



Background Section I: The Arctic

What is the Arctic?

The Arctic can be defined in a variety of terms. The “Arctic” is described in the NSIDC Arctic Climatology and Meteorology Primer (<http://nsidc.org/arcticmet/>) as follows:

“The Arctic consists of ocean surrounded by continental land masses and islands. The central Arctic Ocean is ice-covered year-round, and snow and ice are present on land for most of the year. The southern limit of the arctic region is commonly placed at the Arctic Circle (latitude 66 degrees, 32 minutes North). The Arctic Circle is an imaginary line that marks the latitude above which the sun does not set on the day of the summer solstice (usually 21 June) and does not rise on the day of the winter solstice (usually 21 December). North of this latitude, periods of continuous daylight or night last up to six months at the North Pole.

Arctic researchers also define the Arctic region as:

- The area north of the treeline (the northern limit of upright tree growth)
- Locations in high latitudes where the average daily summer temperature does not rise above 10 degrees Celsius”

The Alaskan Arctic as described by Donald Lynch, “... contains within it the Arctic Coastal Plain, the Arctic Foothills, and most of the Brooks Range. It has an area of 81,00 square miles, a population of about 4,000 people concentrated primarily in Barrow and Prudhoe Bay, continuous permafrost, an Arctic Climate, principally tundra vegetation, and rich deposits of petroleum, natural gas, coal, and phosphates due to its sedimentary rock.”
- Lynch, Donald Francis. 1996. *Geography of Alaska*. University of Alaska.

What are characteristics of the Arctic environment?

Climate

Goode’s World Atlas characterizes the climate in the Arctic region as “Polar Climates: warmest month below 50 degrees F/10 degrees C” (1995, Page 11). Climate is complex and influenced by many factors. Following is an explanation of how some natural forces interact to create some of the current climate patterns found in Arctic Alaska.

“North of the Arctic Circle, most of the winter period lacks direct sunlight, and south of this line winter days tend to be very short. Winter Heat receipt (insolation) from the sun is low and the land loses heat very rapidly...

...There is an ocean current moving from southeast to northwest continuing through the Bering Strait and parallels the coastline to Barrow. At Barrow, another ocean current system appears. This is associated with a clockwise system (called a gyre) which characterizes the Beaufort Sea...

...Pressure systems control basic air movements. The Siberian High develops in the fall over Lake Baykal in Siberia and expands across the Beaufort Sea and, in the depth of winter, extends across central Alaska into the Interior of Canada and North America. Air masses generally move around this Siberian High pressure systems in a clockwise direction...the winds from which normally cross Arctic Alaska from east to west. In the summer, the Siberian High disappears, but a weak high pressure system develops over the pack ice in the Beaufort Sea. This pressure system creates easterly (from east to west) winds over Arctic Alaska. As a consequence, the normal winds along the shore of the Beaufort Sea are from east to west and are known as the Polar Easterlies.”

- Lynch, Donald Francis. 1996. *Geography of Alaska*. University of Alaska.

Ecosystems

➤ Land

In the Arctic, the land is generally continuous permafrost, or permanently frozen ground. The permafrost prevents water from percolating down into the ground, therefore the Arctic Coastal Plain is dotted with many shallow lakes and marshes. Plants that do well in the tundra environment have adapted to extreme conditions.

The major land ecosystem of the Arctic is the tundra. There are various types of tundra (moist, wet, alpine), but in general, tundra is a treeless area where the main vegetation consists of

“...mosses forming continuous mats or separate patches. Besides the mosses, lichens are also typical of the vegetation. The flowering plants consist mainly of sedges (*Carex*) and cotton-grasses (*Eriophorum*); but also of grasses, bushes such as willows, birches, and alders (*Salix*, *Betula*, *Alnus*), dwarf shrubs and berries.”

Chernov, Yu.I. (1985). *The Living Tundra*. Cambridge University Press: New York.

Arctic land animals have adapted methods to survive cold temperatures. Some survival strategies include migration, hibernation, or living, generally, beneath the snow during extreme temperatures.

➤ Marine

According to a map from the Joint Federal-State Land Use Planning Commission for Alaska (1973), the main marine ecosystems in the Arctic are categorized as “Oceanic” and “Ice Affected Coast”. As described,

“Oceanic areas are those with depths greater than 200 meters. High plant productivity occurs in the Arctic Ocean due to plant growth in the lower layers of sea ice. In the oceanic system plant and animal life is normally consumed between the surface and mid-depths.”

“Ice Affected Coasts are bordered by sea ice in the winters of all years; ice may be offshore all summer. Marine plants grow in the lower layers of sea ice during early spring. These support abundant marine life.”

Much marine life depends on the presence of sea ice for a food source. Pack Ice is also important in the ecosystem as it provides the habitat needed by polar bears, arctic fox, seals and walrus.

Why Study the Arctic?

There are many reasons why the study of the Arctic is important. Some of these reasons include:

- Much of the region is remote, so basic scientific understanding of the arctic environment is limited. Baseline data is required in order to understand change over time.
- The permafrost, ice sheets, and lake and ocean sediments contain records of past climates.
- The arctic environment interacts in complex and significant ways with global climate systems.
- Models suggest that global climate change will be detected and amplified in the polar regions first. As stated by one scientist, “The place to study change is the place that is expected to change the most drastically.”
- Global change is likely to have profound consequences for Arctic communities, particularly the indigenous people who depend on local resources for subsistence.