

# **Impact of Glacier Melt in Alaska on the Population of Local Animals and the Inuit**

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## **Introduction**

Global warming is a topic that has emblazoned itself across headlines in newspapers and magazines across the country for decades. It is rapidly becoming more critical for humans to reduce our environmental footprint in order to avoid catastrophic impacts on the world around us. Scientists predict that Earth's temperature will rise between 2.5 and 6.5 degrees (F) in the next century. Failing to curb emissions in the next 10 years could lead to no summer sea ice in the Arctic by 2040 and winter sea ice greatly reduced.<sup>1</sup> There are numerous studies on the impact that glacier melt will have on Alaska, the Arctic, the Antarctic and other areas which contain a large number of glaciers. The National Geographic Society is closely following the effects of thaw, with several articles suggesting that melting glaciers could negatively affect not just a few of the animals, but rather the entire polar ecosystem.

It is imperative that our students learn how we as humans impact the world around us in such drastic ways. Although we live nowhere near the Arctic, it is a real and important example of how we need to work harder to protect the world around us, and that our actions here can have a negative effect far from home. This is the legacy that we are leaving our children, and we need to create a preservation and conservation mindset. The only way that our students will truly understand the impact of global warming, and *care* about it, is to delve deeper into a real situation like glacier melt in Alaska. I want my students to develop empathy as well as a scientific understanding of what is happening to the animals and the people of Alaska.

Specifically, my curriculum unit will invite my students to study the Arctic biome, two major Arctic animals, the polar bear and the harp seal, as well as the Inuit people. We will read, watch videos, look at photographs and discover and analyze how glaciers melting will directly impact the animals, the Inuit people and the ecosystem as a whole. We will study how closely tied the Inuit people are to their environment, and compare and contrast that with how we relate to our environment here in Delaware.

My goals for this unit are multifaceted. I want my students to gain a respect and appreciation for people of different cultures by studying how they are similar to but also different from us. I also want my students to begin to grasp the impacts of global warming and how it can change an entire ecosystem. Ideally I would like to create a sense of activism in my students that will guide them to share their knowledge with

others and raise awareness about what is happening in the Arctic as well as brainstorm ways that we can work together at home to reduce our environmental footprint.

## **Audience**

This unit is intended for third grade classes at Brookside Elementary School, but the unit could easily be adapted for a more in depth study by older grades as well. I am the school librarian at Brookside Elementary School in Newark, DE, teaching students from grades K-5.

I work in one of twenty-two elementary schools in Christina School District. The school houses two Delaware Autistic Program satellite classrooms. There are approximately three hundred and thirty students enrolled in the school. Student demographics are thirty-five percent African American, twenty-eight percent Hispanic, twenty-nine percent Caucasian, and eight percent American Indian, Asian and Multi-Racial combined. Eighty-eight percent of the students are considered low income and qualify for free and reduced breakfast and lunch. Eight percent of students qualify for special educational services. There are twenty-nine educators, eight para-professionals, and two guidance counselors employed at the school. Christina School District is the largest school district in the state of Delaware with an enrollment of over sixteen thousand students. The school district is in New Castle County and serves students in Newark and Wilmington (Christina School District, n.d.).

Brookside Elementary School is situated in a suburban neighborhood in New Castle County. Our students come to school with a variety of home circumstances and differences in levels of background knowledge and life experience. Many of our students have never traveled outside of Delaware, so it is important to provide learning experiences that show them how people live in other places around the world. This unit is designed to interest and challenge my students and differentiate for the variety of learning styles and experiences of my students.

## **Background Information**

### Glaciers

When I first began my research, I had a very basic background knowledge on what a glacier is, how it is formed and how it impacts the environment around it. It's important to have a clear scientific understanding of what a glacier is and what it does before you can truly understand how an increase in glacier melt can impact the ecosystem around it.

#### *What is a glacier?*

Hundreds of feet of snow fall in the winter in Alaska and other Arctic regions. Some of

the snow melts in the summer, but the snow that remains is compacted into coarse, dense snow-like material called firn. Over time, water and snow add pressure and transform the firn into blue glacier ice.<sup>2</sup> It takes at least a 60 foot thickness of ice to form a glacier.<sup>3</sup>

Each winter, the glacier accumulates more snow from heavy snowfall. In the summer, some of the snow melts. When the glacier accumulates more ice than it loses in the summer melt, the glacier will grow larger. When the glacier accumulates the same amount of ice that it loses in melt, it will stay the same size. When the glacier accumulates less ice than it melts in the summer, it will shrink in size. This last example is what is currently happening to glaciers in Alaska, and other areas of the Arctic.<sup>2</sup>

### *Glacier Melt*

According to research at the University of Alaska, despite seasonal ups and downs, there has been a decline in glacier mass in the past decade. Several years of warmer temperatures or less snowfall can lead to a negative mass balance; which means more snow melt than snow accumulating. Scientists are using satellites to determine long-term climate trends and their impact on glacier mass.

“The GRACE satellites circle the earth 15 times a day and measure tiny changes in mass. When all of these changes are added up from hundreds of glaciers over several years of time, they can see if the glaciers in the region are losing or gaining mass. During the past decade, the Gulf of Alaska glaciers lost about 50 gigatons (Gt) of mass each year.”<sup>2</sup>

### *Glacier Biome Impact*

As a result of the loss in glacier mass, more freshwater is pushed out into the ocean. This change leads to a .14mm increase in global sea level per year, which directly impacts the natural marine ecosystems and coast lines.<sup>2</sup>

Glaciers cover over 33,000 sq. miles of Alaska. Many of Alaska’s glaciers form around the Gulf of Alaska; they cover 20% of the region. 50% of the freshwater that drains into Gulf of Alaska comes from glaciers.<sup>2</sup> “Glaciers are a major feature of Alaska’s coastal ecosystems. They impact people, fish and wildlife near and far.”<sup>2</sup> Glaciers and ice sheets collectively act as the second largest reservoir of fresh water.<sup>4</sup>

Glaciers support life from the bottom of the food chain, with microorganisms like bacteria, protozoa, fungi and algae, to the top, including polar bears and humans. The melt water from the glacier flows down to the base, which then “interacts with bedrock, soil and organic matter, creating a habitat of microorganisms,” which live on, within and beneath glaciers.<sup>2</sup> These microorganisms have anti-freeze like properties in their bodies to protect their cells from freezing. These tiny organisms are so important because they

affect movement and cycling of nutrients. The glacier runoff is “physically and biologically unique” from other freshwater sources, providing the elements in the marine ecosystem to allow phytoplankton to grow. This forms the base of the marine food chain. If the glaciers were to disappear, the food chain would eventually be destroyed.<sup>2</sup>

Glacier runoff also impacts the water temperature of streams and other water during the summer. The melt water helps the water to stay cool despite the sunshine. Cold water has more oxygen than warm water, which is required by spawning salmon and other fish/aquatic creatures. Therefore, the glacier melt is crucial to the increase in fish populations in the glacier biome area. The temperature difference also fuels the Alaska Coastal Current; which carries nutrients and organisms through the Gulf and into the Arctic.<sup>2</sup> Even though the marine ecosystems gain nutrients from other sources besides glaciers, the increase in freshwater runoff from glaciers could change the currents of the water, which allows nutrients to flow throughout the marine ecosystem.<sup>4</sup>

Glacier runoff also impacts marine food webs, providing food to small creatures such as krill. Krill is a primary food source to many marine animals, including whales and seals. The krill live under the sea ice, eating algae, which grows underneath it. If glacier mass continues to decrease, there will be less krill and other animals will not have enough food to eat.<sup>2</sup>

## Polar Bears

### *Daily Life of a Polar Bear*

Polar bears live on the ice all year long in Alaska. Polar bears have thick white fur to protect them from the frigid temperatures of the polar climate. They have black skin under their fur to absorb the sun and keep themselves warm. Polar bears can have 1-3 cubs during the winter. The female bear builds a den by making a tunnel in the snow to keep the babies safe and warm. In deep snow or water, the polar bear carries her babies on her back to keep them safe while hunting. Polar bears are great swimmers; they can swim for days without stopping to find ice to hunt on in order to find food.<sup>5</sup>

Polar bears are hunters: they eat seals and other polar animals. Polar bears hunt seals by finding their breathing holes in the ice and waiting for the seal to come up for air so it can be attacked. Polar bears can smell their prey up to 20 miles away and 3 feet under snow.<sup>5</sup> Without the sea ice, polar bears would not be able to find their prey. Bears need an average of 4.4lbs of seal meat per day to survive. Polar bears, therefore, eat as much as they can in the winter because during the summer there is no ice for them to hunt on, so they live off their fat stores.<sup>1</sup>

If the sea ice were to melt permanently, the polar bears would have to turn to other sources of food. Polar bears would then be in competition with brown bears for sources of

food on land. This would not work in their favor because polar bears are genetically predisposed to hunt on ice, so they may starve as a result.<sup>1</sup> Another change that would occur is for polar bears to have more frequent encounters with people as well. This may result in polar bear attacks on humans in their desperation to find another source of food.

### *A Threatened Species*

In 2008, polar bears became a threatened species on the Endangered Species list. There are about 20,000 polar bears left in the world. The bear population is especially declining in Canada and near the Alaskan coast, areas that are directly impacted by an increase in glacier melt.<sup>1</sup>

### Harp Seals

#### *Daily Life of Seals*

Harp seals live on the ice and under the water. They have thick layers of blubber, thick fat, to keep them warm in the Arctic water. Seals also have spotted, waterproof coats, which help them swim. Seals are slow on land, but are very fast swimmers and great divers. They have big eyes and sensitive whiskers that help them find food under the water. Seals eat small fish and shellfish. Baby seals are born on the ice and stay there for 4 weeks until they have learned to swim and hunt on their own. At 12 days old, the baby has enough blubber to survive without its mother.<sup>5</sup>

#### *Glacier Melt Impact*

If sea ice were to disappear, the harp seals could not have their babies. Seal babies need to be born on the ice in order to give them time to develop their waterproof coat and learn to swim and hunt. This would quickly and greatly decline the seal population. Also, with glacier runoff sending more freshwater into the ocean, this might also impact the availability of the sea life that harp seals eat, which could cause them to starve. The decline in seals would directly impact the lives of polar bears as well, who rely on seals as a primary source of food.

### The Inuit

#### *Inuit: Indigenous Peoples*

In Alaska, there are three major groups of Inuit people: Iñupiat, Yup'ik and Cup'ik. The word Inuit in the native language means "people." The Inuit people lived in Alaska long before European contact in the 1500s. They had to discover ways to survive in the harsh conditions of the Arctic environment. Temperatures can drop down to -60 degrees (F) in

winter because the sun does not shine at all during this time. The people lived in ice and snow for 6-9 months out of the year.<sup>6</sup>

### *Sources of Food*

The early Inuit prepared for the harsh winter by hunting, fishing and preserving food in the fall, spring and summer months. If the Inuit did not share their traditional knowledge, the unprepared people would quickly die in the Arctic conditions.<sup>6</sup> In the Arctic “summer” when the sun comes out, temperatures rise to 50F. Moss, ferns and flowering plants grow on the tundra during this time. The Arctic is home to dozens of bird species and 40 land mammals, including polar bears, moose, and caribou. The oceans have seals, whales and walrus. The Inuit hunted all of these animals as traditional sources of food. They also gathered the plants and berries in the summer to use for food, medicines and clothing. The Inuit ate a high protein diet, consisting mostly of meat and blubber. Before acquiring modern weapons, they created tools to hunt with out of ivory and bone. They also used nets and spears to catch fish. Women and children collected the eggs of wild birds to eat.<sup>6</sup>

### *Clothing*

The women in the Inuit villages made the clothing for everyone. Clothing is mostly made from animal hides to protect them from weather. They used the furs from foxes, rabbits and wolves to add extra warmth to the clothing. Inuit people also invented the first down filled clothing, using bird feathers inside coats. Beads and ivory decorations on the clothes are very colorful to show pride. Inuit also wore parkas, which are loose fitting hooded coats made of caribou or seal skin, which have fur linings to keep them warm. These coats protected them from hypothermia during winter. Sealskin and seal oil made parkas waterproof. Inuit also wore mukluks, which are boots made from sealskin to protect them from water. They had seal flippers sewn to bottom of the boots to create skid proof bottoms. They also made snow goggles out of wood and ivory, which had small eye slits to look through to protect from blinding sun glare.<sup>6</sup>

### *Family Life*

Family was the most important thing to the early Arctic people; they relied on each other to survive. The father was the hunter. The oldest most experienced hunter male was the head of tribe. Women prepared food and made animal skins into tents and clothing. Children collected herbs, greens and berries. Everyone had their own purpose to support each other to survive the Arctic conditions.<sup>6</sup> In the past, the Inuit people were migratory: they moved with the animals to maintain sources of food.

Inuit boys learned to hunt and survive. In the past, boys did not go to school, they learned by listening and watching their elders. Fathers taught sons to repair the igloo and

make things from ivory. Boys were encouraged to run, wrestle and weight lift to grow strong enough to be a good hunter in the future. Boys also participated in spear throwing practice to prepare for harpooning. They had to learn to sit in one position for hours to encourage stamina for hunting. Boys had toys when they were very young like pick up sticks and yo-yos to learn dexterity and agility.

Girls had dolls to learn to sew. Girls in the Inuit tribe had a very traditional role of learning how to sew, cook, clean and take care of the family at home. They also learned to gather plants, berries and eggs. Girls were not taught to hunt; this was considered the boys' responsibility.

### *Travel*

Inuit people travel the icy waters using kayaks and umlaks, lightweight boats made of whalebone and covered in seal hide. Umlaks are big, completely open kayaks that can carry up to 20 people at a time. On land, people wear snowshoes to maintain traction on the snow and ice. They also used sleds, often drawn by sled dogs like huskies. Sled dogs were trained not only to draw the sled, but also to help their owners to hunt by finding seal breathing holes and locating animals.<sup>6</sup>

### *Modern Inuit People*

In modern day, the Inuit people have many similarities, but also quite a few differences, from the early Inuit. Some of the areas that have not changed are: family is still the most important thing to the Inuit people, they still hunt and eat traditional foods, they still build igloos, and food is still gathered and stored for the long winters. Some of the modernizations in today's Inuit culture include: the use of modern weapons such as rifles and spears for hunting, the use of modern vehicles such as speedboats, snowmobiles, trucks, ATVs and motorized canoes for travel, some modern foods are purchased at expensive stores to supplement traditional foods, clothing is often bought from stores or traditional clothing is made from more modern materials like cotton. Other changes are that many Inuit people not only speak their native language, but also speak English or French. Inuit families do not migrate with the animals as they used to, but instead they build villages of 20-200 people who help each other survive. These villages are mostly made up of people, who are related, share food, and take care of each other. Inuit children and adults also enjoy modern entertainment like TVs and video games, versus playing string games and juggling etc. Children now attend schools within their own communities, but depending on the area some children miss a lot of school because it interferes with hunting seasons. Some Inuit tribes maintain more of the traditional cultural expectations than others.<sup>9</sup> Many Inuit people have modern jobs, such as mining, business and tourism, but many still supplement their income with hunting.<sup>10</sup>

### *From The Inuit Perspective*

In an interview of an Inuit man who lives in Greenland named Niels Gundel, a reporter heard some truths about indigenous life that she may or may not have expected. Niels comments that, “Starting in the 1980s, with each passing year the winter ice has formed later in the year, and become thinner. Now it is just slush. “You can’t go hunting on ice like that. It’ll break. So now we can’t gather food in the winter at all. If you couldn’t get to the supermarket, you couldn’t get food. If we can’t get to the hunting areas, we can’t get food.”<sup>7</sup>

“Hunting is our identity,” he says. “Hunting is life for Inuit.” Niels was taught to hunt by his father and grandfather when he was five. They showed him how to navigate by the stars, steer a sled, and predict the behavior of prey. A boy’s first hunt—when he turns 13—is considered a turning-point, the moment he becomes a man.<sup>7</sup>

### *The Inuit and their Environment*

The Inuit people believe that they are actually a part of the Arctic ecosystem. The people, animals and nature are all dependent upon each other for survival. The Inuit need the animals and water to survive and the people protect and respect the world around them. There is a sense of pride in committing yourself to your family as well as the natural world that you live in.

At a workshop held by the Inuit Circumpolar Council based in Alaska, the council asked the Inuit people to describe their sense of food security in their own terms.

“...many connections between people are based on traditional foods. Self-esteem and self-identity are tied to the entire ecosystem. Participants also discussed the importance of a first catch to food security. Children are taught that the first animal they catch of a season must be given to an elder; connecting concepts of self-identity, education, language, knowledge of the environment, respect for animals, etc.”<sup>8</sup>

Food security to the Inuit is not just an environmental problem that is caused by global warming and other changes to their local environment; it is also a cultural problem. The Inuit cultural identity is based on hunting, teaching their children to hunt, using traditional tribal knowledge and language from their elders and passing it down. Many of the Inuit rituals and cultural norms are based around the plants and animals that they both use and protect in their environment. “Inuit traditional Arctic foods such as caribou, waterfowl, salmon, seal, salmonberries, and sura (diamond-leaf willow) provide food, fiber, shelter, medicines, energy, nutrients, and spirituality.”<sup>8</sup> The cultural and environmental systems are so closely interconnected for the Inuit people that it would not



be a solution to just stop hunting and begin to solely shop and supermarkets for their food. This would, in a very real sense to the Inuit, disintegrate their cultural identity.<sup>8</sup>

It is not only the Inuit traditional food sources that are threatened; the actual villages and homes they live in on are in danger as well. “In Alaska, in Siberia, in Canada, villages are falling into the sea because the ice that once protected them from storm surges is gone. In other places, the hardened permafrost that has stood beneath their feet for 120,000 years is melting, and anything above is simply sagging into the mud. Collapsing trees and houses jut out of the ground at weird angles.”<sup>7</sup> For the Inuit, their environment is literally collapsing around them. They now need to face the challenges of deciding what they need to do to preserve their cultural values, but also to protect themselves and their families from these huge environmental impacts on their way of life. The Inuit who are the most sequestered from modern life may not even survive these changes. Without hunting and food sharing, many Inuit will starve.

## **Objectives**

I will be collaborating with Wendy Bell, the Art teacher at Brookside and working with her on having the students examine the melting glaciers and sea ice in Alaska. I plan to show videos about glacier melt as a whole class activity to get the students started thinking about what that actually means and what it looks like.

We will also study the Arctic biome and what it looks like to live there, using various nonfiction book resources as well as pictures and videos online.

I will also read aloud the book The Glaciers are Melting! This will begin to prepare the students to understand how the glacier melt impacts the local animals in Alaska. I will ask the students to work in groups to compile a list of fears that the animals had because the glaciers are melting. This activity will prepare us to research polar bears and harp seals.

Then, I will break the students up into groups and have them choose an arctic animal to study – specifically focusing on the impact that the changing environment would have on their Arctic animal. This will be in a jigsaw format, and each group will share their knowledge with the rest of the class using a finished product (posters, oral presentation etc.).

Following this activity, I want to guide the study to include human populations, like the Inuit, and exploring how the climate change and glacier melt will affect their everyday lives. We will use nonfiction resources, videos and pictures to study the Inuit population and how their lives are deeply connected to their environment, in a way that our population here in Delaware does not experience. I will have the students access the e-book Arctic Peoples in order to gain background knowledge about the Inuit. I will also

share testimonials and interviews with actual Inuit people that will help the students understand the real impact of the environmental change on these indigenous people.

As a final project, I would like the students to create awareness posters to post in the hallway to share their knowledge of the impact on glacier melt with their peers, teachers and other students.

### **Teaching Strategies**

#### Oral and Written Format

Students will be sharing the information they have learned about all of the topics in this unit using both oral and written formats. This will include, classroom discussion, oral presentations, written products and posters.

#### Differentiated Instruction

I will differentiate the instruction in this lesson by providing appropriate reading material to students of various reading levels. I am also differentiating by allowing students to choose their own product to present information about their Arctic animals. I will offer extra assistance or provide enrichment assignments as needed throughout the unit in order to keep my students actively engaged in this study of glaciers in Alaska. I am also presenting information to students in a variety of formats: video, books, articles, e-books, photography etc.

#### Cooperative Learning

Students will work together in small groups to find, read and share information about a variety of topics within the unit. They will also work in a whole group setting to learn new information. All projects and lessons within the unit contain a collaborative element so that the students can help each other to understand the new content that is presented to them.

### **Content Standards**

This unit is cross-curricular, incorporating Library Media Standards, Information Literacy Standards, Common Core Literacy and Reading Standards and Delaware Science Standards. I am also collaborating with the art teacher, so her unit is also covering the Art Standards.

Christina School District Library Curriculum/ Referenced with AASL National Library Standards

Students will:

- Use prior and background knowledge as context for new learning (1.1.2)
- Gather information from a variety of print and non-print sources to address a topic or answer questions. (1.1.4)
- Gather information on a research topic using primary and secondary resources (both print and electronic) (1.1.4)
- Experience culture through literature. (2.3.2)
- Develop creative products in a variety of formats. (3.1.3)
- Respect copyright guidelines. (3.1.6)

### Common Core State Standards for Literacy and Reading

Students will:

- Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (CCSS.ELA-LITERACY.RI.3.1)
- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly. (CCSS.ELA-LITERACY.SL.3.1)
- Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently. (CCSS.ELA-LITERACY.RI.3.5)
- Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (CCSS.ELA-LITERACY.SL.3.4)

### Delaware Science Standards

Students will discover:

- The ability of an organism to meet its needs for survival is dependent upon its environment. Manipulation of the environment can positively or negatively affect the well-being of various organisms that live there. (Science Standard 6 Life Processes K-3)

## **Unit Plan**

### Essential Questions

- How do melting glaciers in Alaska affect animals, humans, plants?
- How does the connection between the Inuit people and their environment compare to people here in Delaware? What is the same? What is different? Why do you think this is so?

- What do you think will be the long-term impact of glacier melting on the populations that we are studying?

## **Lesson Activities**

### Lesson 1: The Arctic Biome and Glaciers

In the first lesson, students will explore the Arctic Biome and what it looks like to live there, using a variety of nonfiction books and online resources. Students will watch BrainPop video on the Arctic for an excellent overview of the environment, including weather, plants and animals.

The students will use their laptops and read information about the Arctic/Tundra Biome on various websites. Students will take notes on what they have learned about the Arctic tundra ecosystem and share their information on a class-created anchor chart about the Arctic tundra.

Students will then study glaciers in Alaska. We will use a variety of resources to gain background knowledge to answer the following questions: What is a glacier? Why are glaciers important to the Alaska ecosystem?

These areas of study will serve as background information for a more in depth study of the impact of glacier melt on the animals and people of Alaska. It will also prepare them to create their landscapes of the tundra and glaciers in Art class.

### Lesson 2: Glacial Melt and the Impact on Arctic Animals

This lesson has two major components: the first will be to study glacier melt in Alaska, the second will be to study how the melting will affect the animals in the Arctic. First the teacher will need to establish background knowledge about how and why the glaciers are melting so the students understand what is already happening to the Alaskan ecosystem.

I will discuss with the students about the concept of global warming. Explain how the warmer temperatures across the world are causing the glaciers to melt more rapidly.

I will share with the students images of changing glacier melt in Alaska through pictures online. This will prepare the students to learn about how the increase in melt water affects the ecosystem.

I will read aloud the book [The Glaciers are Melting!](#) This will begin to prepare the students to understand how the glacier melt impacts the local animals in Alaska. Students

will work in their table groups to compile a list of fears that the animals had because the glaciers are melting. This activity will prepare us to research polar bears and harp seals.

Then, I will break the students up into groups and have them choose an Arctic animal to study – specifically focusing on the impact that the changing environment would have on their Arctic animal. Students will find out: What does the animal look like? What does it eat? How does it survive in its habitat? Teacher will provide both books and online resources for the students to study their animals.

#### *Jigsaw Activity*

Each group will share their knowledge with the rest of the class using a finished product (posters, oral presentation etc.).

#### Lesson 3: The Inuit People, Past and Present

I want to guide the study to include human populations, like the Inuit, and explore how the climate change and glacier melt will affect their everyday lives. We will use nonfiction resources, videos and pictures to study the Inuit population and how their lives are deeply connected to their environment, in a way that our population here in Delaware does not experience.

I will have the students access the e-book Arctic Peoples in order to gain background knowledge about the early Inuit. I will also share testimonials and interviews with modern Inuit people that will help the students understand the real impact of the environmental change on these indigenous people.

Students will complete a Venn diagram to compare the lives of early Inuit to modern Inuit people.

#### *Classroom Discussion/Reflection*

We will discuss the following questions:

- How would it be different if this glacier melt had occurred during the times of early Inuit, vs. how it will affect them now?
- If we had glaciers melting here in Delaware, would the impact be the same as the Inuit people will experience? Why or why not?

#### Lesson 4: Final Project

I want the students to better understand what we can do to make a difference in slowing down the glacier melt in Alaska, by creating awareness of what is happening and Alaska and how our actions here in Delaware can impact people across the world. Global

warming is man-made, and students need to realize what they can do to help the global ecosystem to survive.

Together we will find ways that we all can slow down the impact of global warming. We will look at a variety of online resources to gather some facts about reducing our global footprint. The students will use this information along with the rest of the research that they have done throughout the unit so far to complete their final projects.

#### *Awareness Posters*

Students will create awareness posters to present information from each of the areas of study with the rest of our school. These posters must contain facts learned throughout the unit of how glacier melt affects the animals and people of Alaska. The posters will also include information on what we can do to help. This project makes a connection between all of the research that the students have done and connects it back to their lives at home.

#### Possible Extensions

- Study the Iditarod in Alaska – sled dogs and their mushers
- Look at fiction stories about children/people of the Inuit
- Inuit mythology study
- Global warming – a more in depth study

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O'Neel, Shad, Eran Hood, and Kristin Timm. "From Icefield to Ocean." Alaska Climate Science Center. <https://csc.alaska.edu/resource/icefield-ocean> (accessed October 25, 2014). Describes our current understanding of the interconnected icefield, stream, and ocean systems that are such a dominant feature of coastal Alaska.

Olson, Gillia M.. *Polar bears' search for ice: a cause and effect investigation*. Mankato, Minn.: Capstone Press, 2011. Explains the impact of global warming in the Arctic on the lives of polar bears.

"Vanishing Sea Ice - Interactive Map - National Geographic Magazine." Vanishing Sea Ice - Interactive Map - National Geographic Magazine.

<http://ngm.nationalgeographic.com/2007/06/vanishing-sea-ice/sea-ice-interactive> (accessed October 25, 2014). Interactive Map of vanishing sea ice in the Arctic: a good visual for the students.

"Vanishing Sea Ice Photo Gallery - National Geographic Magazine." Vanishing Sea Ice Photo Gallery - National Geographic Magazine.

<http://ngm.nationalgeographic.com/2007/06/vanishing-sea-ice/sea-ice-photography> (accessed October 25, 2014). Real photographs of the Arctic to show the students.

## Teacher Resources

### Books

#### *Fiction*

[Building an Igloo](#) by Ulli Steltzer

[Arctic Son](#) by Jean Craighead George and Wendell Minor

[Mama, Do You Love Me?](#) by Barbara Josse

[Kumak's Fish](#) by Michael Bania

#### *Nonfiction*

[North Pole, South Pole](#) by Nancy Smiler Levinson and Diane Dawson Hearn

[Avati: Discovering Arctic Ecology](#) by Mia Pelletier

[The Best Book of Polar Animals](#) by Christiane Gunzi

[Polar Bears](#) by Gail Gibbons

[Harp Seals](#) by Sam Drumlin

### Websites

#### *Arctic Biome*

<http://www.ngkids.co.uk/did-you-know/ten-facts-about-the-arctic>

<http://www.brainpopjr.com/science/habitats/arctichabitats/>

<http://www.brainpop.com/educators/community/bp-jr-topic/arctic-habitats/>

<http://www.blueplanetbiomes.org/tundra.htm>

<http://www.cotf.edu/ete/modules/mseese/earthsysflr/tundra.html>.

#### *Glacier Melt*

[http://www.huffingtonpost.ca/2013/08/01/arctic-ice-melt-artic-ecosystems\\_n\\_3690664.html](http://www.huffingtonpost.ca/2013/08/01/arctic-ice-melt-artic-ecosystems_n_3690664.html)

[http://en.wikipedia.org/wiki/Retreat\\_of\\_glaciers\\_since\\_1850](http://en.wikipedia.org/wiki/Retreat_of_glaciers_since_1850)

<http://www.climatechange.alaska.gov/cc-ak.htm>

[http://www.usgs.gov/blogs/features/usgs\\_science\\_pick/are-melting-glaciers-disturbing-alaska%E2%80%99s-ecosystems/](http://www.usgs.gov/blogs/features/usgs_science_pick/are-melting-glaciers-disturbing-alaska%E2%80%99s-ecosystems/)

<http://www.pbs.org/wgbh/nova/earth/extreme-ice.html>

#### *Animals*

<http://www.nrdc.org/wildlife/default.asp>

<http://www.epa.gov/climatechange/impacts-adaptation/society.html>

<http://www.eoearth.org/view/article/153781/>

<http://www.wwfblogs.org/climate/sites/default/files/WWFBinaryitem4920.pdf>

<http://www.nwf.org/Wildlife/Threats-to-Wildlife/Global-Warming/Effects-on-Wildlife-and-Habitat/Polar-Bears.aspx>

#### *Global Warming*

<http://www.epa.gov/climatestudents/>



<http://climatekids.nasa.gov/climate-change-meaning/>

*Artists' Work*

<http://inuit.com>

Notes

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<sup>1</sup> Olson, Gillia M.. *Polar bears' search for ice: a cause and effect investigation*. Mankato, Minn.: Capstone Press, 2011.

<sup>2</sup> O'Neel, Shad, Eran Hood, and Kristin Timm. "From Icefield to Ocean." Alaska Climate Science Center. <https://csc.alaska.edu/resource/icefield-ocean> (accessed October 25, 2014).

<sup>3</sup> Love, Donna, and Shennen Bersani. *The glaciers are melting!*. Mt. Pleasant, SC: Sylvan Dell Pub., 2011.

<sup>4</sup> Dell'Amore, Christine. "Melting Glaciers Nourishing Oceans With Ancient Carbon." National Geographic. <http://news.nationalgeographic.com/news/2009/12/091230-glaciers-melt-carbon-alaska/> (accessed October 25, 2014).

<sup>5</sup> Hayes, Susan, and Tory Harris. *Polar animals*. New York: Scholastic, 2014.

<sup>6</sup> Doak, Robin S.. *Arctic peoples*. Chicago: Heinemann Library, 2012.

<sup>7</sup> Hari, Johann. "THE ARCTIC IS MELTING." More Intelligent Life. <http://www.moreintelligentlife.com/content/johann-hari/last-days-arctic?page=full> (accessed October 25, 2014).

<sup>8</sup> Inuit Circumpolar Council-Alaska. "How to Assess Food Security from an Inuit Perspective: Building a Conceptual Framework on How to Assess Food Security in the Alaskan Arctic." ICC Alaska :.

<http://www.iccalaska.org/servlet/content/Food%20Security.html> (accessed October 25, 2014).

<sup>9</sup> "Inuit." - New World Encyclopedia.

[http://www.newworldencyclopedia.org/entry/inuit#Contemporary\\_Inuit](http://www.newworldencyclopedia.org/entry/inuit#Contemporary_Inuit) (accessed December 1, 2014).

<sup>10</sup> "Modern VS Traditional Life." Inuit Cultural Online Resource.

<http://icor.ottawainuitchildrens.com/node/48> (accessed December 1, 2014).

**Curriculum Unit Title**

Impact of Glacier Melt in Alaska on the Population of Local Animals and the Inuit

**Author**

Megan Guderian

**KEY LEARNING, ENDURING UNDERSTANDING, ETC.**

Through the use of a variety of print and online resources, students will research how glacier melt impacts local animals and the Inuit in Alaska. Students will develop background knowledge and present information in a variety of formats about the Arctic tundra biome, glaciers, Arctic animals, past and present Inuit people and global warming.

**ESSENTIAL QUESTION(S) for the UNIT**

- How do melting glaciers in Alaska affect animals, humans, plants?
- How does the connection between the Inuit people and their environment compare to people here in Delaware? What is the same? What is different? Why do you think this is so?
- What do you think will be the long-term impact of glacier melting on the populations that we are studying?

**CONCEPT A**

**CONCEPT B**

**CONCEPT C**

Arctic Tundra Biome/Glaciers

Arctic Animals

Inuit People

**ESSENTIAL QUESTIONS A**

**ESSENTIAL QUESTIONS B**

**ESSENTIAL QUESTIONS C**

What are the characteristics of the Arctic tundra biome?  
  
What are glaciers? How are glaciers formed? Why are glaciers important to the ecosystem?

What do polar bears and harp seals look like? What do they eat? How do the animals adapt to the Arctic environment? How does glacier melt impact these animals?

How did the early Inuit people learn to survive in the Arctic? How are the early Inuit people the same/different from modern day Inuit? How does glacier melt affect the Arctic people? How are the lives of the Inuit the same/different from our lives in Delaware?

**VOCABULARY A**

**VOCABULARY B**

**VOCABULARY C**

Arctic	Nutrients
Tundra	Mass
Glacier	Climate
Run-off	Ecosystem

Blubber
Population
Predator
Prey

Indigenous	Mukluks
Inuit	Hypothermia
Kayak	Igloo
Parka	Stamina

**ADDITIONAL INFORMATION/MATERIAL/TEXT/FILM/RESOURCES**

Text: Avati: Discovering Arctic Ecology by Mia Pelletier  
Website: <http://www.brainpopjr.com/science/habitats/arctichabitats/>  
Video: <http://www.pbs.org/wgbh/nova/earth/extreme-ice.html>  
Picture Book: The Glaciers are Melting! By Donna Love