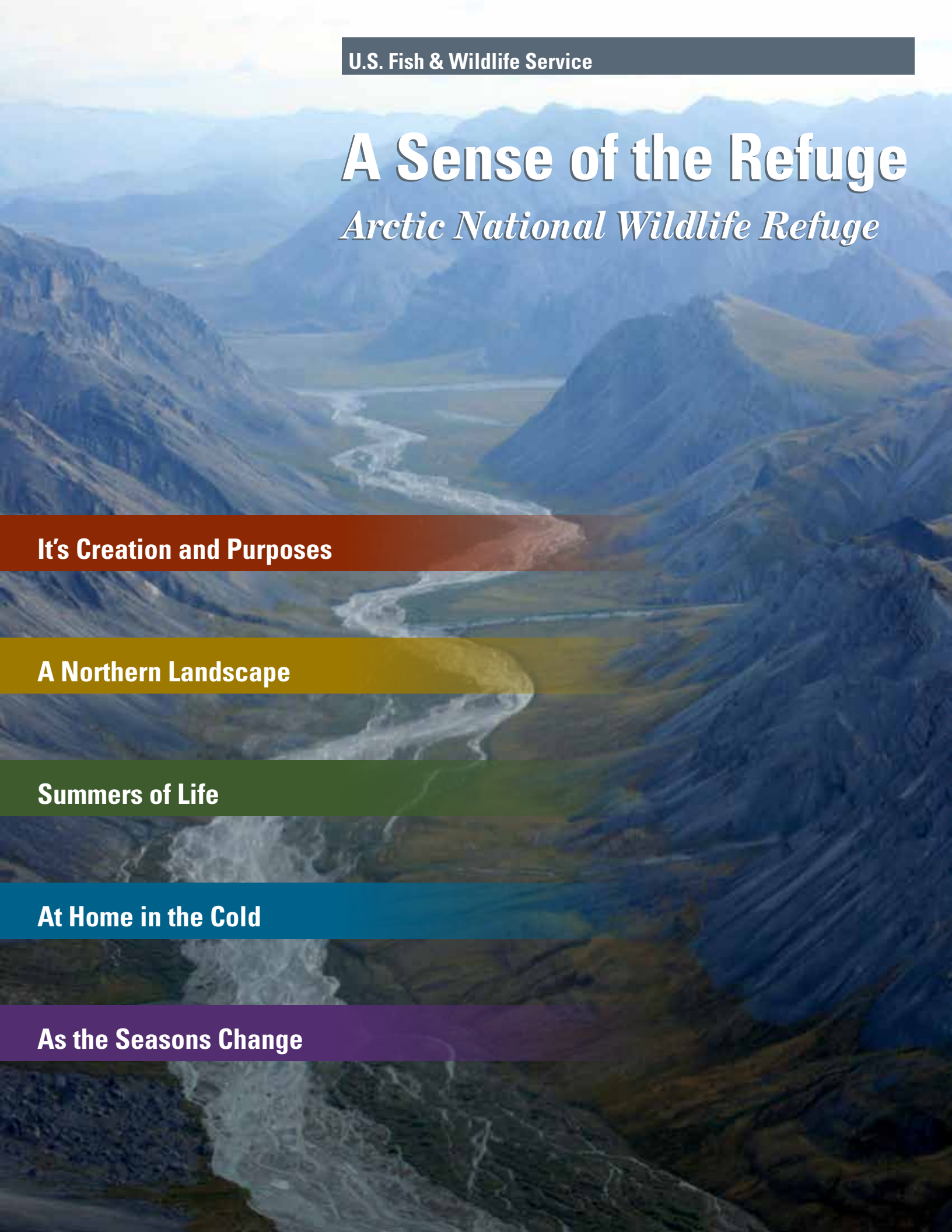
U.S. Fish & Wildlife Service

A Sense of the Refuge

Arctic National Wildlife Refuge



It's Creation and Purposes

A Northern Landscape

Summers of Life

At Home in the Cold

As the Seasons Change

A National Response

Throughout the first half of the 20th century, Americans became increasingly concerned about ecological problems including wide-spread deforestation, loss of wildlife, and air and water pollution.

This awakened a growing appreciation for wilderness, and a recognition that areas of wilderness needed to be preserved or they would disappear.

One response to these concerns was creation of a new conservation area in Alaska. This was established in 1960 as the Arctic National Wildlife Range.

The area was enlarged, and the name changed to Arctic National Wildlife Refuge in the 1980s.

As the founders intended, Arctic Refuge preserves a wild region for us today and for our grandchildren tomorrow.

Courtesy of the Jay N. "Ding" Darling Society

Rivers were once thought to be a natural dumping grounds. The fish in the cartoon says, "And they complain because self respecting fish won't live in their streams." J.N. "Ding" Darling drew this cartoon in 1923.

Refuge Purposes

Arctic Refuge is legally required to preserve "unique wildlife, wilderness and recreational values."

The Refuge is also required to conserve animals and plants in their natural diversity, ensure a place for hunting and gathering activities, protect water quality and quantity, and fulfill international wildlife treaty obligations.

National Interest

A survey of national print media indicates the Arctic Refuge is most valued by the American people for its wildness and naturalness—a place of undisturbed wildlife and wild landscapes.

A Vast Wild Place

Arctic Refuge is about 19.3 million acres. It's approximately the size of South Carolina and has no roads, marked trails, or campgrounds.

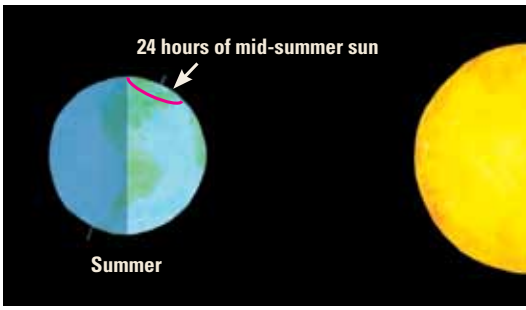
ANWR is a Wildlife Refuge

ANWR (rhymes with an-star) gets mentioned in the news a lot. ANWR is really the Arctic National Wildlife Refuge.

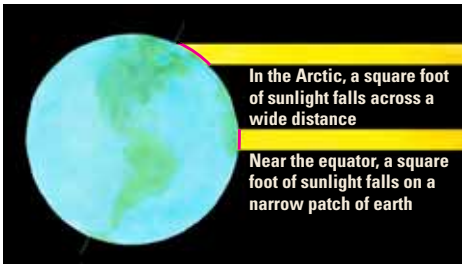
When we hear "ANWR," it's easy to forget it is National (it belongs to all Americans), it's for Wildlife, and it's a Refuge (a conservation area managed by the U. S. Fish and Wildlife Service).

A Northern Landscape

Sunshine is Key



In the Arctic, the mid-summer sun never sets, but the mid-winter sun never rises—sending a dusky twilight over the landscape.



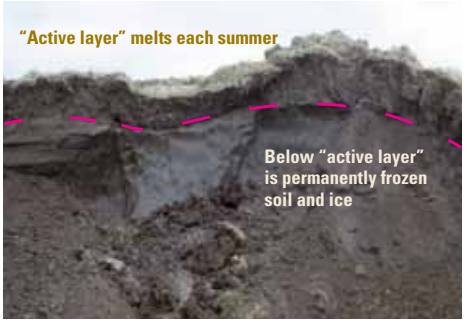
Living creatures derive their energy from the sun by eating plants that absorb the sun's rays, or by eating animals that feed on those plants.

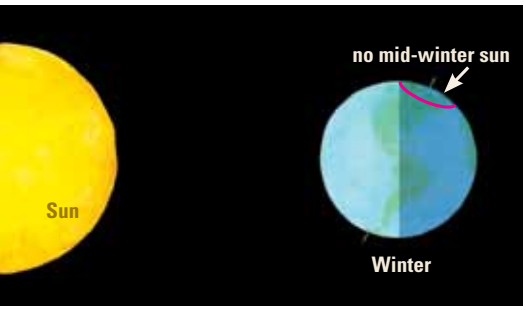
Plants and animals in the Arctic have adapted to this low level of available energy.

Frozen Soil

The arctic tundra is so cold that the ground beneath the surface stays frozen all year. This permanently frozen ground is called permafrost.

When the sun warms the surface, the top few inches of soil thaw, allowing plants to grow and insects to burrow. This thawed layer of soil is called the active layer.





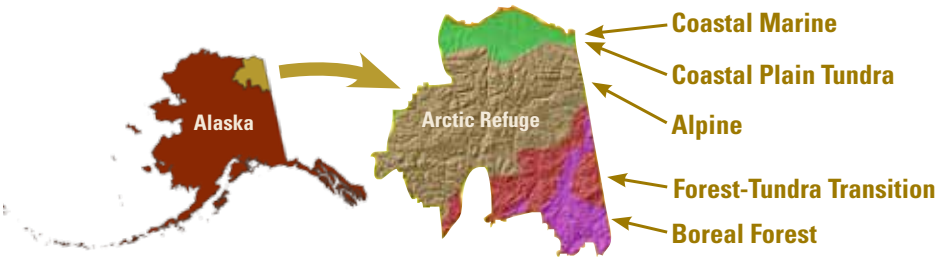
Long-term Residents

Native peoples have lived in the northern and southern portions of what is now the Arctic Refuge for thousands of years. Their hunting and gathering activities provided the foods necessary to nourish their bodies and their cultures. They continue many of their traditional life ways to this day.

Inupiat Eskimos live along the northern coast. They hunted seals and whales, fished from barrier islands and along freshwater rivers, caught birds throughout the spring and summer, and traveled inland to hunt caribou, wolves, and Dall sheep.

Gwich'in Athabaskan Indians live to the south. They traveled widely each year in their search for food. They established summer fishing camps along rivers, built long wooden fences to direct migrating caribou to prime hunting areas, caught waterfowl and other birds, and snared small game.

Five Ecological Regions



The **coastal marine** region, next to the Arctic Ocean, consists of salt marshes, lagoons, barrier islands, beaches and river deltas. These areas are important to polar bears, fish and migratory birds.

Coastal plain tundra is a treeless, flat to hilly region where caribou and birds raise young in summer. Polar bears den here in winter, and fish overwinter in deep pools along shallow rivers.

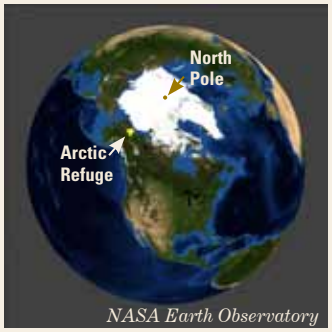
The **alpine** zone is the vast Brooks Range mountains, which are the northern-most extreme of the Rocky Mountains. Dall sheep, grizzly bears, wolves and ground squirrels live here.

The **forest-tundra transition** has spruce trees interspersed with low tundra plants. Caribou feed here through the winter. Moose and wolves roam here year-round.

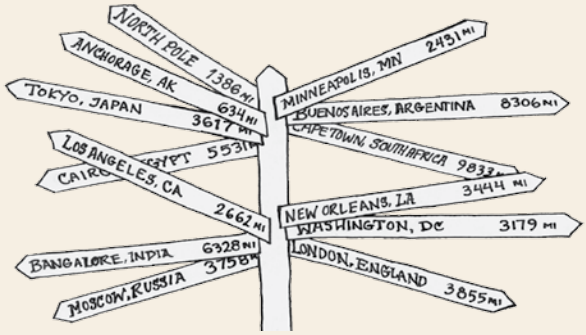
The **boreal forest** is a mix of spruce, birch, and aspen trees. It is the only extensively forested area in the Refuge. This region is home to moose, lynx, weasels, and numerous song-birds.

©Jeff Jones

Distance from the Refuge



NASA Earth Observatory



Land of the Midnight Sun

Summer in the Arctic is short but the days are long. On the coastal plain, the sun circles the horizon 24 hours per day. It will not set from mid-May until late July.

A multiple-exposure photo shows the sun reaching its lowest point over the horizon around midnight on a summer's eve.

For those two intense months, midday and midnight sun blend into one, and plants, animals, and people work hard to gather enough resources to survive the long winter season ahead.

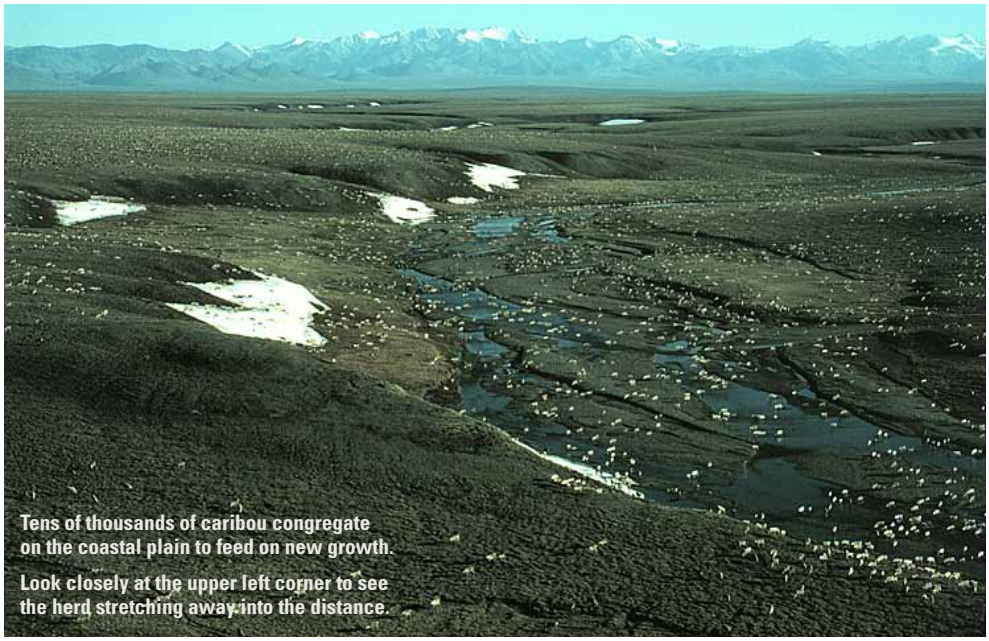
Plants and animals have adapted to these harsh conditions in a variety of surprising ways.

A lone grizzly bear searches for food in a sparse landscape.

A Swivelling Solar Oven

Arctic poppy flower-heads turn toward the sun throughout each day as it moves across the sky. This allows the plants to make use of the summer's 24-hour daylight. The satellite-dish shape of each flower concentrates the heat of the sun, raising the temperature of its developing seeds by as much as 10°F. This gives the poppy an important boost in the short growing season.

Arctic Poppy blossoms face the sun.



Tens of thousands of caribou congregate on the coastal plain to feed on new growth.

Look closely at the upper left corner to see the herd stretching away into the distance.

A Good Meal Draws Thousands from Afar

Plants are the foundation of the food chain in Arctic Refuge. They are eaten by grazers such as caribou. These grazers are in turn eaten by a smaller number of predators such as wolves and bears.

Throughout the year, a lot less sun falls on the Refuge than on areas farther south. This small amount of sunlight supports only a limited amount of plant growth.

As a consequence, plant-eaters such as caribou roam across hundreds of miles searching for the food they need for growth and reproduction.

If all the caribou in the Refuge were spread out at equal distance from each other, there would only be 3 to 4 caribou in each square mile of the Refuge. But plants grow unevenly. In early summer, abundant tender new growth on the coastal tundra attracts hungry caribou together into large aggregations of animals.

The Smell of Smoke

In this northern environment, small changes in the climate can have a significant impact.

For example, increasingly dry conditions can lead to more frequent and larger wildfires in the Refuge. Warming temperatures are also having an effect.

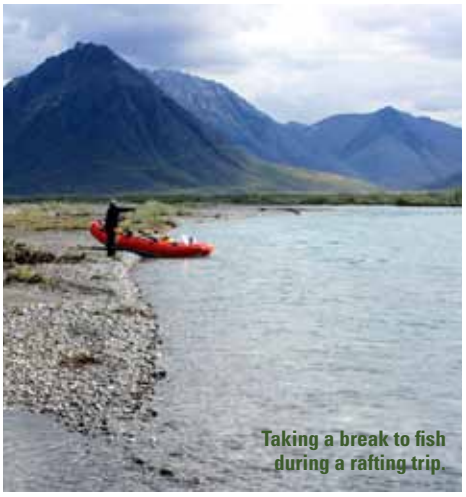
Wildland fire in the boreal forest.

Alpine glaciers in the Refuge shrank dramatically over the past half-century and are now melting ever more quickly. If current trends continue, all the glaciers in Arctic Refuge will be gone within 100 years.

Visitors Seek Untamed Wilderness

When Arctic Refuge was established in 1960 it was already receiving occasional visits by hunters and hikers.

Visitation increased gradually throughout the 1970s, and more rapidly during the 1980s. A public use study in 1975 estimated 281 people visited the Refuge. By 1986 that figure doubled. Similarly, the number of commercial recreational guides increased from 7 in 1980 to 21 only nine years later.



Taking a break to fish during a rafting trip.

Since 1986, visitor numbers have increased another two and a half times. People generally stay 7-11 days, most often to backpack, float rivers, or hunt.

In a 2009 study, visitors said they most appreciated the Refuge's wilderness, vastness, remote isolation, opportunity for adventure, and natural conditions.

Mosquitoes are drawn to the prospect of a meal. Like other creatures in Arctic Refuge, there are relatively few mosquitoes over the whole area, but they concentrate around favorable food sources.

"The moon is at its half phase, casting light and shadow on the snow-covered Romanzof mountains. The Hulahula ice field catches the red of the aurora. Amazing shapes form and disappear in the sky."

Subhankar Banerjee, photographer and environmental educator

Darkness and Light

In stark contrast to the brief, bright summer, winter in the Arctic is long, dark, and cold. Along the northern edge of the Refuge, the sun does not show its face from late November until mid-January. In the depths of darkness, during the months around the winter solstice, dusky sunlight seeps over the horizon for only a few hours each day.

The winter sun casts deep shadows over the southern portion of the Refuge.

Despite the lack of sunlight, it is not actually dark all the time. Dawn, blending into dusk, may last for hours; the winter moon, which, like the summer sun, circles overhead without setting, reflects off the expanse of snow and illuminates the long nights; and the aurora borealis—the northern lights—occasionally glow in the starry sky.

Northern lights dance across the night sky.

Survival Strategies

Arctic animals deal with winter in one of three ways. They can leave—migrate to a warmer climate; they can stay and sleep; or they can stay and keep active.

Asleep... A polar bear mother spends five months in her winter den. From late October she must rely on her body fat, layered on during warmer months, to feed herself and nourish her young. She usually gives birth to a pair of cubs in December. The cubs each grow to 15 pounds by the time all three emerge from their den in early April.

Looking out of a polar bear den

Mosquitoes survive the winter by replacing the water in their bodies with substances that act like antifreeze in a car. These chemicals keep their cells from being ruptured by ice crystals as the mosquitoes freeze.

Young muskoxen frolic in the snow.

Awake... Muskoxen save energy during the winter by moving very little. They are also protected by foot-thick coats, covered by long guard hairs that shed snow and ice.

Like plants, lemmings use the blanket of snow as insulation. Hidden beneath, they create an intricate network of burrows where they stay active all winter, eating willow and dwarf birch twigs. At the beginning of winter, the collared lemming grows enlarged claws for shoveling tunnels through the snow. It is also the only rodent that turns white in winter. This helps lemmings hide from the hungry arctic foxes that depend on them to survive winter above the snow.

Collared lemming

Arctic fox - winter pelt

Arctic fox - summer pelt

The arctic fox's short legs and small ears help it retain body heat. Its thick coat not only keeps it warm, but, like the collared lemming it likes to eat, it turns white in winter. This camouflage helps the fox sneak up on prey and avoid becoming prey itself to polar bears and other large predators.

Migrate... Of the 200 bird species that have been recorded on the Refuge, all but about 25 of them migrate to warmer regions for the winter.

Historic Temperatures

North of the Brooks Range the climate is classified as Arctic. Until recently, temperatures during February (the coldest month) averaged -4°F but extreme lows frequently dropped below -40°F.

South of the Brooks Range the climate is classified as Subarctic. Winter temperatures averaged -15°F to -20°F, with lows periodically reaching -50°F to -60°F.

Feel the Chill

Cow moose nibbling her frosty lunch.

Photo from itsagreengreenworld.com

When you take a breath of the sparkling -25°F air on a February day (the average low for much of the Refuge), your nose tingles and the air feels sharp in your lungs. As you breathe out a cloud of vapor, you may find your eyes gently frozen shut from the frost on your eyelashes. Welcome to winter.

Warming Winters

Climate change is bringing episodes of unseasonably warm weather to the Arctic winter—warming as much as 5-7°F in the past 50 years in Alaska and western Canada. One effect of these increases are icing events, when winter temperatures warm enough for freezing rain or thaws to coat the snow with a hard crust of ice. This can keep animals such as muskoxen from reaching the plants they need beneath the snow. Since the late 1990s, the number of muskoxen on the Refuge has declined, and icing events have likely contributed to this.

Hidden from View

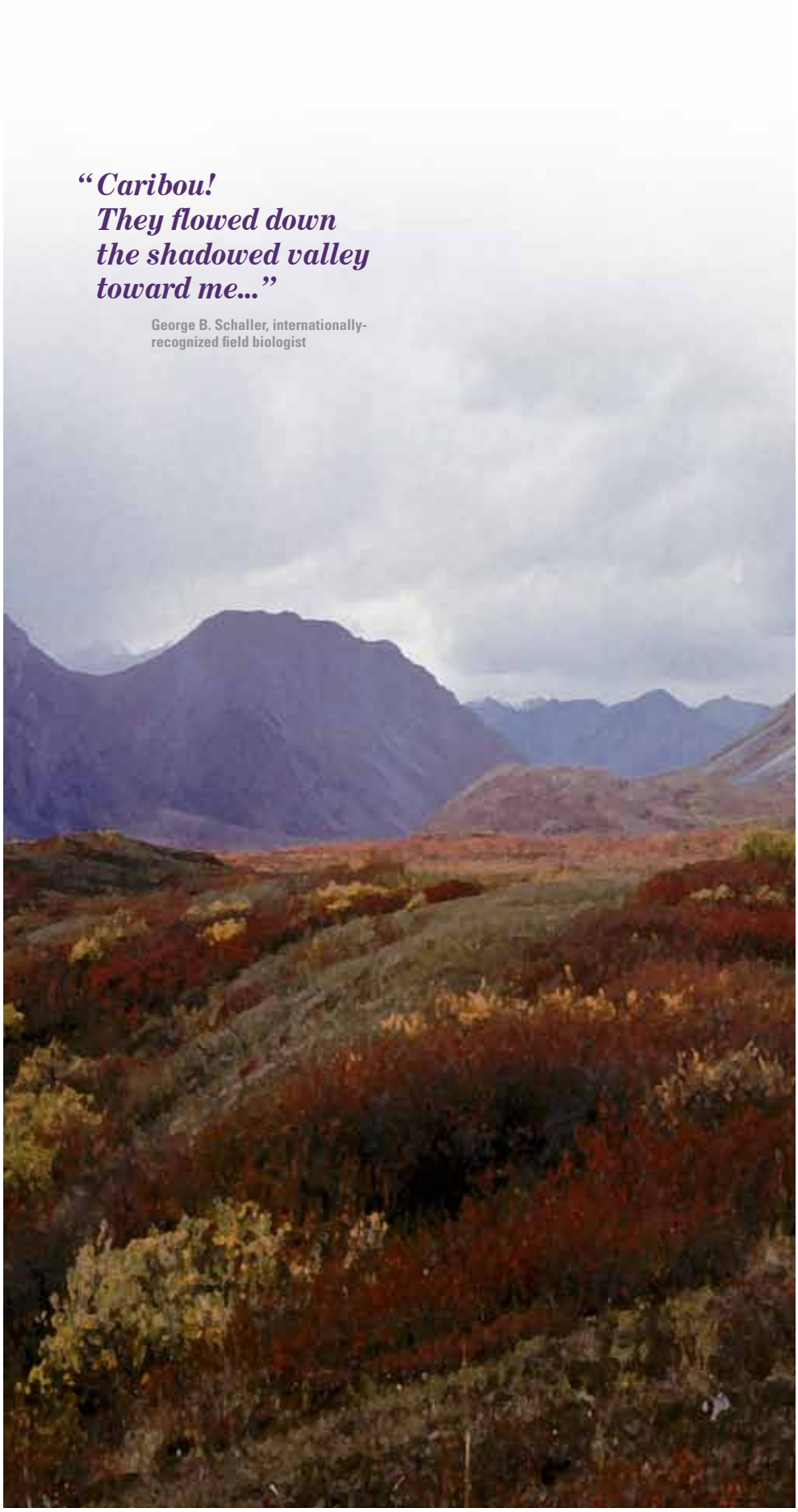
In winter, parts of the Refuge look barren—some say a great white expanse of nothing—but plants, and many animals and birds, as well as fish and insects, live here through the long winter. One question is, where is everything?

Most plants in the Arctic use snow as a protective blanket against extreme low temperatures and scouring winds. This partly explains why plants in the Arctic are so small. If they were taller, the winter wind and icy flakes would destroy any part above the snow.

Snow looks cold, but it is an effective insulator. The base of a snow pack may be +20°F while the air at its surface is -30°F. That's a 50 degree difference!

Willow branches scoured by blowing snow.

As the Seasons Change



"Caribou! They flowed down the shadowed valley toward me..."

George B. Schaller, internationally-recognized field biologist

Times of Flux

Spring and fall are intense times of activity and transition. Animals and birds migrate to and from this remote northeastern corner of Alaska in great numbers. Plants burst out with new green growth and later shut down for the long, dark winter.

Jumpstart on Growth

The sun shines brightly during the lengthening days of April and May, but snow still grips the land. Aspen trees jumpstart their growth by making use of this early-season light. Unlike most other trees, aspen bark contains chlorophyll, which begins photosynthesizing before the ground thaws and before leaves form.

But this special bark can easily sunburn in the intense light, so the trees produce a white surface powder to reflect some of the sunlight away from the delicate cells beneath. This effort requires energy, however, so aspen trees only do it where necessary—on their south sides facing the sun.

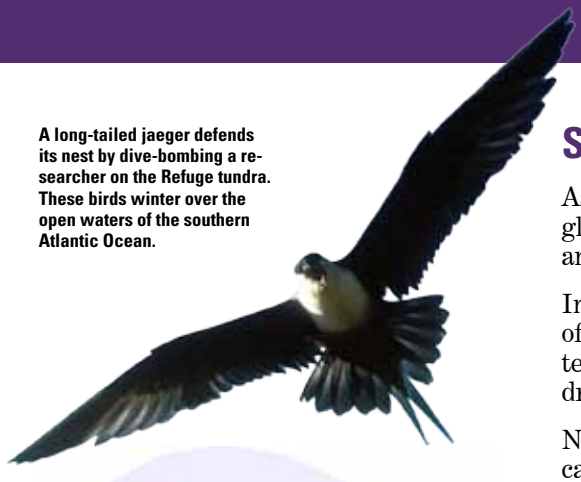
Every aspen trunk is therefore a natural compass—lighter on the south side and darker on the north.

Look closely at this aspen trunk to see the lighter-color, powdery surface on the left, and the darker gray bark on the right. In this forest, SOUTH is to the left-hand side of the photo.

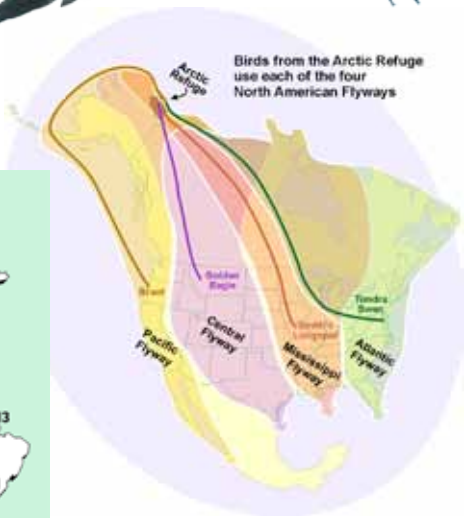
Flying Great Distances

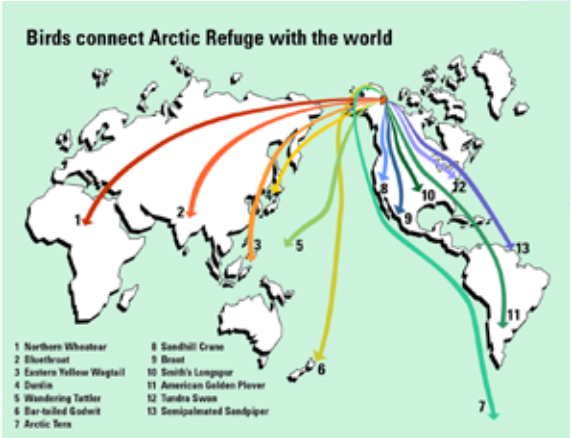
Birds migrate from all corners of the Earth to spend the summer in the Refuge, where long days produce an abundance of insects and plants for them and their young to eat.

The Refuge holds a unique position because it sits at the intersection of the four North American flyways, or main migration routes. Birds breeding on the Refuge have ranges that reach all 50 states as well as five other continents.



A long-tailed jaeger defends its nest by dive-bombing a researcher on the Refuge tundra. These birds winter over the open waters of the southern Atlantic Ocean.





The Northern Wheatear flies approximately 13,000 miles one-way from its breeding grounds on the Refuge, across Asia and the Middle East, to its wintering areas in Africa. This 6-inch bird then travels a similar distance back to Alaska each spring.

The Arctic Terns that breed on the Refuge migrate about 25,000 miles round-trip, flying south to Antarctica to escape winter in the northern hemisphere.

Shifting Seasons

As temperatures warm around the globe, many mammals, insects, birds and plants are facing challenges.

In Arctic Refuge, where temperatures often hover around freezing, a small temperature increase may cause dramatic changes.

Nutrition is critical to pregnant caribou, particularly after the long winter. They give birth in early June, in time for them and their calves to feed on tender, new, green vegetation when they need it most.

As the Arctic warms, however, green-up is happening earlier than in the past. If caribou cannot find proper nourishment for themselves and their calves at this critical time, it may effect the health and future of the herd.

Caribou cow with her newborn calf

Caribou Journey

Each spring, caribou of the Porcupine Herd move by the thousands on a focused march from their wintering grounds north to their calving range. The cows will soon have an urgent matter to attend to—the birth of their calves.

As temperatures cool, caribou amble back across the mountains, feeding slowly along the way to their wintering areas.

In early spring, a long line of caribou migrate north toward their summer calving range.

U.S. Department of the Interior
U.S. Fish & Wildlife Service

ANWR, the Arctic National Wildlife Refuge, is a conservation area in northeast Alaska managed by the U.S. Fish and Wildlife Service and owned by all Americans.

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