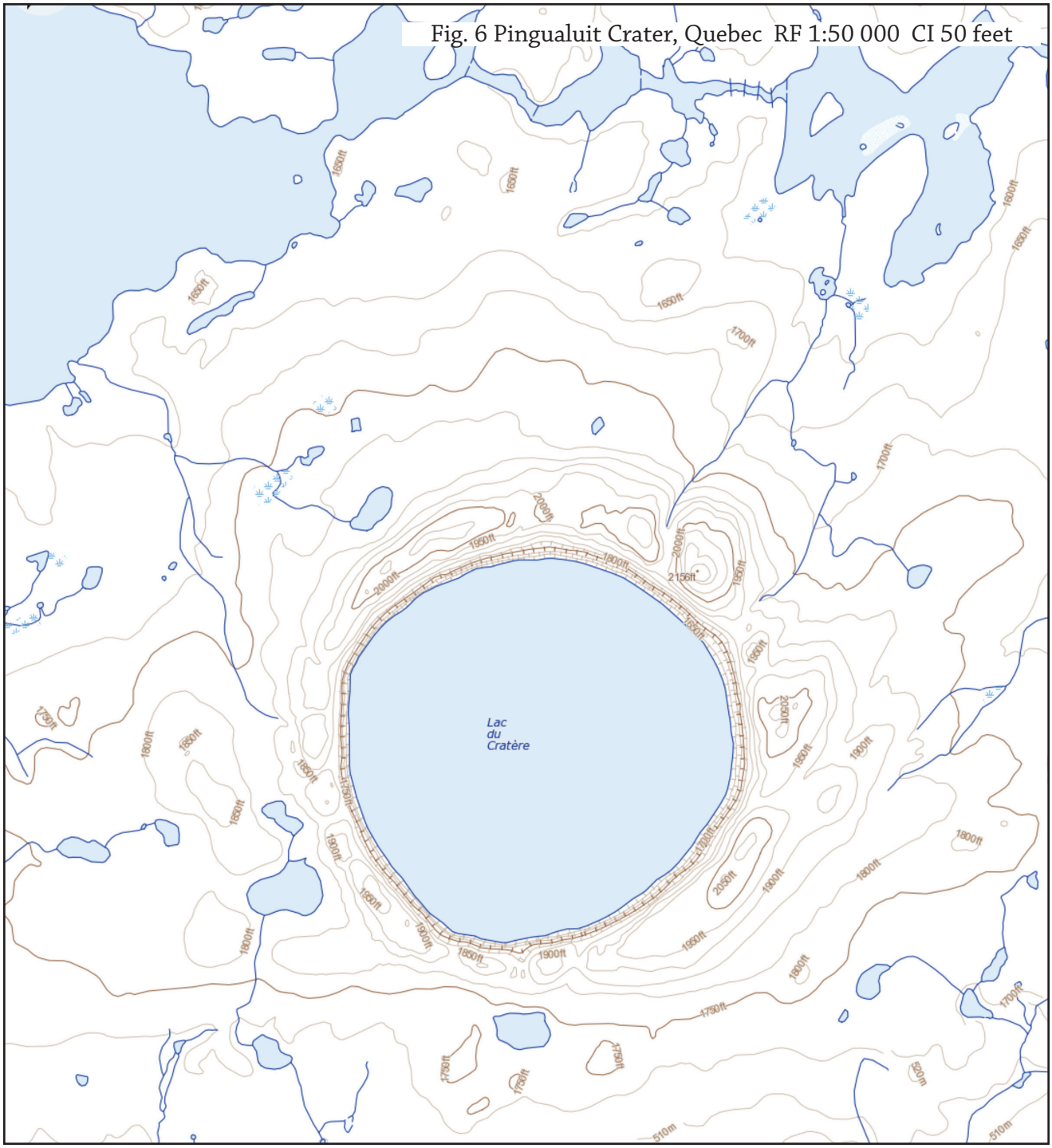


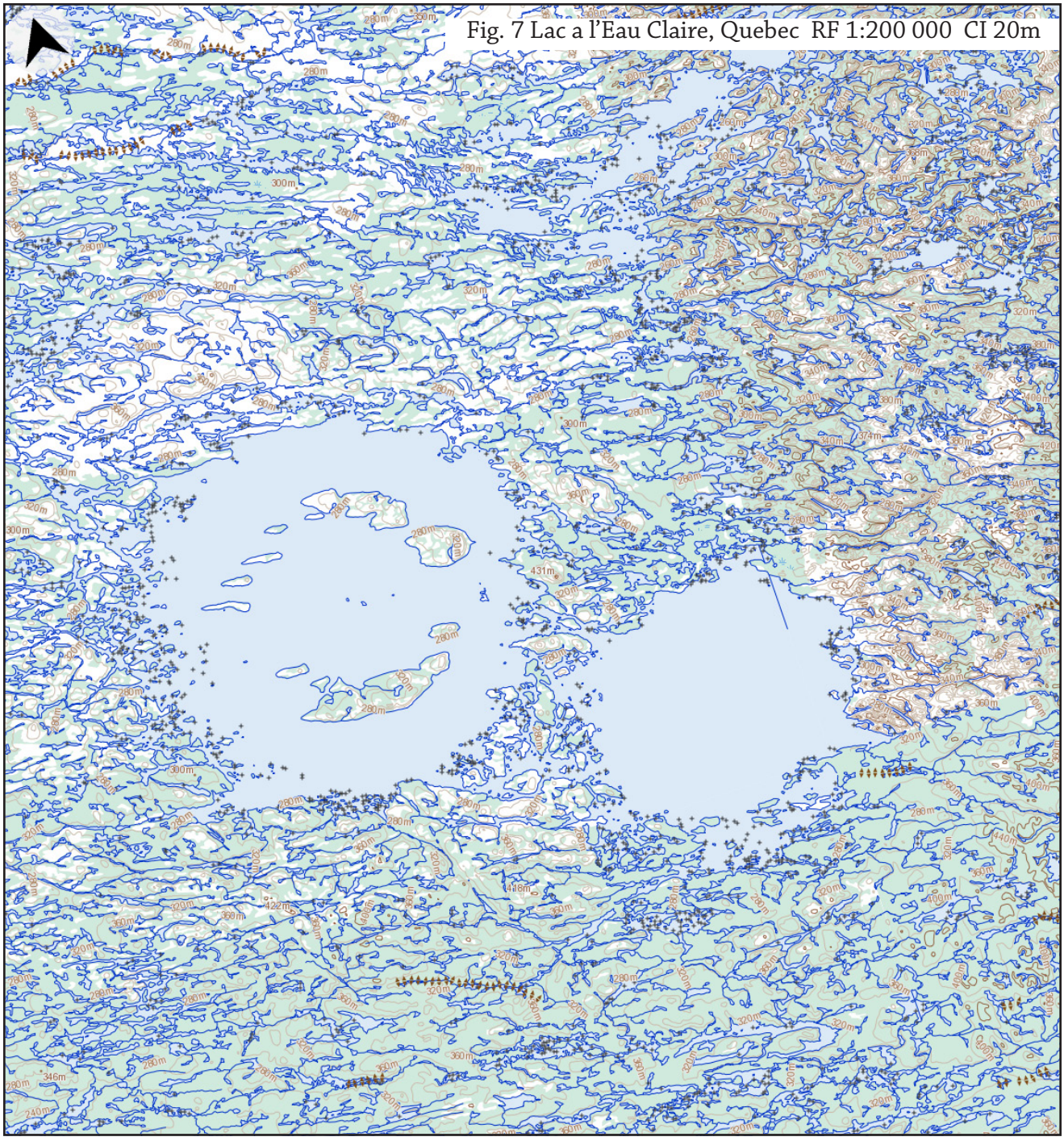
Fig. 6 Pingualuit Crater, Quebec RF 1:50 000 CI 50 feet

GeoSkills

1. Use the scale and measure the diameter of the crater and the height of the crater rim above the lake.
2. Trace the 1750' contour line. Compare the pattern to the splatter patterns.
3. Construct a profile between points XY and label all appropriate features related to an astrobleme.

GeoThinking

1. Analyze the circularity of the impact and possible splatter to suggest the angle of impact.
2. What evidence suggests the age of the impact is very young?



Lac a l'Eau Claire east and west are examples of two meteorite impacts that are the result of different size meteorites, even different speeds at impact. The result is a simple (east) and a complex (west) crater. Which crater may be the result of a meteorite that is larger and travelling at a higher rate of speed?

GeoThinking

1. Compare to Pingualuit. Why would you describe Lac a l'Eau Claire as a much older impacts?
2. After determining the diameter of each of these craters, what other comparisons would you make to the Pingualuit crater?

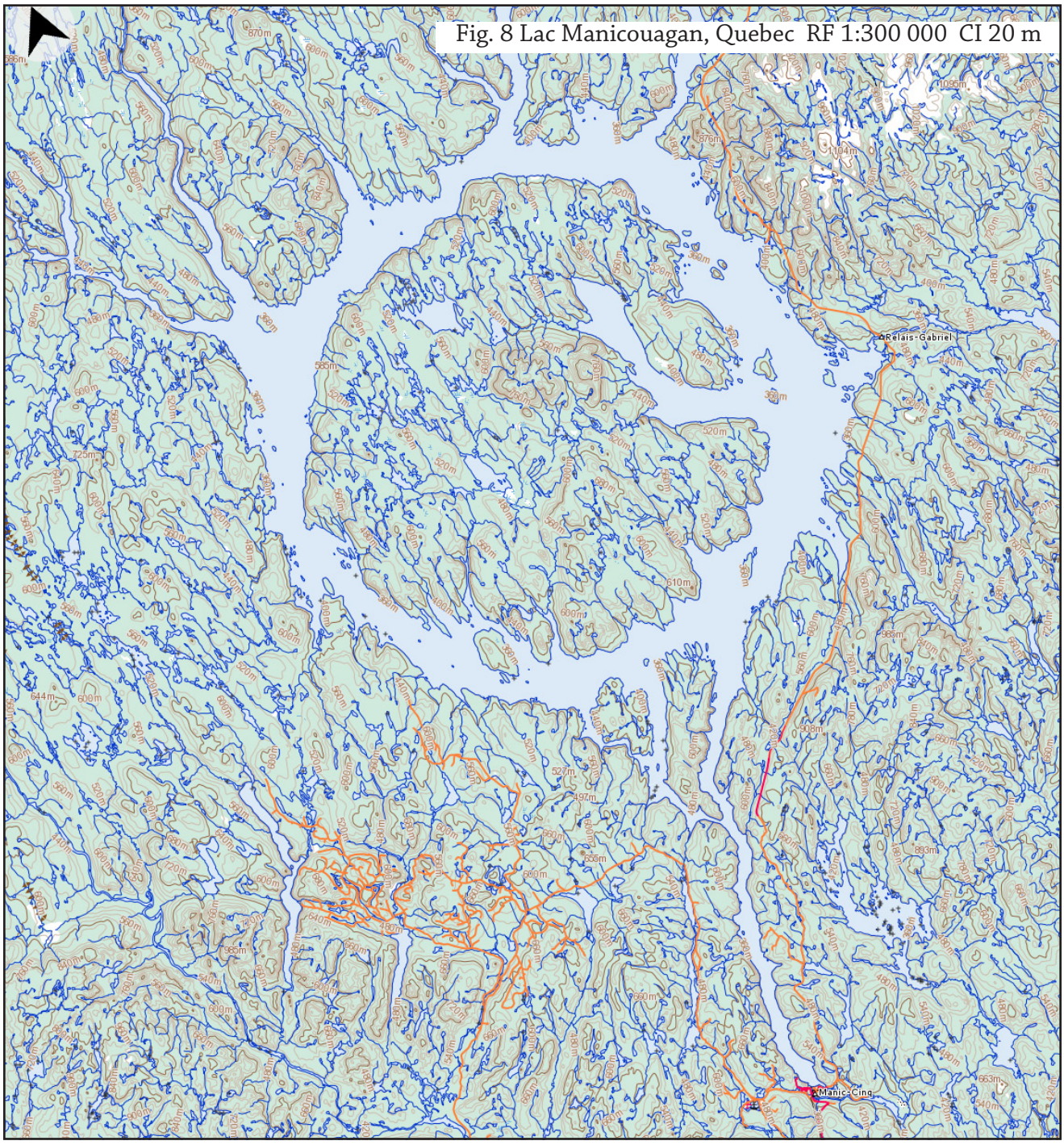
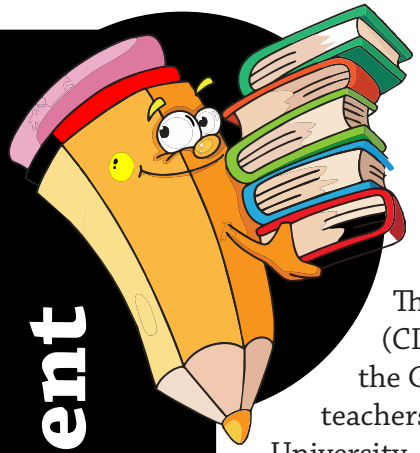


Fig. 8 Lac Manicouagan, Quebec RF 1:300 000 CI 20 m

GeoThinking

1. The Manicouagan meteorite is estimated to be 5 km in diameter, impacting over 200 million years BP. Locate the dam. What role did the dam play in highlighting the features of an astrobleme?
2. What comparisons can be made with the craters of Pingualuit and Lac a l'Eau Claire?
3. It has been suggested that the Manicouagan crater is part of a multiple impact event which formed France's Rochechouart crater, Manitoba's Saint Martin crater, Ukraine's Obolon' crater, and the Red Wing crater of North Dakota. Plot the location of these craters on a map and compare these impacts to the Comet Shoemaker-Levy 9 impact on Jupiter in 1994.

Curriculum Development Project

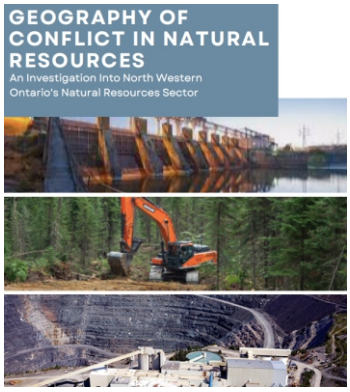


NW Ontario's Natural Resource Sector

Can conflicts in the Natural Resource Sector of Northwestern Ontario be reduced?

Chelsea Caddo

This Curriculum Development Project (CDP) is a summative assignment, for the Geography Methods pre-service teachers at Faculty of Education at Lakehead University. These studnets teachers were required to develop a unit plan. Given a theme, the ***Geography of Conflict***, and a specific course, Grade Eleven, Regional Geography CGD3M, the students were to use the curriculum expectations, geographic frameworks, and the teaching strategies discussed in class to develop the unit. Previous CDP resources have been presented in the ***Monograph***.



Chelsea Caddo, while in first year of the Professional year program, developed her summative CDP, the Geography of Conflict in Natural Resources.

The Why and How to Teach the activities are explained. A ***Mind Map*** and ***Pirozzo Matrix*** demonstrate all the possible takeoffs for other possible lessons. Use the Table of Contents as a place to develop your own spin on other lessons.

Due to space restrictions, highlights of her project, Lessons Three and Four, are highlighted on the following pages.

Chelsea Caddo is a second year Bachelor of Education student at Lakehead University. She is studying to teach Biology and Geography at the intermediate/senior level. Chelsea grew up in Thunder Bay, Ontario, spending her time hiking and camping, which developed her passion for the world. She hopes to combine her interests in the outdoors and travel to teach geography through a sustainability and environmental lens that will inspire students.

Introduction

When teaching geography it is easy to focus on the positive relationships between countries and the give and take between natural resources and humans. Often, we forget to share the conflicts found in geography. That is why this CDP is focused on investigating the conflicts in Northwestern Ontario's (NWO) natural resources sector. This will be done by asking: ***Can conflicts in the Natural Resource Sector of Northwestern Ontario be reduced?***

Overview

This CDP was created with the Grade 11 Regional Geography (CGD3M) curriculum in mind. At this time, students are old enough and have the foundations from Grade 9 Geography to perform a deep analysis on the topic and come away with meaningful learning. By investigating an economic sector that is close to home many students will find meaningful connections to also enhance their learning.

Why Teach this Unit?

This unit is beneficial to teach in the classroom as conflict in geography is so prevalent. It is something that must be discussed with students. Specifically, in NWO, more and more natural resource companies are entering the area and extracting resources from the region. It is important that when students graduate high school, they have a strong understanding of the resources in the area, the sustainable way to extract them, and the relationship different groups of people have with them. These resources must be treated carefully because they play a key role in the economy of many northern communities in the region and for some students this may become their responsibility.

Due to the abundance of natural resources and their extraction, it is highly likely that some students will work within the industry after graduation. Any student who wants to work in this sector will gain valuable information from this set of lessons and will be better prepared to correctly and ethically extract the region's natural resources. This unit will help students understand the geographic significance of NWO's natural resources, their sustainability, how they are extracted, who extracts them, their global significance, the impacts on local communities, and how different groups feel about their extraction. All of this knowledge will be very valuable to those who move on into the industry. This unit plan highlights jobs such as miners, foresters, hydroelectric technicians, mechanics, GIS and mapping specialists, statistical analysts, project developers, indigenous relations liaisons, biologists, geologists, and other careers.

The unit plan also highlights many strategies that will get students excited and involved in geography. It will help to encourage careers in geography. Strategies and skills such as gamification, field work, data analysis, argumentation, musicality, creativity, independent research, decision making, role playing, and problem solving cater to many different personalities and learner types. This helps to engage the whole class and ensure that all students have opportunities for meaningful engagement with this unit plan.

Additionally, it was ensured that this unit plan meets good geography standards by utilizing the four geoconcepts, the four questions, the five themes of geography, basic actions of people, the creativity wheel, and the national standards as the foundational frameworks of the unit and all the following lessons.

How to teach this unit

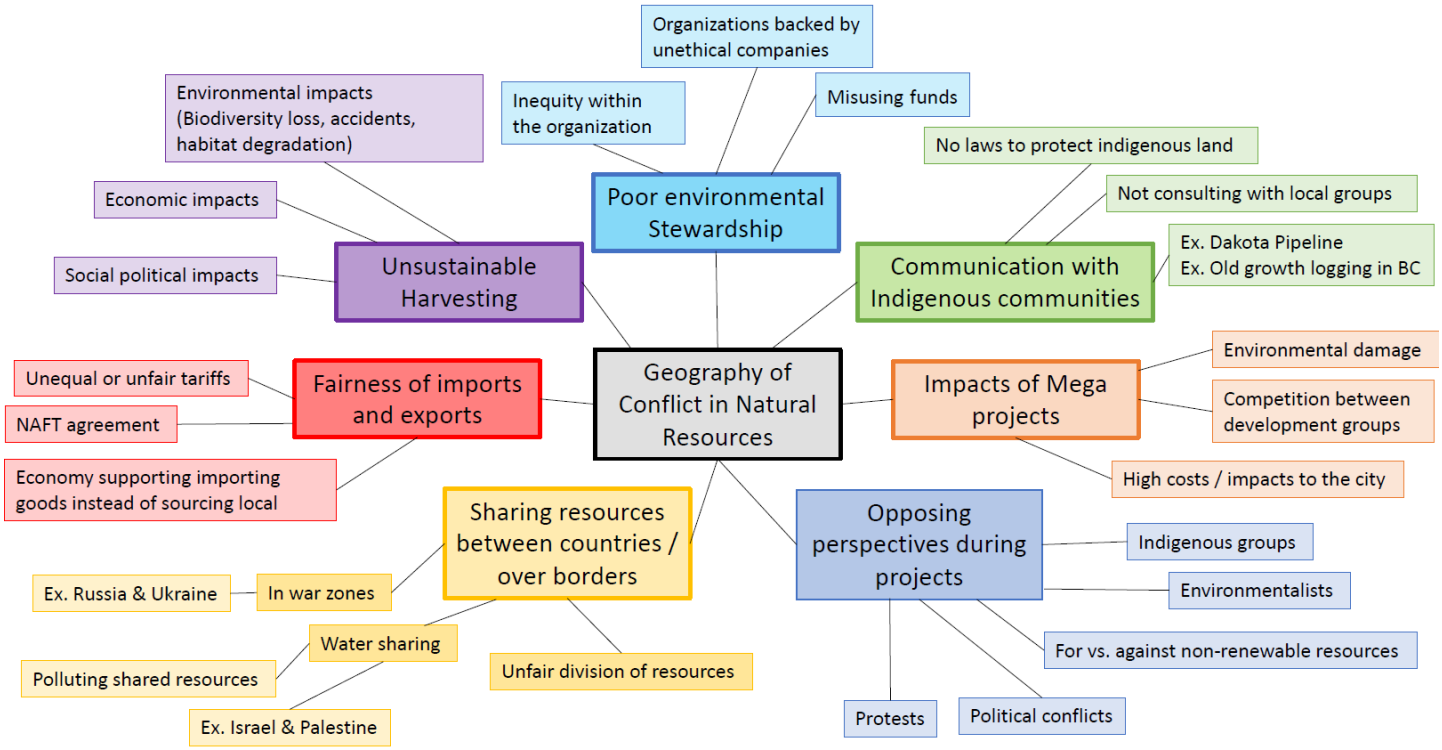
To get the most out of this unit, it is important that students are engaged in the activities and participate in group discussions and tasks. To ensure this occurs, it is important that students feel safe in the classroom environment, and there is a culture that supports sharing your thoughts and ideas without judgment. In order to keep students interested in the lessons, it is key to focus on examples and connect the lessons to meaningful real world events. It is important that teachers share the enthusiasm that you would want to see in your students. The lessons will only be as exciting as you make it.

Although this unit is focused on the resources within NWO, it can be adapted to be taught in any region. The natural resources of NWO are of great importance to all regions of Ontario. This unit provides teachers with a set of lessons and resources to introduce learners to a new place. There is also the alternative option which is to use the lesson ideas but replace the resources and examples to natural resources that better represent your region

The Mind Map and Pirozzo Matrix

As part of the development for the CDP, students were required to create a ***Mind Map***. The Mind Map identified possible subtopics within the central theme. These subtopics gave the students direction in planning their CDP. In this case, the topic was the Geography of Conflict in Natural Resources. The Mind Map enables students to develop future subtopics still within the central topic.

Mind Map



The ***Pirozzo Matrix*** uses Higher Order Thinking Skills (HOTS) to create trigger words in order to provide a focus for each lesson in the CDP. By relating HOTS to Multiple Intelligences, the intent is to find ways to reach to as many students as possible. The highlighted areas, in green (see next page), reflect the CDP lessons.

By completing the matrix, teachers can develop a set of topical questions to develop into lessons. As illustrated, Chelsea completed the matrix and identified eight areas (in green) in order to develop her CDP. Interpersonal (group) and Intrapersonal (individual) intelligences were omitted.

Multiple Intelligences	Higher Order Thinking Skills (HOTS)					
	Knowledge	Comprehension	Application	Analysis	Evaluation	Synthesis
Linguistic	Define the term conflict.	Explain how megaprojects can create conflict between different groups in a region (Lesson 8).	Write a response to the video and reading about the global demand for Ontario's natural resources (Lesson 4).	Analyze the impact that Brazil's forestry industry has on the environment in the country.	Validate whether natural resources are sustainable in Thunder Bay, Ontario, and/or Canada.	Predict the relationship that Indigenous Peoples and natural resources will have by 2050.
Logical	Calculate the carbon footprint of the Alberta Oil Sands.	Use statistics to summarize which nation has the best economic relationship with importing and exporting natural resources.	Graph the relationship of Canada's natural resources revenue with animals in Canada put on the at risk species list overtime.	Compare the amount of lumber harvested each year in Canada, Brazil, and Ghana proportional to their land area.	Using the statistical evidence provided, debate the sustainability of the natural resource (Lesson 2).	Develop a new resource that combines all statistics related to natural resource conflicts in Canada.
Spatial	Use an atlas to locate longitude and latitude of the larger cities in NWO near a natural resource (Lesson 1).	Interpret the map of current natural resource extractions in indigenous treaty territories.	Make a map depicting every protest surrounding natural resources in Canada over the past 20 years.	Analyze the changes in forestry harvesting over the past 20 years and their impact on sustainability.	Justify why GIS helps to create more sustainable natural resource extractions and benefits the sector as a whole. .	Using current and historical maps, suggest three new locations for dams that would minimize conflict in Ontario.
Kinesthetic	Move around the classroom and find partners to discuss the natural resource conflicts you have observed in the news.	Move throughout the classroom and create a summary of your findings. after viewing the photos and cartoons of the region's inequalities.	Create movements to represent the negative impacts that can occur from unsustainable harvesting of natural resources.	Analyze the sustainability of the natural resources observed on your field day by considering potential improvements (Lesson 3).	Justify the importance of prospecting an area in person for natural resource extraction to avoid conflict	Create a skit that tells the story of Nauru Island and its misuse of natural resources.
Rhythmic	Identify songs that discuss conflict. Are any of them about natural resources and conflict?	Explain how music about natural resource sustainability can help make it a reality	Create a playlist that represents how NWO's natural resource extraction makes you feel as a resident of the region (Lesson 6).	Analyze the differences between indigenous and non-indigenous music about natural resources	Justify the importance of prospecting an area in person for natural resource extraction to avoid conflict	Create a song that tell the story of the conflicting opinions on natural resource collection
Naturalistic	Define the term natural resources.	What connections do indigenous people have to the land and to natural resources?	Create a video/ board game to explain the positives and negatives of NWO's natural resource sector (Lesson 5).	Analyze the changes in oil collection over the past 20 years and their impact on the environment.	Rank the top 5 conflicts between nations regarding shared natural resources.	Create a business plan for a natural resource megaproject in NWO that will produce as few conflicts as possible and highlighting where conflict remains (Lesson 7).

Table of Contents

Investigating Natural Resources Through Fieldwork [2 full days]

Big Question

What do Northwestern Ontario's natural resources look like in action?

Overview

This lesson is focused on building students' field work skills and providing an authentic real-world learning opportunity. During this lesson, students will visit three different natural resource extraction sites to learn about how the resources are extracted and look for any environmental impacts. Students will fill out a Survey123 at each site to note any environmental impact. Students will also fill out a worksheet that uses the four questions to study the site.

Field Trip Safety & Notices

Since this lesson involves travelling off of school property, it must be approved by the school principal first and all school board rules must be followed. It is important to highlight that safety is the highest priority. To ensure this, students will wear high visibility vests, closed toed shoes, long pants, and hard hats at each location.

Costs are associated with this field trip. It is recommended that teachers reach out to the local companies to see if they may be willing to sponsor the field trip. With the growth of the natural resources sector, companies are depending on high school students to one day become their future employees.

If there are worries about this trip it can be scaled down to one site or even be done virtually using photos and pre-recorded videos.

Keywords			
Field work	Sketch maps	ArcGIS	Survey123

MoE Expectations	Geoconcepts	National Frameworks
Strand: C - Sustainability and Stewardship Overall: C1 Specific: C1.1, C1.2	Spatial Significance Interrelationships	1, 4, 14
Higher Order Thinking Skills	**Multiple Intelligences**	**GeoFrameworks**
Application Analysis	Spatial Kinesthetic Naturalistic	4 Questions
Skills	**Resources**	
Survey 123 Field work Sketch map	Survey123 https://arcg.is/0beb0O Worksheet (see appendix A) Permission form (See Appendix A) Safety attire Proper clothing (high visibility vests, hard hats, closed toe shoes, long pants)	

Learning Goals: We Are Learning To (WALT):

- Analyze natural resource harvesting sites to identify how the extraction altered the environment.
- Use the four questions framework to answer questions about natural resource harvesting
- Use survey 123 as a field work resource to record information
- Create sketch maps of areas we are in for accurate recounting
- Safely and respectfully learn in real world settings

IceBreaker

Before students head off on their field days, have them draw what they envision each site to look like (prediction sketch maps). This will give the teacher a chance to check their base level knowledge for the trip. Students can start to consider the experience they might have during the trip. Once they return from their field trips they can compare their predictions to the real locations.

Before leaving the classroom this is the time to review all safety rules, make sure students have appropriate attire for the trip and all necessary items are packed (worksheets, epipens and medications, emergency contacts).

Action

The three natural resource extraction sites we will be visiting are a hydroelectric dam, a forestry harvest block, and a mining site within the region. At each site. there will be an industry professional to give a guided tour and answer questions that the students have. While onsite, teachers should watch students and actively manage behaviours.

On Day One, the students will visit Lac Des Iles Mining center. On Day Two, students will visit Kakabeka Hydroelectric dam and a forestry block near Suomi managed by Greenmantle Forest Products.

At each site, students will listen to the professional explain the operations and highlight safety rules for the site. Then, students will follow the instructors and industry professionals on a tour of the site. While on the tour, consider asking these prompting questions:

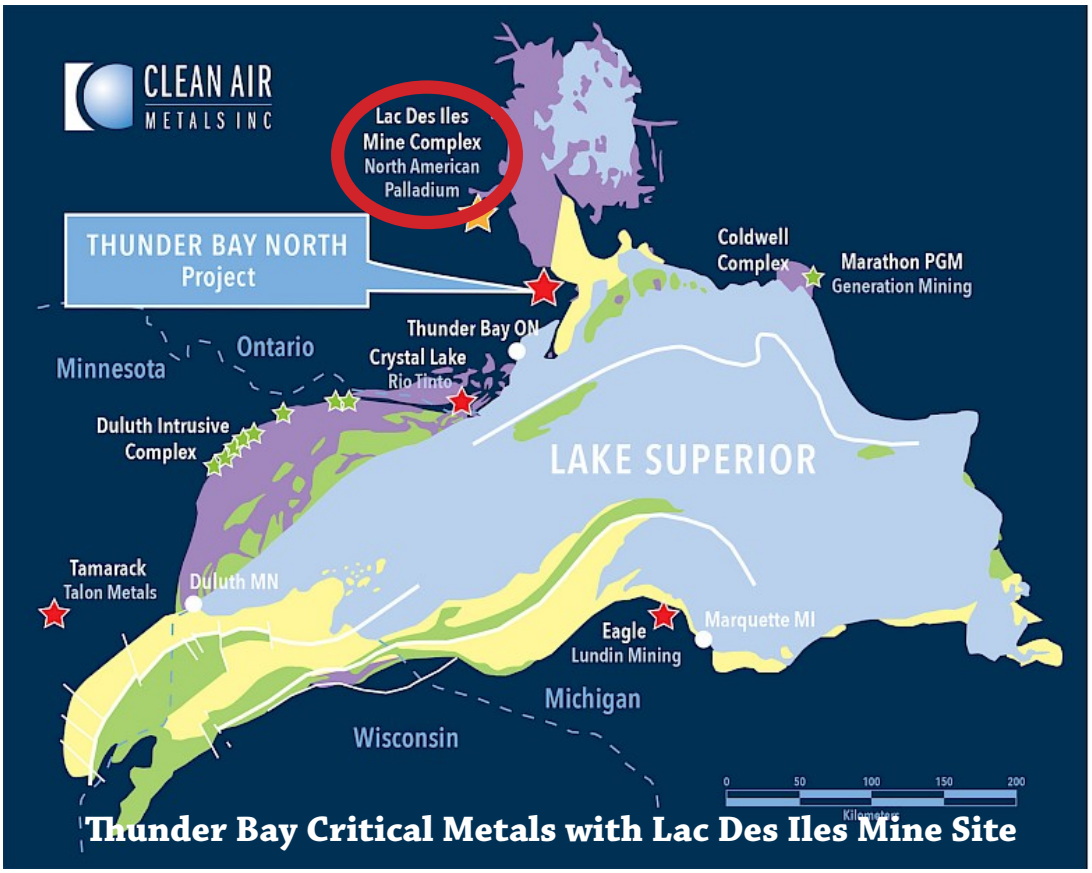
- What do you notice about the area?
- What do you think the area looked like before the resource extraction?
- How do you think professionals return the land to its original state? Is that possible?
- How long do you think the entire process takes?
- Do the three sites have any similarities or differences?
- What animals do you think are affected by this?
- What type of jobs do you think are required for this extraction?

Afterwards students can have free time to explore the area (where safe), take notes, create their sketch map and answer the Survey 123 questions.

Conclusion

When students return to school, they will have time to complete their worksheets. Students will also be asked to write down the most important thing they learned at each site and hand this in with their worksheets. If time permits, a short discussion regarding what students learned and their biggest takeaways.

Assessment
Diagnostic: Pre-field trip sketch maps highlight students baseline knowledge **Formative:** Survey 123 submissions, observations and conversations while on the field trip **Summative:** Worksheets and 3 biggest takeaway submissions **Learning Skills:** Responsibility
Success Criteria: What I'm Looking For (WILF):
• Students demonstrating safe practices and respect while on the field trip • Students ask questions that deepen their learning and demonstrate critical thinking (Thinking) • Students complete and submit both Survey 123 and worksheets (Knowledge and Understanding) • Student responses and discussions demonstrate understanding of how natural resource extraction impacts the surrounding environment (Knowledge and Understanding
Extension/Homework
• To extend learning, ask students to research the three companies they met with while on the field trip and write a brief report about one (or all three). • Have students write one paragraph about which resource extraction site they would most like to work at and why.
Career Links
• While on the field trip students were asked prompting questions about the jobs required for harvesting resources and met industry professionals. • Some jobs that are relevant to these discussions are: miners, foresters, electricians, mechanics, construction workers, welders, technicians, truck drivers, and logging machine operators.
Next Steps
How do natural resources connect to indigenous culture and ways of knowing? Are Indigenous perspectives taken into account during natural resource extraction?



Thunder Bay Critical Metals with Lac Des Iles Mine Site

PERMISSION FORM

Dear parents & guardians,

The grade 11 regional geography class has been given a wonderful learning opportunity to visit natural resource extraction sites in our region. This opportunity has been generously donated by local companies to inspire youth about the importance of natural resources and showcase potential career paths. Students will learn about harvesting procedures, the refining process, and how each natural resource impacts our region. While on this field trip students will be provided personal protective equipment including hard hats and high visibility vests when visiting each location. Safety is our top priority and this is why students are also required to wear full length pants and closed toed shoes for the excursions.

Day one will be spent traveling to Lake Des Iles Mining center North of Thunder Bay where students will be taken on a guided tour of the non operating portions of the mine and given the chance to ask questions with industry professionals. The second day will be spent visiting the Kakabeka Falls hydroelectricity dam and generating station and a forestry harvesting site operated by Greenmantle Forest Products. Once again each stop will begin with a guided tour followed by a question and answer period with industry professionals.

This excursion will take place over the school days of _____ and _____. Each day students will leave the school at 8:30 am and arrive for the end of the school day at 2:30. Thanks to Greenmantle Forest Products, Lake Des Iles Mines, and Ontario Power Generation there are no fees for the bus or safety equipment. Students must bring their own lunches, water, and proper clothing for each day.

If there are any questions or concerns please reach out at any time.

_____
Regional Geography Teacher
(807) 123- 4567

I, _____(parent/guardian name) grant permission for my student, _____ (student name) to leave school grounds on _____ and _____ to attend the natural resources field trip under the supervision of the geography department.

I acknowledge that my student will be obligated to abide by the school rules and the code of conduct whilst off school property or will face the appropriate consequences outlined in the school code of conduct.

I acknowledge that my students' participation in this activity or attendance on this field trip may involve certain inherent risks and potential for serious injury. I am fully aware of the risks involved by my student attendance and participation in this field trip. My students' participation is voluntary and I hereby assert that I knowingly assume all such risks.

I have read and understand the terms of this permission slip. I acknowledge that I am signing this release voluntarily and with full knowledge of its significance. I hereby give permission for my child to participate in the field trip.

_____

Signature of parent/guardian Print Name Date

Natural Resources Field Trip

The next two days we will be going on field trips to different natural resources sites in the region. At each site you will meet with industry professionals who will explain the harvesting and refining processes of the resource. At each stop you will be required to fill out a worksheet and Survey123 questionnaire at each site. Hold onto this worksheet and submit it after all trips have come to an end.

While off of school property it is extremely important to make safe choices and act as respectful representatives of our school. If at any time rules are broken or you put yourself or others in a dangerous situation you will be removed from the trip immediately and face consequences back at school. All rules listed below must be followed.

Rules and safety requirements:

- High visibility vests must be worn at each site
- Closed toe signs must be worn at all times
- When industry professionals are speaking all attention must me given to them
- Never wander off from the group
- When going to the washroom tell an adult and go with a partner

Survey123 QR Code

For **Sites 1,2,** and **3, answer the same following questions.**

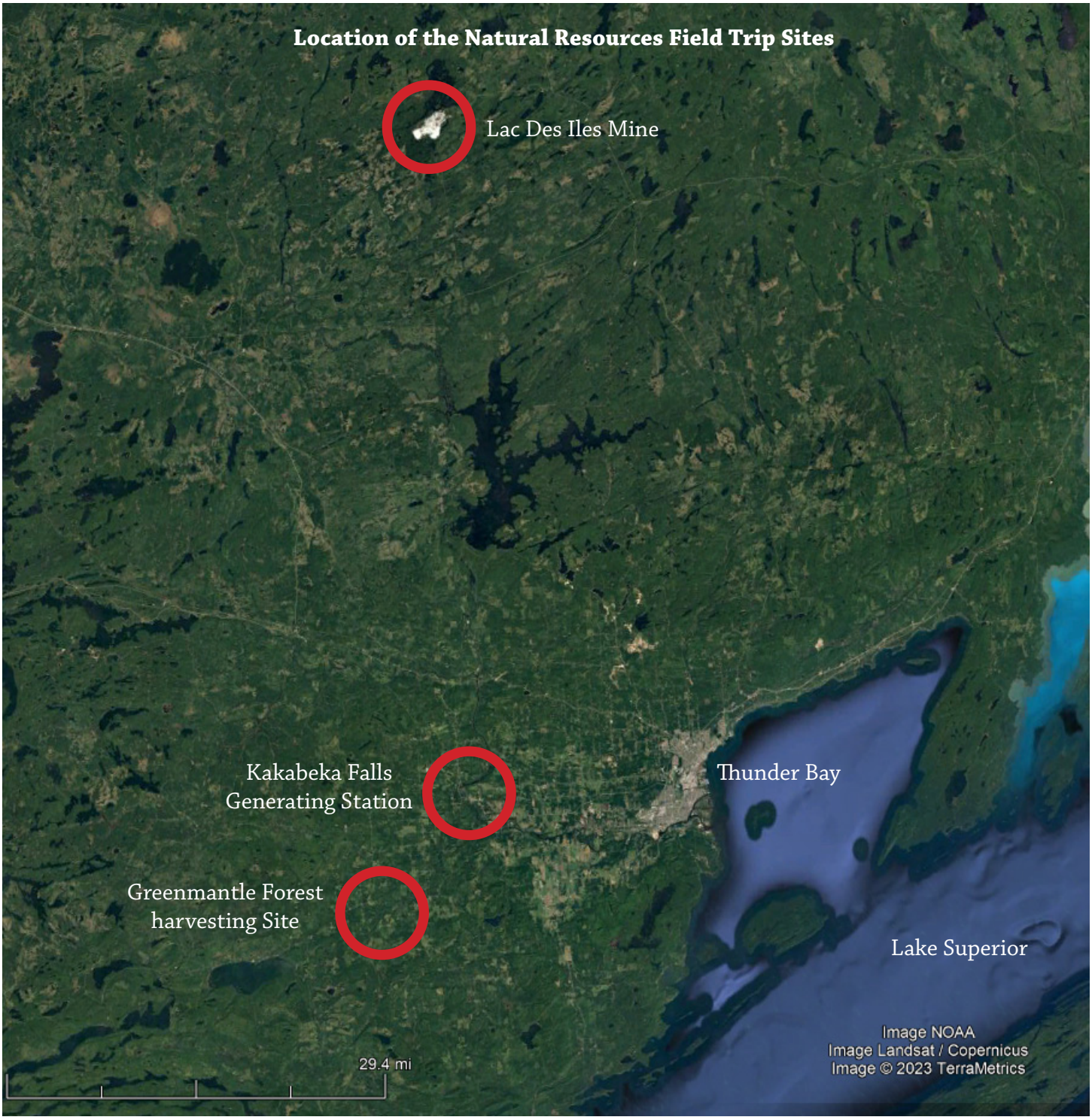
1. Where is this site located? Describe the area.

2. Why is this resource harvested here?

3. Why is the harvesting location important?

4. Moving forward, how can those harvesting the resource be more sustainable and consider their environmental impacts?5. Create a sketch map of the area.

Lac Des Iles Mine Site


Location of the Natural Resources Field Trip Sites
Lac Des Iles Mine
Kakabeka Falls
Generating Station
Thunder Bay
Greenmantle Forest
harvesting Site
Lake Superior
29.4 mi
Image NOAA
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Indigenous Relationships with Natural Resources [90 min]

Big Question
Does Northwestern Ontario's natural resource sector take into account Indigenous relations to the land?

Overview
In this lesson students will learn about indigenous perspectives on natural resources and their role in the natural resource sector. Students will also learn about indigenous peoples connection the the land and how this impacts their relationship with natural resources. Creativity and musicality are two skills that will be utilized within this lesson. Students will demonstrate their learning by using music to then express their personal perspectives to the topic.

Keywords		
Indigenous Ways of Knowing	Conflicting Perspectives	Connecting through Music

MoE Expectations	Geoconcepts	National Frameworks
Strand: C - Sustainability and Stewardship Overall: C1 Specific: C1.4	Geographic Perspective	6
Higher Order Thinking Skills	**Multiple Intelligences**	**GeoFrameworks**
Application	Rhythmic	Creativity Wheel
Skills	**Resources**	
Creativity Musicality	Icebreaker cartoon (see Appendix A) Instruction sheet and rubric (see Appendix A) ***Videos:*** Indigenous People Should Be Involved in Resource Project ... https://www.youtube.com/shorts/z2yMyM_Tobc ***Songs:*** • Sing The Water Song • Nibi Water Song - Turtle Lodge https://perpich.mn.gov/wp-content/uploads/2020/10/7.Nibi-Song-Elementary-.pdf (Meaning behind the Nibi Water song) https://vimeo.com/716225333?embedded=true&source=vimeo_logo&owner=19438586 ***Extension website / documentary*** https://ecampusontario.pressbooks.pub/indigstudies/chapter/environment-and-natural-resources/	

Learning Goals: We Are Learning To (WALT):
• Consider all perspectives and groups in natural resource management • Understand the complex history between settlers and indigenous groups surrounding natural resource management • Consider the connect indigenous groups have to the land and how natural resources impact this • Use music to describe our personal connect to the land

IceBreaker
To begin the lesson, students will be shown a political cartoon and they will have one to two minutes to consider the image individually before sharing with their tablemates what they think the meaning of the cartoon is. Finally as a class, the cartoon can be discussed. While students are working independently and in small groups, the teacher circulates, makes observations, and does a quick diagnostic assessment during small group and whole class discussions to check the baseline learning. Consider asking prompting questions such as: • Who do you think the audience of the cartoon is? • How can this be connected to Northwestern Ontario's natural resources? • How could natural resources be harvested while respecting Indigenous rights and connection to the land?

Action

To further introduce students to the importance of indigenous inclusion and rights during natural resource extraction, two short videos will be shared that provide indigenous perspective to natural resource extraction in Canada (listed in resources section).

After the videos ask students:

- Who do you think indigenous peoples feel?
- Do you think indigenous peoples are being treated fairly?
- What laws and regulations do you think should be in place?
- What do you think this relationship was like 20 years ago? 50 years ago?
- Are there any natural resource groups that do a good job (or poor job) in our region with including indigenous perspective? (Ex.Nawiinginokiima Forest Management Corporation)

To deepen knowledge and learning, students will listen to a number of Indigenous songs about nature (listed in resources). Once again, students will be asked reflective questions, such as:

- How did those songs make you feel?
- How do indigenous peoples view nature?
- Do you think the natural resources sector cares for the land how indigenous groups would want it to be cared for?
- Would you want to have your home harmed because of natural resource extraction?
- The Nibi water song is saying thank you Great Spirit, thank you Woman Who Cares for the Water, thank you Thunder Birds, thank you Grandmother Moon. Why do you think the singer is thanking these things?

Once students have a strong understanding about Indigenous connections to the land and their perspective on natural resources, students will be tasked with the job of creating their own playlist of five or more songs that describe nature and how nature makes them feel, and if the extraction of natural resources affects that. There is an instruction sheet that has a rubric and success criteria that can be shared with students at this time. Accompanying their playlists will be a short paragraph explaining their song choices.

While students are working, the teacher can circulate the room helping students that are stuck, asking deeper thinking questions and checking for understanding through conversation.

Conclusion

To conclude the class and bring closure to the lesson, you can go around the room and have students each share one song from their playlist and briefly share why they choose it. Students will also be required to submit the assignment by the deadline outlined.

Assessment

Diagnostic: During small group and whole class discussions to check the baseline learning during the ice-breaker discussions
Formative: Through observation and conversation while having class discussions and listening to and partaking in conversations during the work period
Summative: The submission of the playlist and written paragraph will be marked for a summative grade using the rubric provided.
Learning Skills: Independent work

Success Criteria: What I'm Looking For (WILF):
• Students are to: • share reflexive thoughts and feelings about the videos and songs shared in class (thinking) • demonstrate knowledge about the history between settlers and indigenous groups surrounding natural resource management through discussion (Knowledge and understanding) • demonstrate their understanding of the different perspectives involved in natural resource extraction in the region through discussion (knowledge and understanding) • use what they learned and personal opinions to communicate their perspective through music (Communication)
Extension/Homework
The documentary on the Ring of Fire and the side stories can be shared in class if there is extra time or can be assigned as an at home task. This is a great resource to shine more light on the current and past state of Canada's natural resource sector from an indigenous perspective. (see resources for link)
Career Links
If students are passionate about music, this draws a connection to how they can bring in concepts from geography to inspire their music. This also brings to light the need for indigenous roles in the natural resource sector for any indigenous students in the class.
Next Steps
Now that students have an understanding of Northwestern Ontario's natural resource sectors, the different perspectives on it, and the impacts it can have, students will create a board game combining all of this knowledge.

CONFERENCE POSTER

The Conference Poster

is a integral part of the ***OAGEE Conference*** with a poster being developed specifically for these events.

The 2023 Poster, ***A Space for All***, highlights three aspects related to Equity, Diversity, and Inclusion. The poster reflects the colours of the ***First Nations***, ***Transgender***, and ***LGBTQ+*** communities.

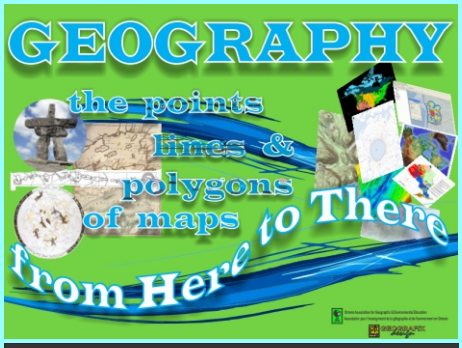
The poster is duplicated in French by ***Claude Tremblay Brun del Re***. However, in keeping with this year's theme, there is a single poster in the official languages.

The backside has activities produced by Claude. This year, Maple Syrup is the focus of the poster due to its contribution to Canada's geography and history.

All previous posters are available on the ***OAGEE website*** with a membership to the organization. Go to https://oagee.org/en/poster-series/

The poster are arranged by the following themes: Careers, Concepts of Thinking, Geographical Concepts, Grade Levels, Mapping, Partners, Promotion, and Sustainability. The Infographics developed for the Monograph are included here.

Sample posters are illustrated below with the 2023 poster and activities



GEOGRAF/X
Design
Un espace pour tous
équité
diversité
inclusion
GÉOGRAPHIES
Space for All
equity
diversity
inclusion
Ontario Association for Geographic & Environmental Education
Association pour l'enseignement de la géographie et de l'environnement en Ontario

Poster 2023 - Maple Syrup Activity
Claude Tremblay Brun del Re

Why is Canada's "Sweet Spot" for Maple Syrup So Important?
Answer this Inquiry question by looking at Native People, Landforms, Climate, Vegetation, Soils, Animal Connections and the Impacts of Climate Change using the Geographical Concepts of Thinking.

Sugar maple, like hockey, is uniquely Canadian. Moreover, it is not surprising that the leaf of its tree appears on our flag. Thanks to First Nations and a warming climate, maple syrup is a classic Canadian product. This age-old tradition of producing maple syrup has its roots in Indigenous cultures and now fuels a $400 million dollar industry concentrated almost exclusively on Canadian soil. However, climate change threatens this most important industry. Our maple syrup, this gold syrup envy of the world, could be facing challenges as the effects of global warming take shape in the next century.

Brief history of Maple Syrup
The sweet sap of the sugar maple (Acer saccharum) was known and valued by First Nations of the Eastern Woodlands, including the Abenaki, Haudenosaunee, and Mi'kmaq, long before the arrival of European settlers. Haudenosaunee tradition tells of the piercing of the bark of a maple and the use of its "sweet water" to cook venison, a happy accident that might have also established the culinary technique of maple-cured meats.

Maple curing was a food preservation method practised by the Anishinaabe that allowed communities to keep food stores for the winter months when food was scarce. Reserves of maple syrup were stored in large birch bark baskets sealed with bear grease and resin. This technique prevented the syrup from crystallizing and provided the natives with a reserve of sugar to face the great winter cold. Upon the arrival of European settlers, this survival skill was shared with the newcomers to a strange land with much longer, colder and harsher winters than they were used to. Popular history mentions that between 1536 and 1542, Jacques Cartier and his companions were introduced to the sugar maple and the sap that they found tasted good. First Nations told them that this tree was called "couton".

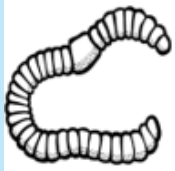
The Maple Syrup activity was developed by **Claude Tremblay Brun del Re**, OAGEE's French Rep. with help from **David Scott**, OAGEE's website guru. Claude has been with OAGEE since 1995 serving OAGEE'S French community (French Boards and French Immersion teachers) translating and adapting the OAGEE website, posters, school textbooks, and creating French resources. She loves doing maps, creating data, and resources and has a particular interest in Remote Sensing and GIS. Her pastime is taking care of her 6 grandkids, gardening, and visiting her home area on the North Shore of Quebec and the Saguenay.

As the settlers recognized the importance of syrup for survival, their attention turned towards syrup production. A century ago, about 80% of the world syrup was produced in the United States and 20% in Canada. Today, Canada produces about 78% of the world's maple syrup production with Quebec representing 92% of this total. Canadian maple syrup producers harvested 104.6 million kilograms (17.4 million gallons) of maple syrup in 2022, an increase of 53.9% compared to 2021. In 2022, Canadian maple syrup exports totalled 69.6 million kilograms (11,583 gallons) and reached 616 million dollars. Maple products are exported to 72 countries. The largest importers are the United States (61.9%), Germany (9.8%), France (5.0%), the United Kingdom (5.0%), Japan (4.6%), Australia (4.2%) and other countries (9.6%).

Activity 1 First Nations Stories: The discovery of collecting and transforming maple sap into syrup.
Guidelines:
1. Read the following versions of First Nations stories about the discovery of how to collect sap from maple trees, and how sap is transformed into maple syrup.
2. Compare the stories. Which legends may be factual? What morals can you gather from some of these legends? Provide at least three examples of morals.
3. Which of these stories do you prefer? Explain why.

Sugar Maple and Dogs
Some say that First Nations dogs aroused their masters' attention when a branch of a maple tree fell and the dogs scrambled to lick the sap that flowed from it. Their masters decided to taste it as well and liked it.

Few
Peu



Les vers de terre sont des espèces envahissantes dans les forêts canadiennes et affectent le sirop d'érable. Effectue une recherche pour expliquer pourquoi.

Research and explain why earthworms are an invasive species in Canadian Forests and affect Maple Syrup.

Lots
Beaucoup

Sugar Maple and Squirrels
At the end of winter, when the supply of nuts is exhausted and famine is at hand, squirrels go to the treetops and gnaw the branches of sugar maples. Scraping the bark allows the sap to escape from the twigs and the squirrels drink it. However, the real treat comes next morning when sugar crystals form on the bark they gnawed at the day before. Freezing temperatures cause the water in the sap to leave a sweet, candy-like, crystalline crust that helps them get through this period of scarcity.

The Nishnaabeg and Anishinaabeg Approach
Several First Nations approach the seasons according to the activities they practise on their territory. As such, there are six seasons. Among the Nishnaabeg and the Anishinaabeg ("original people"), the pre-spring, the period during which the sap of the sugar maple is collected, is called "sugar season" or "Maple Moon", Zizibaskwet Giizis, the previous month is known as "Hard crust on Snow Moon". People living a subsistence lifestyle also know this season as the Hunger Moon, when food supplies are dwindling and game is scarce, but maple trees helped people get by, providing food when they needed it most.

Nanabozho and the Maple Trees
When Nanabozho, the original Anishinaabe man travelled the world, he took note of those who flourished and those who did not, of those who heeded the original instructions, and those who did not follow them. He was dismayed when he came across villages where gardens were not tended, fishing nets were not repaired, and where children did not learn how to live. Instead of seeing piles of firewood and caches of corn, he found people lying under maple trees, mouths wide open, delighting in the maple syrup from those generous trees. They had become lazy and took the gifts of the Creator for granted. They did not practise their ceremonies anymore and didn't take care of each other. Nanabozho knew what he had to do. He went to the river and scooped up many buckets of water. He poured the water directly into the maple trees to dilute the syrup. Today, maple sap flows like a stream of water with only a trace of sweet taste to remind people to be responsible and to discover the potential of things. This is why you must work hard to get maple syrup since it takes at least forty gallons of sap to make one gallon of syrup.

Anishinaabe of Mississauga
Refer to a YouTube story told by Kim Wheatley on the discovery of maple syrup.
The Story of Maple Syrup: Ziizbaaktoke Dabik-Giizis (Sugar Making Moon)

Among the Mohawk of the Haudenosaunee Confederacy - The importance of the wáhta
For the Kanyen'kehá:ka, the wáhta, the sugar maple, is the chief of all trees in nature. The flow of its sap is the first sign of renewal in spring, and it reveals the awakening of Mother Earth after a long period of hibernation. Maple sap is a diuretic and internal purifier, and maple syrup is a natural sweetener used in traditional dishes. Each year, the Kanyen'kehá:ka organize a ceremony to thank the wáhta for all its benefits. See the following

- Wahta Stories 1 to 4 on YouTube
- Wáhta Teachings https://www.queensu.ca/science-rendezvous/wahta See the Rise digital module to learn more about the tree, the Interactive Guide and the series of videos on traditional Maple grove Ziinzibaakwadgummig - The Sugar Bush (1. The story, 2. Collecting Maple Sap, 3. Language, 4. Ininiaatig - Maple Trees, 5. Ziinzibaakwad - Maple Sugar)

The Mi'kmaq
One pre-spring day, while the wind was still chilly, an old Mi'kmaq woman went to collect the sap from maple trees. Since it tastes better hot, she put some in a jar and placed it over her teepee fire. Being tired, she went to lie down. When she woke up, it was already evening, she found a golden syrup in the jar, clear and sweet.

The Algonquins
The chief took out his tomahawk from a maple he had stuck the night before. As the sun rose in the sky, the sap began to flow. His wife tasted it and found the liquid very good. She used it to cook her meat, thus avoiding fetching water from a source. The sweet taste and sweet smell of the meat were highly appreciated by the chief. He called the syrup in which the meat was boiled, Sinzibuckwud, an Algonquin word that means "taken from the trees".

The Iroquois
Long ago, on a freezing morning, an Iroquois chief named Woksis came out of his hut. Since he had to go hunting, he took out his tomahawk he had planted in a sugar maple the night before. The tomahawk had made a deep gash in the tree, but Woksis ignored it and went hunting. At the foot of the tree, a birch bark container was placed and drop by drop the sap that looked like water flowed, filling the container. The next day, Woksis' wife noticed that the container was full. Thinking the colourless sap was water, she used it to make game stew. In the evening, at supper, Woksis smiled and said to his wife: "This stew is delicious. It tastes sweet". His confused wife then dipped her finger in the stew that had been simmering all afternoon. Woksis was right, the stew was sweet. She had just discovered maple syrup!

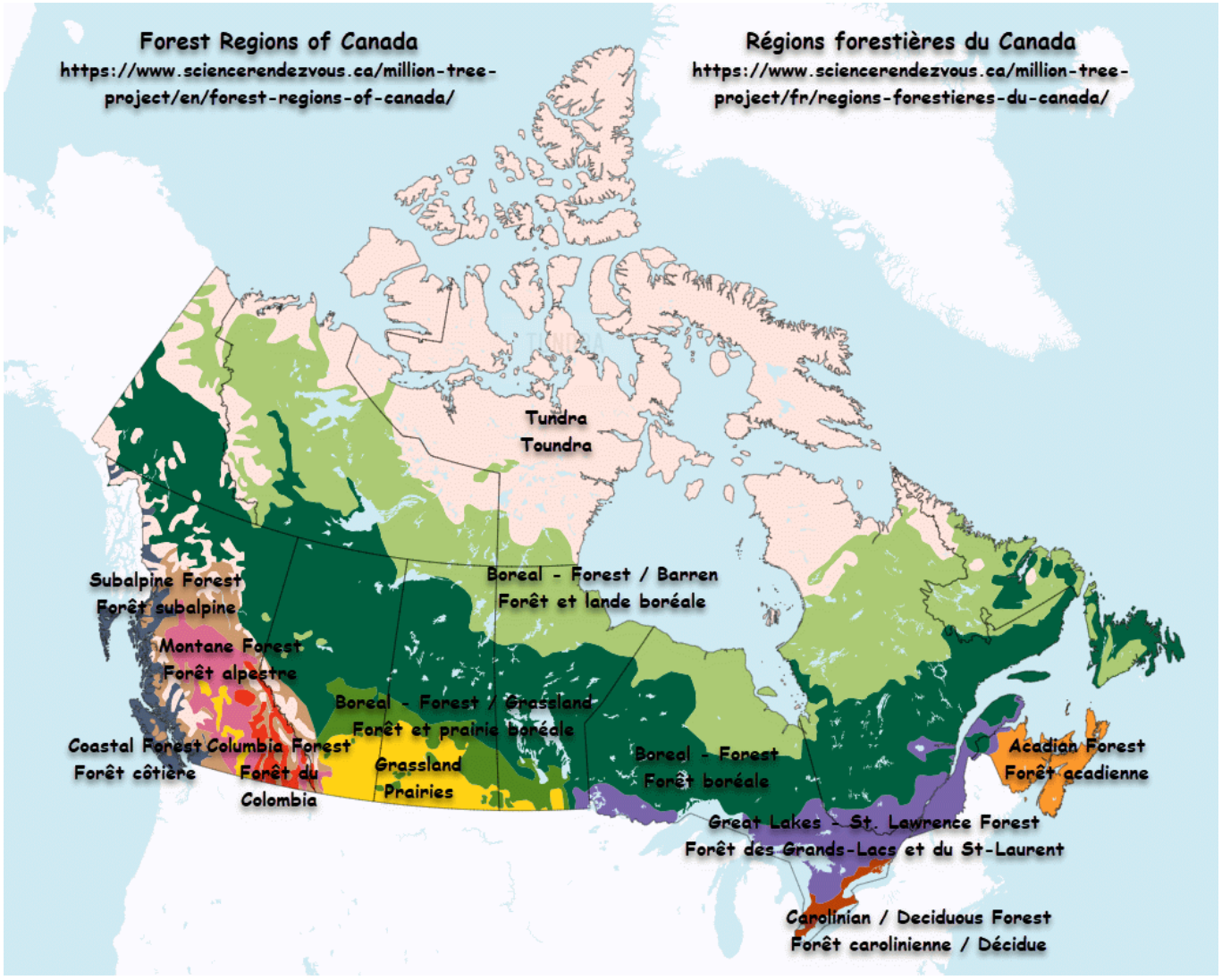
The Legend of Nokomis (The Earth)
This legend says that Nokomis (The Earth) was the first to drill holes in the trunks of maple trees and collect maple syrup directly. Manabush found that the sap was ready-to-eat syrup. He went to find his grandmother, and said to her: "Grandmother, it is not good that the trees produce sugar so easily. If men can thus effortlessly collect sugar, they will soon become lazy. We must try to make them work. Before they can taste this exquisite syrup, it would be good if the men were forced to chop wood and spend nights watching the syrup cook". He said no more, but he was worried that Nokomis was indifferent to his words and that she was forgetting to take steps to prevent men from becoming lazy. He climbed to the top of a maple tree with a container filled with water and poured the contents inside the tree, thus dissolving the sugar that was in the maple tree. Since that time, according to legend, instead of a thick syrup, the sap contains 1% to 2% sugar, and to obtain sugar, it is now necessary to work for it.

Sources
Sirop d'érable : Origines et légendes
https://www.authentikcanada.com/ca-fr/blog/sirop-derable-origine-et-legendes
Robin Wall Kimmerer, Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants https://www.goodreads.com/author/quotes/49921.Robin_Wall_Kimmerer?page=7
Wháta Teaching WAHTA TEACHINGS-F21.pdf (queensu.ca)
The Legend of Chief Woksis https://www.d.umn.edu/~tbates/curricularesources/MapleSyruping/CheifWoksisStory.pdf

Activity 2: Appreciating Diverse Perspectives
Maple syrup is important to diverse groups of people for several reasons.

Compare and contrast the value of this "Liquid Gold" to both Canada's First Nations and settlers and their descendants. Consider the economic, environmental, political, social, and cultural perspectives for each one.

Issues for Maple Sugar Tree Facing Climate Change
Global warming threatens several species of trees like the sugar maple, and the trees are moving north at a speed of nearly 100 km per century. Since 1970, there has been a northward shift of hardwood and mixed forests in Ontario and Quebec. Sugar maple trees prefer certain temperature and precipitation conditions to grow and develop. This is called the sugar maple's climatic niche, which provides the tree with favourable or even tolerable conditions for its development. But with climate change, the area where maple is now growing will change. By 2070, the maple's climatic niche will extend northward, leaving areas to the south where the majority of sugar bushes are now located to face new climatic conditions which may prove to be difficult for the trees to adapt to. Some maple-producing regions may no longer be present in the future. Climate change is raising seasonal temperatures in southern Canada affecting the "sweet spot" of sugar maples



Activity 3 Complete a webquest and find Radio-Canada: Maple Syrup is under threat by Daniel Blanchette Pelletier.

Answer the following questions.
1. In the context of climate change, what do computer models predict by 2100 about maple forests in Canada and what natural conditions will limit the quality of the sap produced by these trees?
2. Where are the areas suitable for the development of the sugar maple in Canada? Indicates the vegetation zones involved.
3. Who is at the forefront of global warming concerning Maple Syrup? Explain why.
4. Explain what can happen to the areas where sugar bushes are now growing?
5. Where is maple syrup production concentrated in Canada, and how has it changed over the years?
6. As sugar maple progresses north, in which vegetation zone is it likely to migrate?
7. What will be certain limitations of this vegetation zone (new climatic niche)? Provide details of soils and climate.
8. Provide some examples of planned adaptation and creation of sugar bushes in northern areas with possibly favourable conditions.
9. With climate change, which tree might provide competition to the sugar maple and why?

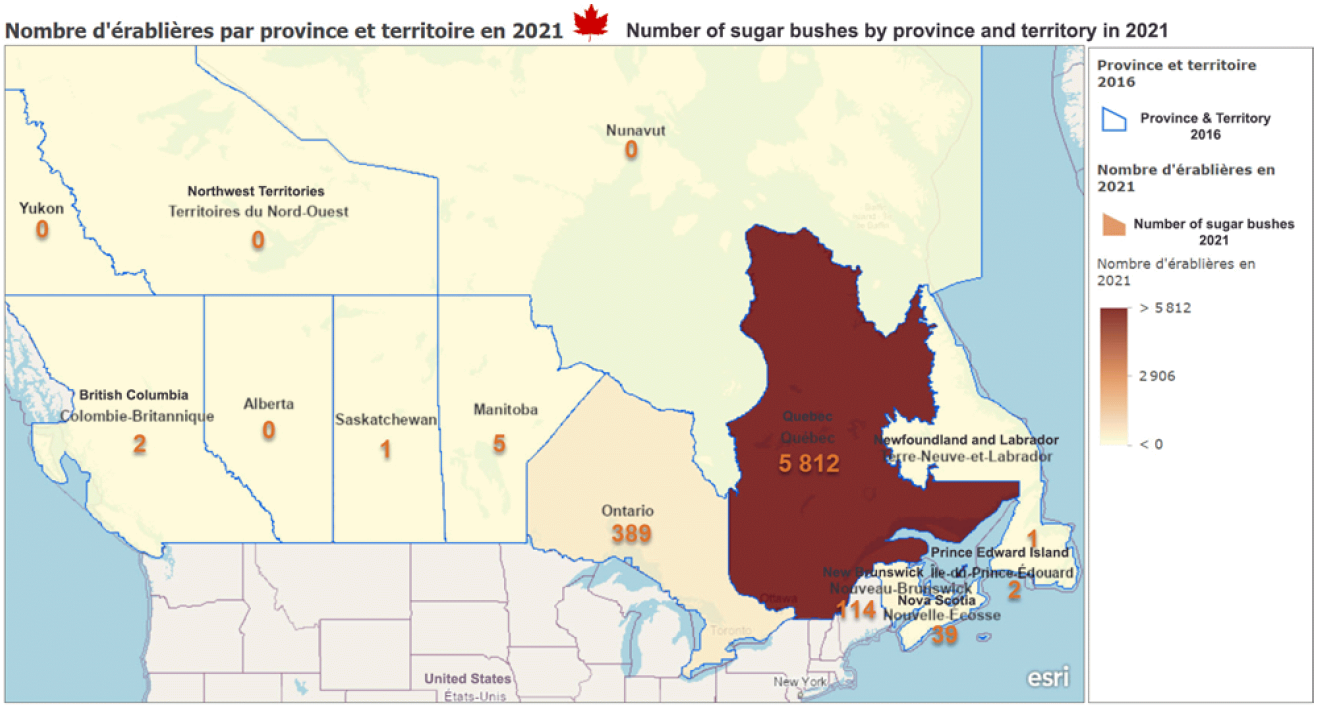
Activity 4 Pattern Questions:

The map below illustrates maple syrup production by provinces. Use the phrase bank to help answer the following:

1. What does the map show well?
2. What does the map fail to show?

Phrase Bank

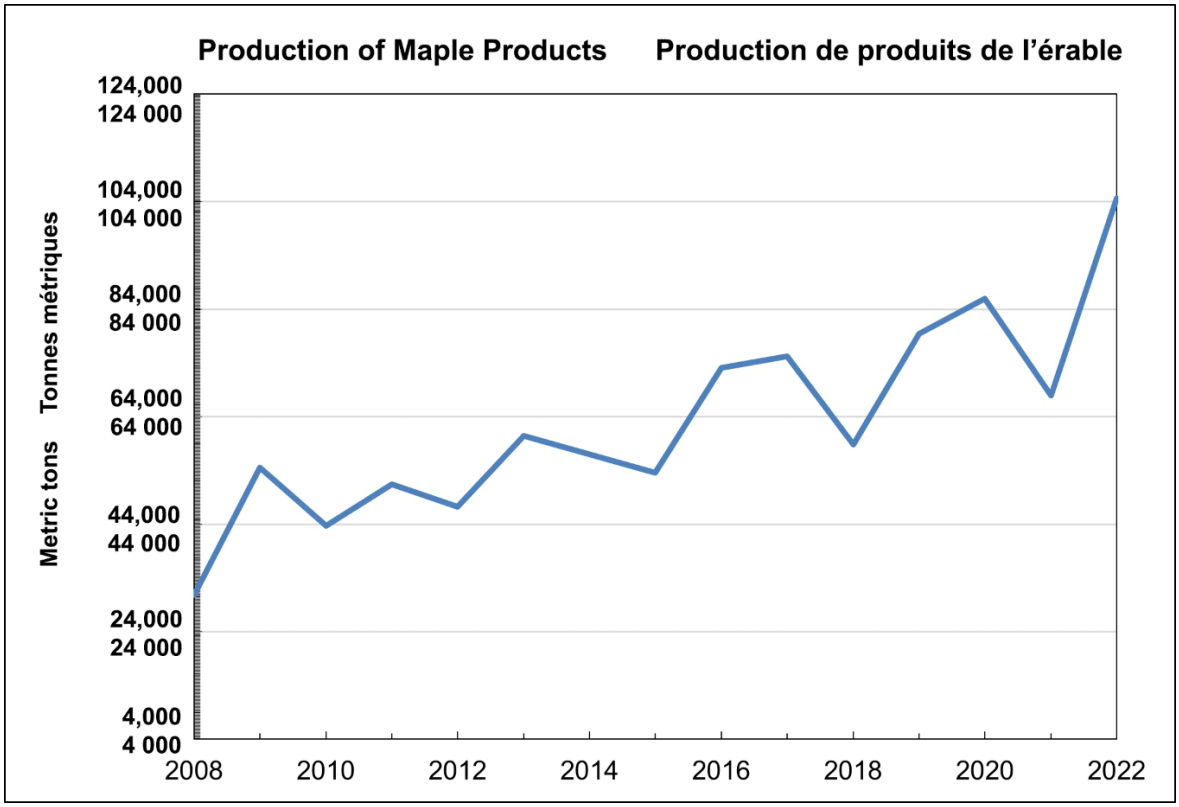
- Exact natural locations with the ideal climate for maple trees
- General human locations where syrup is produced
- Changes in syrup production over time
- Provinces with a large maple syrup industry



Gouvernement du Canada; Statistique Canada; Division des registres statistiques et de la géographie | Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri

Trend Questions

The maple syrup industry relies on natural conditions for success. See the graph below.



1. Which year would you suggest it was either too warm or too cold for the ideal striping conditions? Backup your answer with numbers from the graph.
2. Describe the overall trend in maple syrup production between 2008 and 2022. Suggest a reason to explain this trend. Answers can be natural or human!
3. Make a prediction for the number of metric tons of syrup produced in Canada for the years 2025, 2050 and 2100. Defend each answer.

Perspective Question

Climate Change is happening fast. Identify two ways that Canada will benefit from and be hurt by the changing climate. Answers should identify social, environmental, economic and political perspective. They should also connect to patterns or trends.

The History of Maple Syrup

Before the1500's
Before the European settlers arrived, First Nations were using the maple tree sap to make maple syrup.

1532 -1542
Jacques Cartier and his companions were introduced to "couton".

Circa 1676
Maple sugar is being made in iron pots.

1700 & 1800
Maple sugar is a popular curiosity in Europe. It became a substitute for cane sugar in 1749. In 1764, it was more appealing with the new Sugar Act to the American colonies, and dairy farmers are starting to make maple syrup as a secondary income.

1810
Maple trees are tapped with a wooden spile.

1850
The sugar shack is born.

18 76
Metal pots and pails appear.

1889
The maple sap evaporator is invented.

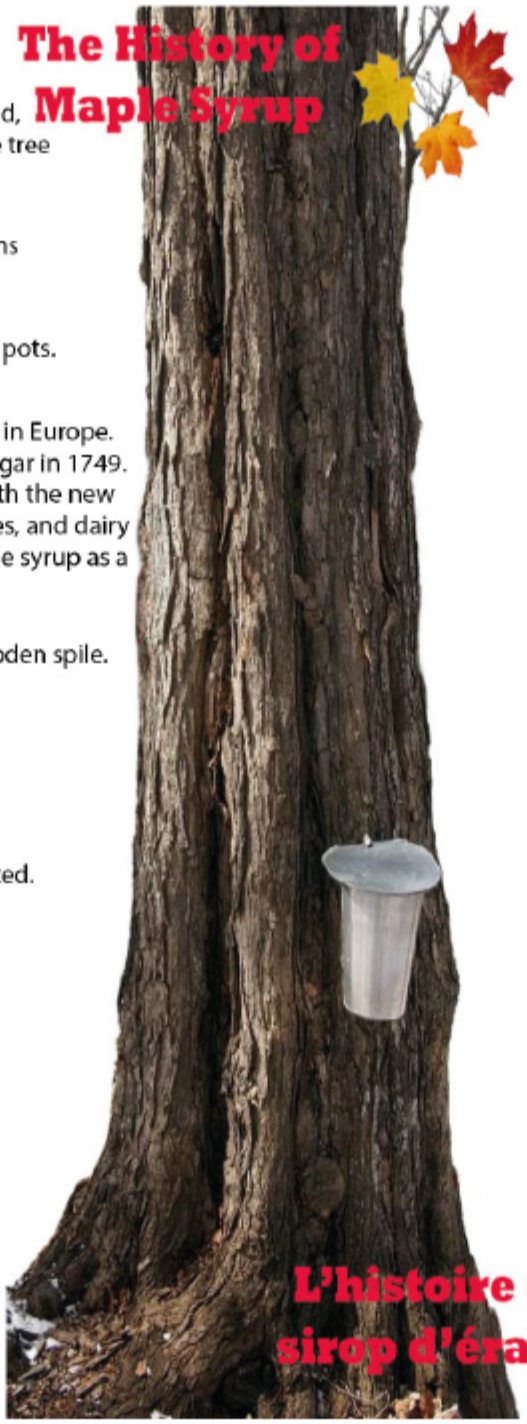
1932
Maple butter is invented.

1951
Maple syrup appears in cans.

1970
Maple trees start to be connected with tubing systems.

2005
Minerals, vitamins and other molecules are identified in maple syrup.

2010
Discovery of the Quebecol molecule unique to maple syrup and beneficial for humans.



L'histoire du sirop d'érable

Avant 1500
Avant l'arrivée des colons européens, les Premières Nations utilisaient la sève d'érable pour faire du sirop d'érable.

1532 -1542
Jacques Cartier et ses compagnons sont introduits au couton.

Vers1676
On fabrique du sucre d'érable grâce au chaudron en fer.

1700 et1800
Le sucre d'érable est une curiosité populaire en Europe et devient un substitut à la canne à sucre en 1749. En 1764, avec l'application de la nouvelle loi sur le sucre auprès des colonies américaines plusieurs agriculteurs produisent du sirop comme revenu secondaire.

1810
On utilise des chalumeaux en bois.

1850
Apparition des premières cabanes à sucre.

1876
On utilise des chaudières de métal.

1889
Invention de l'évaporateur pour l'eau d'érable.

1932
Le beurre d'érable est inventé.

1951
Le sirop d'érable est vendu en canne de conserve.

1970
Les érables à sucre sont connectés par des systèmes de tubulure dans les érablières.

2005
Des minéraux, des vitamines et d'autres molécules sont identifiés dans le sirop d'érable.

2010
Découverte de la molécule québécol, unique au sirop d'érable et bénéfique pour l'humain.

Acer saccharum

Sugar Maple / Érable à sucre

Where? Carolinian Deciduous Forest and Great Lakes - St. Lawrence Forest
(In the provinces of Quebec, Ontario and the Maritimes)
Où ? Forêt d'arbres à feuilles caduques (décidue) carolinienne et forêt des Grands Lacs et du Saint-Laurent (dans les provinces du Québec, de l'Ontario et des maritimes)

Leaf - La feuille

Make food from water, carbon dioxide, and light.
Deciduous leaf - 5 lobes and borne in opposite pairs
Long tips , blunt-pointed
8-20 cm

Fall colours

Colors d'automne

Fabrique sa nourriture avec l'eau, le dioxyde de carbone et la lumière.
feuille caduque à 5 lobes,
portée en paire opposée,
pointes longues, pointues
8 à 20cm

Fruit - Le fruit

The samara is a pair of winged of 1cm to 2 cm and carries two globes like seeds.
It whirls when falling.

La samare a deux ailes qui mesurent de 1 à 2 cm et portent deux graines globuleuses. Elle tourbillonne en tombant de l'arbre.

Flower - La fleur

The flower is without petals
5 sepals, greenish-yellow
Drooping
Appears before the leaves

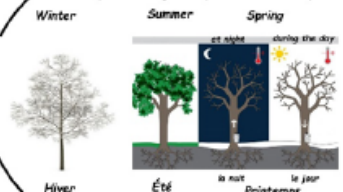
La fleur est sans pétales,
5 sépales jaune -verdâtre,
pendante et
apparaît avant les feuilles.

Twig - La tige

The twig is hairless, shiny, and reddish-brown to green.

La tige est sans poil, luisante et de brun rougeâtre à vert.

In winter, the tree is dormant.
In summer the tree builds its reserves.
In spring, frost at night create suction and the sap move up while during the day, with thaw, the sap flows down.



L'hiver, l'arbre est dormant. L'été, l'arbre construit ces réserves.
Au printemps, le gel la nuit permet la succion de la sève vers le haut alors que le jour avec la fonte la sève liquide descend.

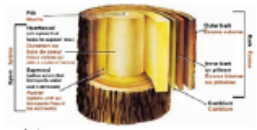
Roots - Les racines

Roots provide anchorage for the tree and take in water and nutrients necessary for its development.

Les racines servent à fixer l'arbre au sol et à y puiser l'eau et les éléments nutritifs nécessaires à son développement.

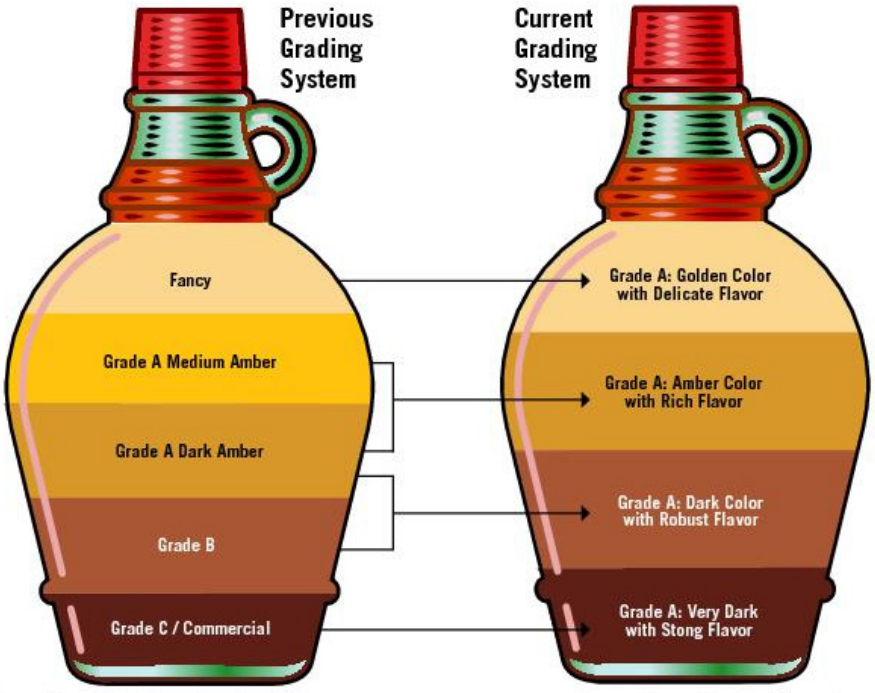
Trunk - Le tronc

Straight
Can reach 35 m tall
Diameter can be more than 100 cm at breast height
Bark : Grey - smooth on young trees and with age split and curl



droit,
hauteur pouvant atteindre 35 m,
diamètre peut atteindre plus de 100 cm à hauteur de poitrine
Écorce : grise - lisse sur les jeunes arbres,
gondole et se fend avec l'âge.

Learn to identify Sugar Maple.
Apprends à identifier l'érable à sucre.
Look at this video to learn more about the Wáhta.
Regarde cette vidéo pour en connaître davantage sur le Wáhta.
https://www.youtube.com/embed/B2ohOjAXFGI



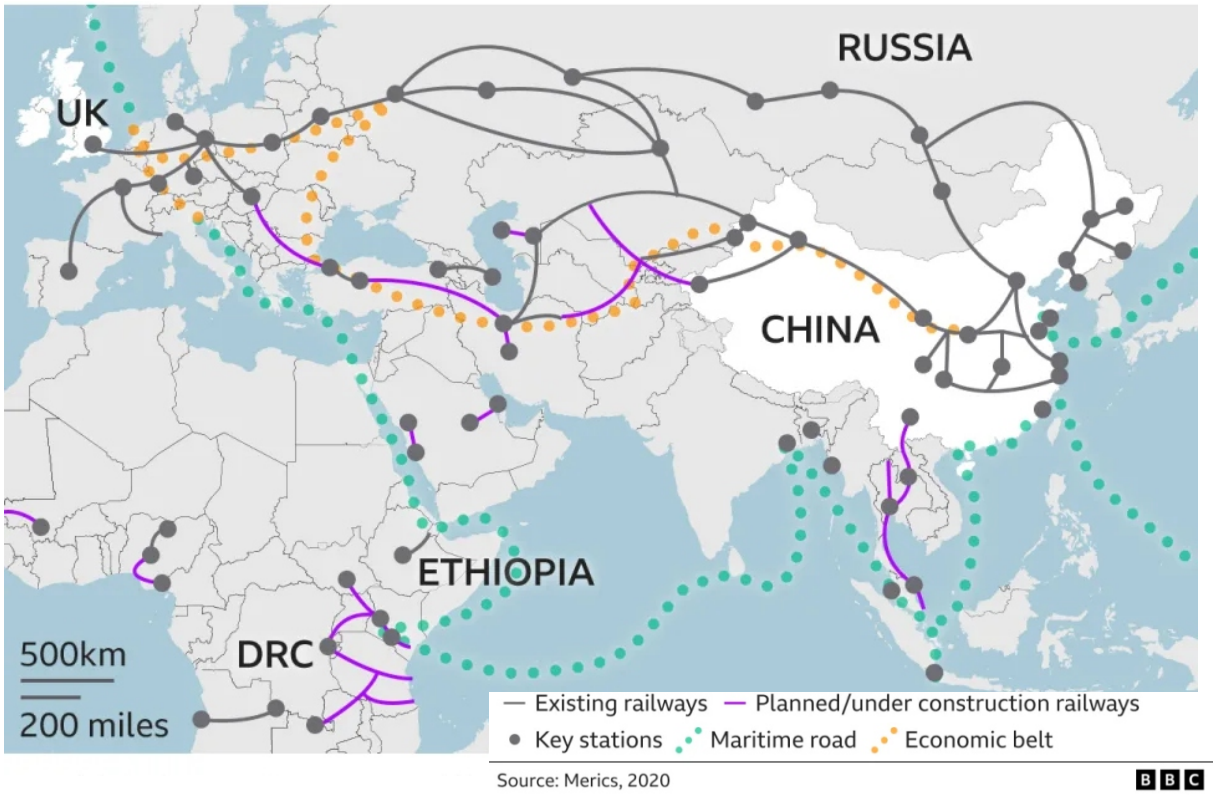
Source: Vermont Maple Sugar Makers Association

VALLEY NEWS — SHAWN BRALEY

THE LAST PAGE

challenges our readers to implement
your teaching strategy for this map.

Belt & Road Initiative & Expansion Plans



Pick a BIG Question

1. How does transportation infrastructure promote economic development and trade?

2. What dis/advantages does the B&R give to China? host nations?

3. Determine whether or not the B&R creates a region of economic prosperity and trade.

4. Is China reshaping the world?

5. A counterweight is the IMEC or India Middle East Corridor. The USA, Canada, most of Western Europe, Israel, Jordan, India, Australia, and Japan have agreed to build a rival B&R. Map the possible route and outline the dis/advantages this corridor.

Find a BIG Answer