



STUDENTS ON ICE

Arctic Education Modules

UNIT #1 - INTRODUCTION TO THE ARCTIC

We normally think of the Arctic as the northern part of the North American Continent. This vast area includes territory in Alaska, the Yukon, Northwest Territories and Nunavut, as well as the many islands of the Canadian Arctic. As impressive as this huge area is, the Arctic also includes all the ocean and lands north of the Arctic Circle and even areas south of the circle that share Arctic characteristics. A serious study of the Arctic would include the northern regions under the flags of Canada, Russia, Finland, Sweden, Norway, Iceland and Denmark (Greenland).

Antarctica is a continent almost half the size of Africa, covered by ice, that is surrounded by oceans. The Arctic, on the other hand, is an immense ocean covered by ice, surrounded by continents.

Antarctica has little human history other than explorers, whalers, scientists, thrill seekers, scientists and, lately, tourists. The Arctic had many centuries of human occupation before modern day explorers 'discovered' it. The stories of these peoples, past and present, add a fascinating element to the study of the Arctic. The thousand year-old history of Norse settlement in Greenland, the poverty and isolation of the Chukchi peoples of the Russian Far East, and the recent formation of Nunavut in northern Canada are just a few examples.

Of course, tales of exploration abound and the plight of expeditions, such as Franklin's, continue to fascinate us to this day. Recent deaths of both experienced scientists and seasoned adventurers attest to the often inhospitable and always unpredictable nature of the Arctic.

Recently, unsettling events have come to light in the Arctic regions. A February headline in the Toronto Star declared: *'Arctic may trigger dire new climate.'* The article opens by stating that *'The Arctic ecosystem has a hair trigger that could go off suddenly and plunge the world into severe and irreversible climate change, including shutting down the Gulf Stream, disrupting ocean circulation globally and speeding up the rise in sea levels.'*

Most children are aware of the North Pole as the home of Santa Claus. But, which pole is it? There are four North Poles about which you may wish to learn: the Geographic North Pole, the Magnetic North Pole, the Geomagnetic North Pole and the Northern Pole of Inaccessibility. Which pole will you come closest to on your expedition to the Arctic?

The Arctic, unlike Antarctica, has a wide diversity of flora. It can be found in the forested taiga at the edges of the Arctic, in the tundra (the treeless meadows and bogs further north) and in the Arctic Basin where lichens and plankton abound.

As in Antarctica, an incredible variety of fauna flourishes. Animal life does not include penguins (to the surprise of many) but seals, caribou, polar bear, walrus and whales are among the inhabitants of this truly incredible region of our magnificent planet.



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Sadly, pollution is a very present danger in this important and fragile ecosystem. Pesticides, PCBs, sulphur dioxide and oil and gas contaminants have been introduced to Arctic waters with a direct and indirect impact on marine life and the health of human populations. Radiation is a distinct threat as a result of the dumping of nuclear waste, nuclear testing, the Chernobyl disaster, waste from nuclear reprocessing plants and the scuttling of nuclear submarines. Air pollution is also carried to the Arctic regions by winds that circulate far more widely than commonly believed.

Much scientific activity is carried out in the Arctic. Some of this activity is intended to provide data that may help protect the regions through resulting government action and legislation. Much research could result in mining growth, oil and gas drilling and other resource projects. Economic interests and ecological interests are bound to create major conflicts in the years and decades ahead. The Canadian Space Agency, among others, is adding considerable and valuable knowledge to the debate.

The politics of the Arctic will become increasingly intense in the days and years ahead. Valuable and rare resources create tension when international interests are out of step. Scientific knowledge about pollution, declining wildlife, global warming, and other impacts of human endeavours, will have an unknown influence on political decision-making. Watch for the playing out of George W. Bush's energy policy on resource development in Alaska.

Tourism will play an increasing role in the future of the Arctic. The government of Nunavut is promoting the unique nature of such assets as its land, culture, recreational opportunities, climate and wildlife. 'Arctic Fever' says *The Nunavut Handbook*, 'is an affliction of the heart and soul for which there is no known cure.'

Enjoy your study of the Arctic. Your increased awareness will help you to appreciate the importance of the Arctic to all future generations on earth. Your travels to the Arctic will build on your knowledge as you experience firsthand this amazing part of our world!

UNIT # 1 - EXERCISES

1. EXPLORATION:

There are many resources that can be accessed to learn more about the Arctic. Web sites, audiovisual materials and print materials offer diverse views, data and insights.

Try some of the following resources:

- [Canada's Arctic \(University of Guelph\)](#)
- [Nunavut Tourism](#)



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- www.greenland-guide.gl will provide direct links to interesting information on animal life, culture and history etc.
- [Discovering the Arctic](#)
- [Dive and Discover](#)
- [Athropolis Links](#)
- [Students on Ice Arctic Reader](#)
- Longitude Books offers such titles as *The Vanishing Arctic*, Bryan Alexander, Cherry Alexander; *Arctic Dreams, Imagination and Desire in a Northern Landscape*, Barry Lopez and *The Arctic, A History*, Richard Vaughan
- *The Nunavut Handbook* is a valuable resource sold by Nunavut Tourism (ISBN 1-55036-587-8)

Activity:

- a) Check out some of the above resources and a few additional resources of your own
- b) Which resources met your information needs best? What criteria did you use to decide?

2. CONCENTRATION:

Using one or more of the resources you found useful -

- a) Select a topic about the Arctic about which you'd like to learn more. (e.g. global warming is shortening the hunting season of the polar bear. This is leading to weight loss, low fertility rates and the eventual demise of the magnificent mammal if global warming causes are not reversed.)
- b) Research your topic. What is your premise? What sources did you find the most useful? What conclusion(s) did you draw?
- c) What would you still like to find out about your topic of interest?

3. SPECULATION:

During the above research, you may have gained some understanding of the affect of human activities on the Arctic (e.g. green house gases building in the atmosphere are causing thinning of Arctic sea ice, thawing of permafrost, appearance of non-Arctic species).



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Activity:

a) In a page, or less, discuss your findings and speculate on the future impact of these activities, on the following:

- Human populations in both the Arctic and elsewhere in the world
- The natural world e.g., animals, plants etc.
- The physical world e.g., land, ice, winds, weather patterns etc.
- Other

b) Offer solutions and/or recommendations that might begin to remedy the impacts you discussed above.

4. PERSONALIZATION:

Your interest in the Arctic and your desire to travel there makes you somewhat unique among your peers. Think about some of your personal interests/strengths that could be applied to future involvement in terms of the Arctic.

a) How might you personally make a positive difference related to the topic you discussed above, through:

- Leadership skills
- Photography
- Writing
- Acting (drama)
- Other



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UNIT #2 - ARCTIC FLORA AND FAUNA

The Arctic region derives its name from the stellar constellation of Ursa Major, the Great Bear. Arctos is Greek for bear. Fittingly, the mammal that most captures the imagination of anyone studying, or visiting, the Arctic is, unarguably, the great white bear, the polar bear. There are many other impressive species of marine and land mammal, and bird, in the Arctic, both native, and seasonal visitors. Not to be outdone, a wide and surprising variety of flora exists in the Arctic regions.

For flora, life is a precarious phenomenon. Winter's icy grip lasts for months on end and even spring temperatures can dip to -30 degrees Celsius. Summer is a brief respite during the months of July and August with temperatures often dropping below freezing, accompanied by dry inhospitable winds. There is little soil and it is usually acidic and lacking in nitrogen. Just below the surface lies either bedrock or permafrost. Amazingly, the Arctic flora, through a series of adaptations, is able to survive severe and rapid fluctuations in temperature. Plants can literally freeze one minute and thaw the next. About 200 species of flowering plant exist above the tree line, but is exceeded by the number of mosses and lichens.

Dandelions, buttercups, harebells and chamomile daisies can be viewed. On the tundra meadows are found willow catkins (pussy willows), purple saxifrage, yellow cinquefoils, Lapland rosebay, white bells and mountain avens (known in Inuit as malikkat 'the follower' because the pale cream flowers always face the sun). Wintergreen, moss campion, arctic cotton, louseworts (similar to snap dragons), the prolific fireweed (that can turn a whole valley a splendid pink), prickly saxifrages, bladder campions and mouse-ear chickweed choose their own ecosystems. Crowberries, blueberries, cranberries and alpine bearberries are edibles that have their place in Inuit diets. Lichens are vital elements in the Arctic environment. Rather than single plants they are a symbiotic association of algae and fungi cells co-habiting. Some are staples in the diets of caribou and some have saved native peoples and many explorers from starvation.

Treat all flora with respect. A botanist has reported counting 400 growth rings on a stem of Lapland roseberry that was no thicker than a man's thumb.

Land mammals share with flora the incredible adaptations that have made it possible for them to survive the harsh fluctuations of temperature, environment and resources, so common in the Arctic. With a little luck the visitor to the Arctic may see caribou (reindeer), known to the Inuit as 'tuktu'. In Nunavut, alone, it is estimated that there are 750,000 caribou. Some migrate as much as several hundred kilometres in the spring. Although DNA tests suggest that all caribou are members of one subspecies, there are generally considered to be three distinct subspecies: the barren-ground, Baffin and diminutive Peary. The visitor to Kangerlussuaq may very well see Musk Oxen. This area is home to one of the largest populations in the Arctic. Look for them here because they will not be found on Baffin Island. The 'umingmak' prefer grasses and sedges to the lichens that provide sustenance to the caribou. Well known for their habit of circling face outwards to protect their calves, it is wise to stay well clear. In summer, bulls are very aggressive and unpredictable and will charge the unwary visitor. The tundra



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wolf and the arctic wolf prey on musk oxen, caribou and arctic hares. Wolverines, the largest of the weasels, are distinctive for the two tan stripes running the length of their bodies. The male weighs up to 28 kilograms and its fur is prized for use in parka hoods because frost slips easily off the hairs. Smaller animals include lemmings, hares, weasels and foxes. These animals are common on Baffin Island and have moved as far as the Queen Elizabeth Islands.

Many marine mammals flourish in Arctic waters. They provided the resources that allowed centuries of native culture to develop. They provided food, shelter, clothing, fuel and even the raw materials for tools, weapons and crafts. The three most bountiful species of seal are the ringed, harp and bearded. The ringed seal 'natsiq' was the main staple of Inuit diet and a primary resource for many of their survival needs. Walrus are a paradoxical animal that can reach up to 3.5 metres and 1,400 kilograms. Clumsy on land, they are masterful swimmers. An adult walrus can consume as many as 3,000 clams in one day. They use their tusks as a symbol of social dominance and to assist them to get out of the water. They are found in shallower waters in Hudson Bay, around Baffin Island and in the High Arctic. Whales are prolific. Other whales are seen but the true Arctic whales are the beluga, narwhals and bowheads. Up to 100,000 of the snow-white belugas congregate, frolic and sing in the same waters each summer. Early whalers called them 'sea canaries'. The narwhals have a more restricted range, although a visitor might be lucky enough to spot one in the fertile waters of Lancaster Sound or a deep fiord of northern Baffin Island. The narwhal is the mysterious 'unicorn' of the sea with its ivory tusk spiralling from its upper jaw. The narwhal averages 4 metres and weighs nearly two tonnes. The bowhead is the giant of arctic whales reaching 18 metres and 100 tonnes. They were hunted to near extinction in the 1800s and early 1900s and their numbers are still dangerously low. From a high of about 100,000 there remain no more than 1,000 in the eastern Canadian Arctic. Killer whales also visit these waters and may be partly responsible for the difficulty bowheads have in increasing their numbers. Young bowheads are a part of the Orca diet.

The polar bear is the world's largest land carnivore. The polar bear is considered a marine mammal since it spends its life on the sea ice and in the water. Extraordinary swimmers, they have been witnessed swimming many miles from the nearest land. Polar bears, or 'nanuq', tend to be solitary creatures and are likely to venture near settlements only when the ice retreats and seals are difficult to find. Further south, in the James and Hudson Bay region, global warming is the suspected cause of shortened winters and earlier sea ice melting. The region's polar bears are losing weight, are having fewer offspring and are approaching a dangerous point in terms of survival.

There are a limited number of bird species in the Arctic but this is more than made up for by their exotic nature and the sheer numbers of some birds in their breeding colonies. Imagine seeing and hearing peregrine falcons spiralling upward on air currents or catching a glimpse of the awe-inspiring gyrfalcon, the largest and fastest of all falcons. Rock and willow ptarmigan, the ivory gull, the elusive Ross's gull, the 'dashing pirates' or jaegers (that prey on other birds nests and on lemmings), eiders, snow, Brant and Canada geese and many other species make the Arctic home in the summer months. Shorebirds include plovers, sandpipers, phalaropes and ruddy turnstones. Almost as synonymous as the polar bear, with the



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Arctic, is the snowy owl. Numbers increase in direct relationship with the population of lemmings. These magnificent snow-white birds make no effort to disguise themselves on the open tundra.

You will enjoy discovering much more about the flora and fauna of the Arctic as you delve into the many resources available in the library, in bookstores and on the internet.

UNIT # 2 - EXERCISES

1. EXPLORATION:

There are many resources that can be accessed to learn more about the flora and fauna of the Arctic. Web sites, audiovisual materials and print materials offer diverse views, data and insights.

Try some of the following resources:

- www.google.com, and simply indicate topics such as Arctic animals, birds, flora, fauna etc.
- <http://arcticculture.about.com/gi/pages/mmail.htm> and click Animals and Birds under Subjects.
- [Discovering the Arctic](#)
- [Think Quest](#)
- [National Park Service \(U.S Department of the Interior\)](#)
- [Arctic Plants](#)
- The Lonely Planet guide *The Arctic*.
- The *Nunavut Handbook* mentioned in Unit # 1
- Your *Northwest Passage Handbook* supplied by Students On Ice.

For interesting flash animations from the International Polar Foundation:

- [Biodiversity in the Arctic](#)

Activity:

Familiarize yourself with some of the animals, plants and birds that you might see in the areas you will be visiting. In this way, you will be more likely to identify them from a distance or at a glance. It's fun to have friendly contests with your fellow travellers.

2. CONCENTRATION:



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Activity:

Now that you have a better sense of the types of wildlife you are likely to see, select one animal that you think may be your special connection with the Arctic e.g., polar bear, gyrfalcon, narwhal. This animal will have special abilities or adaptations that allow it to survive, perhaps thrive, in this harsh environment. Learn about these adaptations and jot them down to share/discuss with your fellow passengers and your lecturers. Note any questions you have about your special creature(s) that you still wish to discover.

3. SPECULATION

As noted above, there are a limited number of species of flora in the Arctic but those that exist can be very impressive and, as with the fauna, have developed amazing adaptations to help them survive a seemingly impossible environment.

Activity:

Chose one or two examples of flora and study the adaptations they have developed to assist them to survive e.g., how is it possible for a plant to freeze and still thrive? Study two or three plants that provided a valuable resource to native peoples.

4. PERSONALIZATION:

One of the greatest treasures you will bring home will be the photographic record you will share with others of this amazing region of the earth. You will need a camera, a notebook and the discipline to use both regularly. You will forget the details very quickly even though you will not think so at the time.

Activity:

Do some research on cold weather photography. Following are some hints. Do further study and prepare ahead to avoid the plight that has befallen all travellers at least once: :full storage cards, dead batteries etc.

Hints:

- Take extra batteries and keep them warm
- Don't throw out 'new' failed batteries. They may just be cold.
- Consider rechargeable batteries and a battery charger (don't forget your universal adapters)
- Keep you camera inside your coat except when using
- If you are sweating, also keep it inside a zip lock bag



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- Remember that salt water and camera equipment DO NOT MIX!
- Carry your camera inside in a zip lock bag
- Practice overexposing images with bright backgrounds before you go
- Remember that front lighting enhances light and colour, side-lighting enhances texture and form and back-lighting enhances mood and silhouettes



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UNIT #3 - People of the Arctic

The origin of the first inhabitants of the Arctic is subject to conjecture. However, it is believed that American Indians were descended from Siberian peoples who crossed the Bering Land Bridge as much as 25 000 years ago. There is considerable evidence that the first Inuit arrived in Alaska about 8 000 years later and that the Paleoeskimo people began emigrating from Alaska to the Arctic (Nunavut) area about 4,000 years ago. Archaeologists refer to these peoples as the Pre-Dorset (had some dogs, bows and arrows, kayaks) and Dorset (colder climate, loss of dogs and some technology). About 1,000 years ago the Neoeskimos began arriving as a result of a warming climate. The Neoeskimos were whale hunters who had large boats, dog teams and more effective tools and weapons. The first of this group were the Thule and the second, the Historic Inuit. The Thule continued eastward and by the 10th Century had moved as far east as the Greenlandic coast. There is convincing evidence that today's Greenlandic Inuit are descended from the Thule. The Thule culture also introduced the harpoon, kayak and dogsled all of which are still used to some degree today. The Historic Inuit period began with the voyages of Martin Frobisher in the 1570s. Occasional European contact made little impact on Inuit culture. Then came the arrival of the whalers in the 1820s. They drastically depleted bowhead stocks and introduced devastating diseases and materials to Inuit society. From this point on rapid changes occurred in the Inuit way of life: social organization, religion and material culture.

In Greenland, there was also another relatively early influence. The Viking, Eric Thorwaldsson, (or Eric 'The Red') founded two separate colonies of expatriate Icelanders on the southwest coast of Greenland in 986. One of the settlements grew as large as 3,000 inhabitants. For over 300 years the climate allowed the growing of fruit and wheat and the settlements flourished. Sixteen churches were built and a surviving foundation of one is 84' long by 60' wide. Trade with Europe grew and hides of elk, bear, beaver, otter, lynx and wolf were prized. Polar bear were sent to Europe as exotic pets and falcons were sold as far away as Baghdad. A cooling climate made the colonies more dependent on goods from Scandinavia and by the mid-1300s the settlements began to be abandoned. Were these the Vikings who settled coastal areas of North America? The settlement of Vineland could have been anywhere from Newfoundland to New Jersey. There is definite evidence of a settlement at L'Anse-aux-Meadows in Newfoundland. For what reason(s) the settlements were abandoned is still not certain. There has long been a theory that Vikings settled in an area of North America in what is now North Dakota. Explorers such as La Verendrye in 1738 and Lewis and Clark in 1804 reported fair-haired, blue-eyed, courteous and civilized people with European features. Reports were common of European style battlements and homes in the land of the Mandans.

The last written record of Vikings in Greenland was in 1408. It is believed that all settlers were gone within 100 years, or less. In 1775, Denmark claimed Greenland as a colony. The people of Greenland fared poorly under Danish rule but in 1952 Greenland became an integral part of Denmark. The standards of living increased dramatically but, with concerns that Greenland's cultural identity was being lost, Home Rule Government was established in 1979. Much is being done to preserve both the Inuit and Viking culture and history for future generations.



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Meanwhile, back in the Arctic, there are many archaeological sites that, because of the desert climate, are remarkably well preserved. Although difficult to date, they provide valuable evidence of centuries of occupation. The *inuksuit* (rock cairns) had many uses including marking routes, indicating food caches, pointing out good fishing spots and funnelling caribou toward the hunters. Small rock boxes (*pullatit*) were used to trap foxes and tall rock towers were used for prey as large as polar bears.

Summer and winter campsites can still be seen with remains of homes, caches, fireplaces, and even the rock outlines of children's play structures such as kayaks, tents and snowhouses. Paleoeskimo and Neoeskimo campsites are distinguishable from each other and provide much information about the people who inhabited them. Even winter snow house sites can sometimes be identified by the remains of meals, blubber lamps, bones and other detritus.

Over the years, the Inuit have suffered and changed greatly but are beginning to re-establish pride in their heritage. Their culture and sense of identity suffered as a result of the impact of whalers, explorers, missionaries and government policies. Nomadic hunters were taken from their land, families were forced into communities, children were flown to residential/religious schools and disease, drugs and alcohol became antidotes to their pain.

The Inuit are a patient people and the official formation of the political entity of Nunavut in 1999 may herald many improvements in the future aspirations of each Inuk.

All areas that this expedition will visit, with the exception of Greenland, are in Nunavut territory. You may experience some of the spirit of hope for the future during your visit. Your increasing knowledge and understanding of the Inuit peoples and their changing environment are an important part of our understanding of our world and our selves.

UNIT # 3 - EXERCISES

1. EXPLORATION:

There are many resources that can be accessed to learn more about the peoples of the Arctic regions. Web sites, museum displays, print materials and expeditions, such as your August visit, will help you develop a greater understanding and empathy.

Try resources such as these:

- www.google.com , and indicate key words from the first part of this lesson and from other reading you may have done e.g., Nunavut, Thule, Inuit, kayak, Erik the Red, etc. and see what you find.
- <http://arcticculture.about.com/gi/pages/mmail.htm> and click on pertinent subjects



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- [Windows to the Universe](#)
- [Newfoundland and Labrador Heritage](#)
- [Canada's First Peoples](#)
- Your Lonely Planet '*The Arctic*' Guide.
- The Nunavut Handbook mentioned in Unit # 1

Activity:

Explore, in more depth, some areas of interest from the introduction to this unit or do further research e.g., there is a fascinating history of Arctic peoples in the Russian Arctic. (You will not be visiting the Chukchi communities but there are intriguing similarities with North American Inuit. There are also appalling circumstances resulting from years of government policies and the recent economic woes of the Soviet economy.)

2. CONCENTRATION:

Activity:

Choose a particular time period or group of inhabitants (e.g., Pre-Dorset, Thule, Paleoeskimo) and study it in more detail according to your interest. It may be of additional interest if your study is pertinent to the places you will visit during the expedition. Make special note of any surprising, unusual or generally misunderstood findings you discover. See if you can be familiar enough with your chosen area to share your new knowledge, with confidence, with fellow participants on the expedition.

3. SPECULATION:

Activity:

There is always a certain amount of speculation involved in historical research. Moving beyond the evidence that points to the information that you have gathered for Activity 2, above, what other possibilities exist? e.g., could the early Inuit have come from somewhere other than Alaska or Asia? Is it possible that Vikings could have inhabited central North America as early as the 1400 or 1500s? What future do you envision for the Inuit in 10, 20 or 30 years?

All living creatures require food, water, shelter and space, all arranged in a manner suitable to their needs. Think of an example of how the loss of any one of these requirements has impacted, or will impact, significantly on the life and habitat of the Arctic people you have been studying.

4. PERSONALIZATION:

Activity:



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You will have many amazing experiences in the Arctic involving wildlife, physical spaces and people. Imagine meeting with native people. What aspect of native culture would you like to experience? What questions might you like to ask an Inuit elder? A young man? A child? What perceptions of Inuit life do you hope to check out? Consider the questions you might ask in a sensitive interview of an Inuit native of Nunavut or Greenland. What impression would you like this individual to have of you? What etiquette should you consider if you wish to take pictures of individuals or groups?