



Climate Change



The Arctic is warming four to seven times faster than the rest of the world, causing massive changes to a fragile ecosystem. The Western Arctic Caribou Herd is declining; the treeline is racing northward; permafrost is thawing; and salmon are suffocating in warm waters. The Iñupiat are no longer able to rely on thousands of years of knowledge of this land, as subsistence resources and practices are altered and threatened. Climate change poses incredible dangers to the ecosystem and way of life in the Arctic.

Sea Ice and Ice Formation

While ice may be a foreign concept or unwelcome sight to much of the rest of the world, it is critical to the animals, plants and people that call the Arctic home. Traditionally, Arctic residents expect the ocean, lakes and rivers to “freeze up” in October. In the indigenous Iñupiaq language October is called Sikkuvik—the time of ice. In the spring, we expect the river ice to “break up” in May and the ocean ice to retreat in June.

In recent years, freeze up has occurred up to three weeks later, and break up has occurred up to three weeks earlier. Even after the ice has formed, warmer temperatures or even rain will result in thinner, less safe ice.

Loss of sea ice is a detriment to many animals. Polar bears, for example, rely on sea ice year round for seal hunting.

Walrus need ice to haul out on to rest between hunting trips. Seals rely on ice for supporting their pups and molting in the spring.

Loss of sea or river ice also creates problems for people practicing their subsistence way of life. Thin ice makes for dangerous traveling to hunting or fishing grounds, and can make it impossible for coastal indigenous Iñupiaq to hunt seals at certain times of year.

Fewer weeks of ice means more time for waves and current action to erode the shoreline. The village of Kivalina along the Chukchi Sea, for example, is in the process of relocating to higher ground. In Kotzebue, a multi-million dollar sea wall was built to protect homes and businesses along the shore.

Permafrost Thaw

Northwest Alaska marks the beginning of the continuous permafrost zone. This means that all of the land is underlain with frozen ground. In summer, a few inches of frozen ground thaws, and in winter it refreezes. Recently, however, many inches of permafrost will thaw.

Permafrost creates the mosaic tundra landscape. As you fly over land, you can see geometric shapes, pingos and ruts.

For millennia, building in the Arctic has been challenged by the shifting grounds of permafrost. This is part of the reason that Inuit sod homes were regularly moved and rebuilt. With warmer temperatures, however, permafrost is becoming especially unstable. Roads built on permafrost often settle, crack or slump, making for a bumpy ride.

Thawing permafrost may be beneficial to plants, as their roots are able to reach deeper nutrients. Permafrost has been frozen for so long that when it thaws, it releases microbes and gases that have been trapped for thousands of years. Once thawed, these microbes begin rapidly decomposing organic matter, releasing greenhouse gases into the atmosphere and contributing to increasing temperatures.

On the Salmon River as well as other tributaries in Kobuk Valley National Park permafrost thaw is releasing an iron-rich sludge into the river, staining the water orange and impacting fish and aquatic organisms, as well as other animals that rely on the clean water. Scientists are actively researching this process and looking for other places where this is occurring.

Western Arctic

National Park Service
U. S. Department of the Interior

Noatak National Preserve



Rain-On-Snow With warmer temperatures precipitation that once fell as snow now falls as rain. This becomes an issue if rain falls after snow already covers the ground—a “rain-on-snow event.” Rain-on-snow creates a tough layer of ice over the land and rapidly melts and pocks sea and river ice.

The tough layer of ice created on land is detrimental to several important species. Caribou use their shovel-like hooves to dig through the snow to reach lichen to eat, but their hooves are not made for breaking ice. Ptarmigan rely on soft snow to burrow into for safety and warmth at night. An icy layer on top can be the difference in life and death for these birds.

Moose and sheep are also impacted by rain-on-snow events. Moose are in greater danger from wolves after an event, as wolves can run on top of the crusty layer while a moose breaks through, struggling through the deep snow. Sheep, meanwhile, live in the steep mountains. An icy layer is slippery, too, causing injuries or death for sheep.

All of these animals are important species for the ecosystem as bears, wolves, foxes, lynx, wolverine and birds of prey rely on these animals for survival. The indigenous Iñupiat also rely on these animals for subsistence food, making rain-on-snow deadly for cultural survival as well.

Vegetation Encroachment Between warmer air temperatures and deeper, warmer soils due to permafrost thaw, the Arctic now has a weeks-longer growing season. Willows and alders are taller and denser than ever before. Spruce trees are marching the treeline northward and grasses are taking over the tundra.

At first glance, a longer growing season may seem like a benefit in the Arctic, but while some plants are thriving, others are suffering. Low bush cranberries and crowberries grow close to the ground and may receive limited sunlight as they compete with taller grasses and willows. These berries are picked each fall as an important part of the Iñupiaq diet.

Increasing trees and willows may provide more food for animals like rabbits, moose, beavers, ptarmigan and porcupine. For caribou, however, the increased vegetation damages important habitat.

Lichens make up to 70% of a caribou’s diet. Between temperature conditions that limit lichen growth and the encroachment of trees onto the tundra, the food staple of caribou is now threatened. Furthermore, caribou migrations may be impacted by the increased vegetation. Caribou prefer open tundra, both for grazing and awareness of predators. More willows and trees means less prime caribou habitat.

Cold Water Fish in Warm Water Fish are a major part of life in Northwest Alaska. Sheefish, salmon, and countless species of whitefish are important subsistence foods, and a commercial chum salmon fishery operates in Kotzebue Sound. These fish are in optimum health in cold waters. Climate change is increasing water temperatures in the ocean and rivers in the region, which has both direct and indirect impacts on fish.

Higher temperatures have the direct effect of decreasing the amount of oxygen dissolved in water. During especially warm summers in the region, salmon die-offs have been reported along the Kobuk River.

Water temperature also impacts the growth rate of young fish. The cooler the water, the slower the development. Warmer water speeds up development, but if it increases too much, fish may eat less and grow less.

As temperatures warm, habitat may become suitable for other fish species. For example, fishermen in Kotzebue Sound are reporting significantly more pink salmon. The immigrating species competes for resources, putting pressure on the native species for survival.

Impacts to Iñupiaq and Local Culture Information about climate change can seem like a distant concept that affects polar bears and penguins. In Northwest Alaska, however, climate change is actively impacting a millennia-old culture and the daily lives of residents.

Increased shoreline erosion means coastal villages are looking into relocation; homes and roads are shifting underfoot; seal hunting is difficult due to changing ice conditions; and many plants and animals that locals rely on are threatened.

Lack of ice is one of the more visible effects of climate change in the region. Typically, locals use snowmobiles for hunting and traveling between villages from October thru May. As temperatures warm ice is less safe and predictable in the shoulder seasons, resulting in more accidents, search and rescue missions, and even deaths.

Climate change is also threatening Iñupiaq historical sites and artifacts. Many artifacts are made of wood, bone, or hide and preserved by frozen permafrost. Thawing permafrost can expose and degrade these items. During storms, coastal sites may be eroded or inundated with water, literally washing away Iñupiaq history.