

## ARCTIC TUNDRA

### **Intent:**

To familiarize the visitor with the harsh beauty of this environment and to illustrate some basic adaptations and relationships of wildlife and man.

### **Content:**

The roof of the continent is a composite of Arctic and tundra, posing a harsh environment for all forms of life. Although barren for the most part, this region is not without its own special beauty.

Often called Land of the Midnight Sun, there are times of the year when days have no nighttime, and nights have no daytime. Since the earth rotates on a tilted axis, the North Pole is inclined toward the sun for six months of the year and away from the sun the other six months.

The true Arctic is primarily an ocean, which is able to store the heat from summer, and thereby, moderate the cold of winter. The Oceanic Arctic acts as the world's great freezer for sea ice. Sea ice begins to form when saltwater temperature drops below 28°F. In the winter, ice forms over most of the North Polar Basin, several feet thick, and covering 1,900 to 2,500 miles; this is referred to as pack ice. When the spring melt begins, fresh water lakes spread across its surface. Although temperatures of -60°F are common in this region, the seawater below the pack ice prevents it from becoming the coldest place in the North. In the summer, a brief warm up phase allows life to renew itself again.

Northward, from the limit of trees to the shores of the Arctic Ocean, the wide plains and moors of the tundra stretch around the North Pole. It is an area of 5 million square miles, about a tenth of the Earth's total land surface. Although littered with lakes and swampy ground, the tundra has a desert climate, since it only averages 8 inches of rainfall yearly. Yet, to see it from the air, it appears as more water than land. The tundra maintains its water because the cold air cannot easily absorb water vapor, and the frozen ground just below the surface thwarts ground absorption. This moisture is more than enough to sustain the thin mantle of vegetation that spreads over the land.

The tundra is the creation of intense cold and glaciation. Tundra regions bordered the great continental ice sheets of the Pleistocene era as they spread over the present temperate zones. When the glaciers retreated to the north, the tundra followed them. Today, the tundra has invaded the region leveled and scoured by the vanished ice sheets. It supports an array of life forms that are slowly covering up the damage. Still, the remains of the last glacial wreckage are apparent everywhere. Forbidding mounds of lichen-covered rubble attest to the terminal moraines of individual offshoots of the ice. Eskers, looking like railroad embankments, wander for miles, tracing the paths of debris-laden streams within the vanished glaciers. The ground is strewn with erratic boulders, carried from

distant regions and dropped by the ice. The contour of the land itself is flattened and filled with depressions.

The effects of intense cold are equally spectacular. Frost, interrupted at the surface only during the short summer months, invades the bedrock wherever it is exposed. Water, which has seeped into the rock during thaws, freezes and expands, often shatters stone into thousands of sharp boulders. These can cover immense areas, and although the debris may be covered with lichens, it offers no hospitality to higher vegetation. In some dry lakes and streambeds, weird conical-shaped mounds of earth, known as pingos (frost heaves), jut as high as 300 feet from the level ground.

Most Arctic tundra soil consists of permanently frozen ground, called permafrost, extending as much as 1,600 feet down. Only the top few inches melt during the brief summer, and it is this part of the soil, only, that supports life.

Another deforming action of frost on the land is a phenomenon called solifluction. During the warm months, the sodden upper layer of soil and the frozen undersoil may sit precariously upon a slope. When this happens, the top layer of soil tends to flow downhill. The rate of slippage is usually slow and uneven, perhaps only a few inches a year, but any movement may be disastrous for immobile plants. Often whole colonies of plants, located downhill from a patch of unstable soil, are slowly buried alive, while other plants are uprooted in the process.

The plants and animals of the Arctic tundra region are uniquely adapted for survival in this harsh environment. In the summer, tundra ponds and streams are the nesting grounds for myriad of waterfowl; its grasslands are dotted with the nests of land birds and undermined with the burrows of lemmings. Its lakes and rivers abound with muskrats, nibbling on succulent water plants, and with fish supported by insects and their larvae. The tundra is a rich hunting ground for the carnivores: owls swooping down on lemmings, foxes feeding on bird eggs, or wolves in pursuit of the migrating caribou. The short growing season forces the plants to race to maturity before the frost, and in very quick succession flowers unfold their bright blossoms, ripen their seeds, flush with autumn coloration, wither, and return to dormancy.

In winter, this abundant life disappears and the land is frozen and forlorn. Whatever snow falls, remains until the following summer, except where the ground is swept bare by the wind. Thick ice forms on the lakes and rivers. The waterfowl have flown south, the lemmings have gone under the snow, and the caribou have returned to the shelter of the forest. A few musk ox and scattered polar bears remain. Beneath the icy waters of the surrounding sea, the odyssey of Arctic aquatic life continues with the arctic jellyfish, king crabs, seals, the mysterious narwhal and the beluga whale.

Despite these perils, the treacherous soils of the tundra are home to about 900 species of flowering plants. This is the land of the little plant, few growing more than ankle high, and no trees. There are many bare rock surfaces, but in the crevices, small pockets of soil and lichen remain collecting and holding a little water. Mosses invade these stony pockets, and in time, form a base upon which small flowering plants can grow.

The populations of Arctic birds and mammals are relatively large, which underscores a basic fact of polar life. In such vigorous environments, there is a paucity of species of plants and animals, yet each species tends to be represented by many individuals. This is primarily due to the climate, since only a few niches are available and a diversity of species cannot be accommodated. Although small in species numbers, the number of individuals attests to the success of animal and plant adaptations to the Arctic tundra region.

### **ARCTIC VEGETATION**

Special adaptations to these severe Arctic conditions are found in the plants of this region. The most conspicuous adaptation is small size and compact form. Many species are ground huggers, spreading low along the ground surface. A salix, or ground willow, rarely rises more than a few inches high, but often reaches a length of 10 to 15 feet. Other species are tight cushions dotted with blossoms; others put forth flowers in snug clusters. Arctic poppies track the sun, turning to keep its petals in the direct rays.

Leaves and stems assist in the plants' struggle to keep warm and retain moisture in a dry, windy climate. Various species, such as the lingonberry, have leaves with leathery or waxy surfaces that retard evaporation. A graceful plant with an ungracious name, the woolly lousewort puts forth hairy insulation on stems and buds that act to hold heat in the plant.

As a result of these adaptations, Arctic plants exist in microclimates more hospitable than their general environment. In the case of one moss campion, measurements revealed that the temperature inside the plant was 40° warmer than the air around it. The most successful plants here are the simple ones, such as algae, lichens and mosses. The lichen is actually two plants: algae, which carries on photosynthesis, and fungus, which anchors the algae to the rocks and helps to provide a good water supply. They grow with incredible slowness.

### **ARCTIC ANIMAL LIFE**

**Polar bear:** The great white bear is found from the coast of Alaska to Northern Labrador, and on the islands and pack ice of the Arctic Ocean. Its dense yellowish-white fur provides appropriate camouflage on the ice and snow. The hair on its footpads offers traction on ice and snow. They are solitary animals, pairing up only during the breeding season. Polar bears are primarily predators; their main prey is seal and walrus. They sometimes wait at the breathing holes of seals and grasp the unsuspecting quarry with one swipe of their paw. With an

estimated wild population of 15,000 to 20,000 individuals, polar bears are becoming scarce in the wild, and currently, are protected under the Marine Mammal Protection Act.

**Arctic fox:** The dense hair covering on the arctic fox's feet in winter and short, rounded ears minimize heat loss through the extremities. They occur in several color phases. The white phase changes from brown in summer to white in winter; this is a seasonal adjustment for year round camouflage. Feeding upon a variety of small mammals and birds, the arctic fox may follow polar bears and feed on leftovers.

**Snowy owl:** A ground-nesting bird whose plumage is matched to the environment for camouflage. The relationship between the snowy owl and lemmings is exemplary. Every three or four years the number of lemmings rises to such enormous heights that they destroy their own food supply and cover. As they overrun their habitat, they attract vast numbers of predators, including the snowy owl. With this temporary abundance of prey, the predators also increase in numbers; when the lemming population abruptly declines (crashes), the predators have few alternative prey species to turn to and must therefore decrease in numbers themselves. The influx of snowy owls into lower latitudes, in search of food, is one result.

**Musk-ox:** The musk-ox is not a true ox. Known for their defensive behavior, bulls form a defensive circle around cows and calves to stave off predators (wolves). Their luxurious double coat has an undercoat with a high commercial value. They are so well adapted to this cold, dry environment that they have sweat glands only on their back hooves. They are a vanishing species.

## **ESKIMO - THE PEOPLE OF THE NORTH**

The original Eskimos came to North America some 4,000 or 5,000 years ago, independent of the Paleo-Indians' arrival much earlier. They did not come over Beringia, since the land bridge had long vanished beneath the rising seas. Rather, it is theorized that their travel was by boat or possibly over ice floes.

The Eskimo can generally be divided into two groups, those who live near the coast and those who live in the interior. The former were more settled whaling communities, while the latter were caribou-hunting nomads. There were differences in terms of organization, worldview, and basic definitions of man and nature. Some differences, as may be expected, were present in their material goods. They spoke the same language and were mutually interdependent. Trade flows between coastal and inland peoples were brisk. Thus, the maritime peoples wore caribou skin coats and the inland hunters ate seal and whale oil with their meat.

Eskimo culture is not uniform throughout the Arctic. The main thing that binds them together and makes them Eskimos is their common speech, one of the

most difficult languages in the world for an outsider to learn. Another common thread going through the Eskimo cultures is the adaptation to the severe Arctic environment and utilization of its meager resources for their survival. Seal and fish make up most of the Eskimos diet. Their clothing comes mostly from the skin and fur of bear, seal, caribou and elk. They light their homes with whale-blubber lamps, and cook with seal oil or caribou tallow in shell-shaped, soapstone lamps with moss wicks. Food is served with broad scoops carved of musk-ox horn. Caribou antlers are used to make strong knife hilts. Most bows are strung with sealskin. Whale harpoons had walrus-ivory heads with a bone fore shaft. The kayak is covered with sealskin.

Although not common to all Eskimo cultures, the igloo is nonetheless one of the most ingenious and well-recognized dwellings in the world. Experienced Eskimos can build it in 20 to 30 minutes. Ten feet is a customary diameter, with the blocks laid from the inside in a spiral fashion with each layer leaning slightly more inward. A king block fills the last gap in the dome and cracks are filled with snow. An underground crawl hole provides entry to the igloo.

Eskimo beliefs and perceptions of animals may seem strange to us. Between humans and animals there existed a specialized relationship founded on the view that animals were superior morally and intellectually, and that they allowed themselves to be taken both out of pity for people and through the magic devised by people to coerce them. At all costs, attempts had to be made to avoid giving offense; the result being that each animal had its special sets of taboos. If any of these were violated, not only might the offended animal withhold itself, but also the violator himself became ill. This, in fact, was the theoretical basis of illness in the society, and the curing was done by a religious practitioner, the shaman, who could determine the nature of the offense. All animals had to be treated with respect.

The Eskimo's life has changed. The white man brought a technology that resulted in new relationships to the environment and to other bands. Commercial fishing encouraged small Eskimo groups to merge into large villages. The Eskimo now imports canned and preserved foods from the temperate and tropic zones to help them through the winter. They have switched to a cash and carry economy. Yet, the Eskimo has managed to salvage more of his culture than any other aboriginal group in North America.