

STATION 7: GAMBELL, ALASKA

Background Information

Watch the [video on Gambell, Alaska](#).

Leaving the tropics, you travel north over the Pacific Ocean under a night sky of twinkling stars that arches from horizon to horizon. Arriving at Gambell, Alaska, 171° 44' W, 63° 46' S, you step into the Arctic tundra of St. Lawrence Island. Almost all of the inhabitants of Gambell are members of the [Yupik tribe](#). The Yupik are indigenous people closely related to Inuit and Iñupiat peoples.

Although like Satitua, Gambell is on an island, the residents of Gambell face different challenges from climate change. In Samoa, rising sea levels were the pressing climate threat. However, the changes affecting St. Lawrence Island come from diminishing periods of ice cover. During the dark, cold Arctic winter, ice sheets form around the [Bering Strait](#). When summer returns, the ice recedes. Since 1980, the period of ice coverage has decreased by 30 days (Klimahaus). Ice melts earlier in spring and forms later in autumn. Yupik people are permitted to hunt whales for food. Yupik people depend on the Arctic ice to reach winter hunting grounds in the ocean. This means that today, the Yupik hunting season is one month shorter than it was 35 years ago.

A painting on the wall depicts animals adapted to life in the Alaskan tundra. You are prompted to find a walrus, hare, and bear. Each animal is well camouflaged, making the search a challenge. The polar bear, also called “nanook” by the natives, is one of the biggest and most dangerous carnivores in the world, but it too is facing the same one-month shorter hunting season experienced by the Yupik. For the polar bear, a shorter hunting season means less food and the threat of starvation. It is perhaps understandable that the polar bear has become the poster animal for climate change in the Arctic.

Another hidden climate threat bubbles up from melting permafrost: [methane](#) gas.

[Permafrost](#) is soil frozen all year. Rising temperatures in the Arctic are causing the permafrost to thaw. As the land thaws, decomposition of plants that died and froze long ago begins. This decomposition process releases methane gas, a gas with high global warming potential. Scientists conducting research in the Arctic regions are measuring higher concentrations of methane and carbon dioxide as the permafrost thaws. Additional concerns have been raised regarding ancient bacteria and other disease causing organisms locked away in the Arctic deep freeze.

Tundra ecosystems depend on producers that include moss, sedge, grass, shrub, and lichen. These [autotrophs](#) (organisms that make their own food) are well adapted to a climate with a short growing season, cold temperatures, and little precipitation. There are signs that, as temperatures rise, forests are creeping into the tundra, an ecosystem that is usually devoid of trees. Although the amount of sunlight will not change unless the Earth's tilt changes, a warmer temperature may be enough to promote tree growth. Producers support an ecosystem food web. What changes will occur as the result of changes in the tundra producers is a hot topic in polar research.

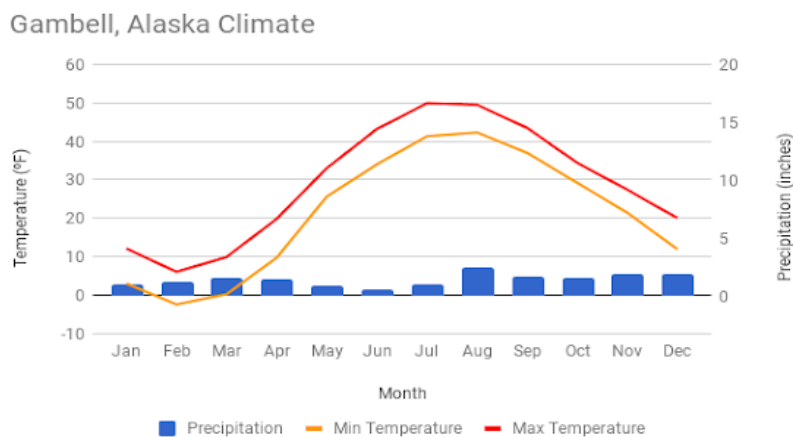
The Yupik people of Gambell live with one foot in tradition and one foot in the modern world. You watch a video of a festival that includes a blanket toss competition. It looks like fun, but the traditional purpose of the blanket toss was to hurl a hunter high enough to spot dangerous polar bears before the polar bears spotted the hunters. While the traditional whale hunt continues, you notice that the vehicle for hunting is a modern quad bike. Tribal legends and hunting stories may be told around a fire, but electricity powers modern

appliances and lights. The inhabitants of Gambell have also lowered their energy production cost by installing three wind turbines in 2009 (STG Inc., n.d.).

With rising temperatures affecting sea ice, thawing tundra, and changing ecosystems, how much longer will the Yupik way of life continue?

Explore Gambell

1. Use Google Earth to develop a sense of place.
2. Use the data and information on the climograph to observe patterns in rainfall and temperature.



3. View the animation [Permafrost—What Is It?](#) and explore other resources at the Alfred-Wegener-Institut website.
4. Identify factors that influence climate.
5. Identify sources of carbon dioxide and other greenhouse gas emissions.

Explore Arctic Sea Ice Minimum at [NASA Global Climate Change Vital Signs of the Planet](#).

Predicted Climate Change	Climate Change Threat	Climate Change Impact
Warmer ocean temperatures	Shorter period of sea ice coverage	Ecosystem changes
Warmer air temperatures	Increasing methane and carbon dioxide from thawing permafrost	Loss of biodiversity
		Accelerated warming
		Reduced hunting season

Use evidence from [NASA Sea Ice Minimum](#) and other resources to predict the impact of warmer temperatures on Arctic human and natural populations in the next 30 years.

Modeling Methane from Thawing of Permafrost

Phenomenon

“The Arctic landscape stores one of the largest natural reservoirs of organic carbon in the world in its frozen soils. But once thawed, soil microbes in the permafrost can turn that carbon into the greenhouse gases carbon dioxide and methane, which then enter into the atmosphere and contribute to climate warming” ([NASA, 2018](#)).

Read the article “[Unexpected Future Boost of Methane Possible from Arctic Permafrost](#).”

Create a visual model of methane release from thawing permafrost. Your model may be hand-drawn images, digital images, or a physical model with labels. Include the key scientific principles and processes that explain methane release from thawing permafrost.