BALLARD BRIEF

April 2023

# Ecological Disruption in the Arctic National Wildlife Refuge

Jane Allen

# Summary

Ecological disruption is an issue that is affecting the wildlife and people that live in the Arctic National Wildlife Refuge (ANWR). Climate change and oil drilling are two of the main causes of ecological disruption in the ANWR. The native people and wildlife are the ones being affected by the ecological disruption and deterioration. Food source decline and land degradation are some of the ways that climate change is affecting these people. Oil drilling and government involvement in the lands of Alaska is causing the degradation for many Alaskans to worsen. Oil drilling destroys ecosystems and harms the native animals, which then decreases the food sources, as well as interferes with the spiritual and traditional aspects of the lives of the people. One best practice that may help these people is to make governmental policies that favor the people. Also, filing settlements to hold oil companies and governments responsible for their part in harming the lands and the people would also help.

# Key Terms

**Climate change**—A change in the pattern of weather, in oceans, land surfaces, and ice sheets, occurring over time scales of decades or longer due to increased levels of greenhouse gasses in the atmosphere that absorbs UV sun rays.

**Cryosphere**—Portions of the earth's surface where water is in solid forms like ice caps, frozen ground (permafrost), and snow cover.

**Permafrost**—Land that is completely frozen for more than 2 years. This frozen land is essential for arctic areas as it makes the land watertight and maintains wetlands.

**Land degradation**—When land is harmed or destroyed through human processes. Land degradation is any type of disturbance to the land that affects it from functioning naturally.

**Thermokarst**—A form of erosion that is specific to melting ice. When ice or

permafrost melts, it can turn into water-filled pits or marshy-like surfaces.

# Context

### *Q: Where is the Arctic National Wildlife Refuge?*

**A:** The ANWR is a wildlife refuge located in the Northeast corner of Alaska, which covers a little over 19 million acres of land.[1] It is sectioned off by the government to protect wildlife and conserve the land from human development.[2] To help achieve this purpose, there are no established trails or roads in the refuge.[3] The Arctic National Wildlife Refuge started as an 8.9 million acre chunk of land dedicated to preserving wild land in Alaska in the 1960s by President Eisenhower. There were nearly 11 million acres added in the next administration in 1980, and the land got the name the Arctic National Wildlife Refuge.[4] There are Native Alaskan Peoples living in 15 villages along the coastal lands of Northeast Alaska and Canada in the ANWR.

### *Q: What does the ecosystem of the ANWR look like?*

**A:** The ANWR is made up of arctic and subarctic ecosystems. These ecosystems have severe conditions that the ANWR wildlife is specifically adapted to. For example, most animals have hollow hair follicles and black skin to absorb heat to help keep them warm.[5] The main species that live in the ANWR include black, brown, and polar bears, porcupine caribou, Dall sheep, wolves, muskox, and over 200 different species of birds.[6] The structure of the land itself plays a big role in the arctic ecosystems. Permafrost makes up 84% of Alaska.[7] Permafrost is a layer of the soil that is frozen throughout the year and is responsible for keeping the land watertight, meaning it holds a lot of water, so when it melts, ponds and marshes form, which changes the ecosystem.[8] The vegetation in the Arctic also had to adapt to the harsh climate to live there. Boreal forests,

which are made up of evergreen trees, are common in the ANWR.[9] Other common plants in the ANWR include willows, mosses, and lichens; these plants have adapted to living in frozen ground.[10]

## *Q: What is ecological disruption?*

**A:** Ecological disruption occurs when an ecosystem experiences mortality to organisms or changes in the operations of the ecosystem because of biological or manmade changes. Disruption can include things like winds, floods, wildfires, or storms.[11] In the ANWR, climate change, which is in part caused by humans,[12] is one of the main causes of ecological disruption because it causes floods, melting ice, and wildfires.[13] Ecological disruption causes animals and humans living in the area to be negatively affected. Manmade ecological disturbances include tree removal, road building, pastures and cropland, and blocking waterways with retaining walls.[14]

The type of ecological disruption happening in Alaska mostly involves warming from climate change, oil drilling, and other human disruption. Climate change is causing the melting of glaciers and permafrost. Studies of the ANWR are showing that most of the disruption is happening to ice wedges that have been stable for thousands of years,[15] as well as other forms of melting ice like thermokarsts that now cover 3.8% of the land.[16] Another type of ecological disruption happening is to native animals. The native animals that live in the area, such as the porcupine caribou and beluga whale,[17] are in danger because their habitat in the ANWR is changing.

## *Q: When did the ecological disruption start?*

**A:** The beginnings of all ecological disruption around the world can be linked to the industrial revolution.[18] Atmosphere carbon dioxide levels before the industrial revolution were about 280 parts per million (ppm), and after the revolution, they reached about 410 ppm (ppm can also be thought of as the amount of contamination per unit of volume).[19] These statistics

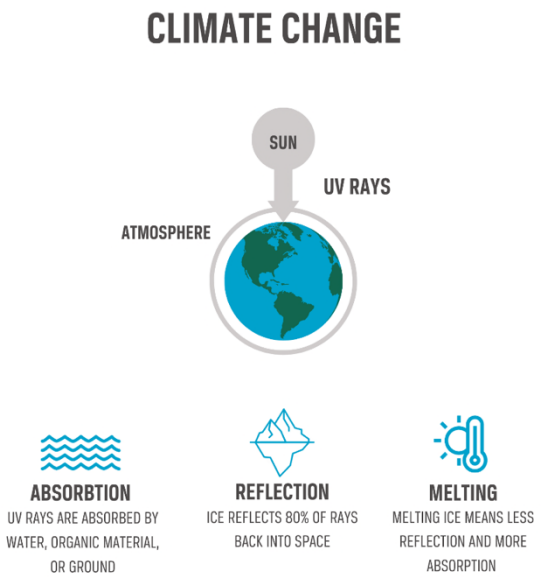
suggest that the amount of atmospheric carbon dioxide doubled, and since carbon dioxide absorbs and reflects heat back toward the earth, the higher amount of carbon dioxide leads to more global warming. The atmosphere's carbon dioxide levels started to grow right after the industrial revolution but have been increasing since.[20] The serious effects of climate change began to be noticeable in Alaska in 1982, which coincided with record warm temperatures in 1989 and 1998.[21] These temperatures also caused icebergs that were stable for thousands of years to become unstable. Ecological disruption is affecting all aspects of native life, including people, plants, and animals. Alaska's sea ice is also receding alarmingly fast and is expected to be completely gone by the mid-century, which negatively affects native marine ecosystems in ways like loss of habitat and loss of food supply.[22]

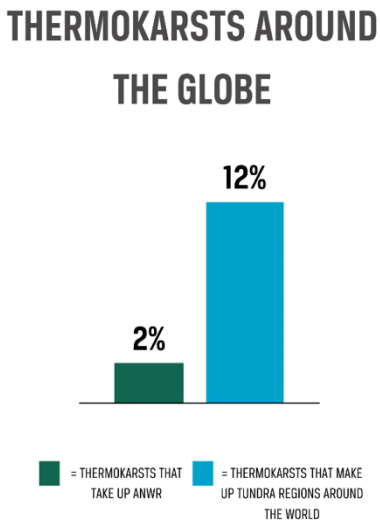
# Contributing Factors

## *Climate Change*

The effects of climate change are impacting ecological deterioration in the ANWR. The ecological disruption can be seen in the form of land degradation like landslides and erosion. The ANWR is mostly made up of glaciers, snow cover, and permafrost, which combine to form the earth system called the cryosphere. The cryosphere is any part of the earth where water is frozen.[23] The ANWR's cryosphere functions as one of the key parts of the earth that keeps balance in the earth's temperature.[24] Climate change is responsible for a 3-degree overall increase in Alaskan temperatures over the last 60 years as well as a 6-degree increase during the winter. This 3-degree F increase is twice as much as the rest of the US.[25] This global heating of the atmosphere is affecting Alaska by causing changes to the ecosystems.

Part of the degradation is the melting of the permafrost. Melting permafrost means that the structure of the land is falling apart, leading to landslides, increased erosion, and ground subsidence.[26]




Thermokarsts (areas of irregular marshy hollows) form in areas where permafrost has melted and can cause landslides and release large amounts of carbon.[27] From 1945 to 2001, thermokarsts pit density also increased from 88 km2 to 1336 km2.[28] This increase in pit density is seen in mostly new pits being created, not old ones growing.[29] More recent data from the last decade shows that thermokarsts now make up 2% of the ANWR as a whole and 12% of its tundra regions.[30] These degradation effects are occurring alongside increases in the temperature of Alaska. Temperature greatly affects ecological processes and patterns,[31] like decreases in agriculture products and changes in animal migration which can affect native's hunting activities.

Changing sea levels around the world and in the ANWR can be traced back to climate change.[32] Sea levels changing, either rising or falling, can accelerate the process of erosion, which affects both wildlife and people. Along Alaska's North Coast, which includes the ANWR, the shoreline retreats about 1.5 meters a year.[33]

According to historical records that can be found by analyzing layers in ice, arctic ice started to decline around 1900 with an acceleration of loss since the 1950s. Satellite records show an overall loss of 13% per decade of sea ice coverage since 1979.[34] With melting ice in Alaska, it is surprising to find that sea levels are not rising in surrounding areas as the ice melts to water. Sea levels in Alaska have decreased by about 32 inches since 1950.[35] This can be explained by 2 processes: plate tectonic activity and glacial isostatic adjustment. Glacial isostatic adjustment is the elastic ability of the soil to bounce back after being weighed down by extremely heavy ice.[36] So the movement of the land after the melting of heavy ice is displacing the sea water and causing the sea to have a falling effect instead of rising. However, the melting cryosphere, due to climate change, in Alaska is causing global sea levels to rise. While looking at current melting rates and thermal heat expansion of the oceans, global sea levels are expected to rise 32 cm by 2050,[37] in part because of climate change.

Because of falling sea levels, the coasts of Alaska have eroded in certain locations, and some nearby towns are experiencing flooding due to that erosion.[38] The newly exposed land that was formerly underwater and protected from above-water forces now experiences accelerated erosion as a result of wind and other elements.[39] The lower sea levels also allow for erosion to cut lower and cause big chunks of the top layer of ice to fall into the sea.[40] The average net loss of ice in arctic regions is estimated to be 16.7 ± 4.4 cubic kilometers per year which corresponds to 0.04 ± 0.01 mm per year of global sea level rise.[41] Sea level changes disrupt the natural activities of the ecosystem, forcing the organisms in the ecosystem and the people who hunt and harvest shoreline animals to adapt.[42] Sea levels rising means there will be an increase in flooding, erosion, and forcing natives to relocate. Sea level falling causes erosion as well and also leads to natives having to relocate. In the ANWR, falling sea levels and the

associated side effects are leading to ecological disruption.

Another form of ecological disruption that is strongly affecting the ANWR is wildfires. Wildfires need 3 conditions to start; source of ignition, oxygen, and fuel ignition.[43] climate change does not necessarily change the amount of ignition or oxygen, but it makes it easier for the ignition to start fires due to the increase in fuel. The source of ignition that is most common in Alaska is lightning strikes, with 83% of the wildfires in Alaska in the last 50 years being caused by lightning strikes.[44] Climate change in the last 12 years has increased droughts and heat waves and changed wind patterns globally,[45] and specifically, the ANWR has become dryer than normal, which causes fuel to be more available.[46] Increased heat waves mixed with droughts, which cause dry vegetation (fuel), create a perfect environment for a natural or manmade wildfire to thrive. According to the National land cover database, 74% of Alaska is vegetation and 24% is forest land.[47] Between 2000 and 2018, NDVI values, which are a common indicator for the amount of vegetation and plant cover existing in an area, were cut in half from 8,000 NDVI to 4,000 NDVI.[48] The modification of vegetation is in part caused by wildfires. In the past 50 years, 18% of the land in the ANWR has been altered, with 6% being caused by wildfires.[49]

### *Oil Drilling*

Oil drilling is not currently happening in the ANWR, but there are many people who are trying to drill there. In 2004, the American-Made Energy and Good Job Act legislature originally started to open up the ANWR for oil drilling. Then later on, in 2017, the United States government started its plan to open up the ANWR for oil drilling. In 2020 the plan was finalized,

and preparations for auctioning off land and drilling leases began.[50] Later that year, the US presidential administration changed, and the new administration suspended drilling leases in the ANWR.[51] The President cited "legal deficiencies" in the oil drilling plan and "inadequacy of the environmental review" that the plan was based on as the reasons for suspending the leases.[52]

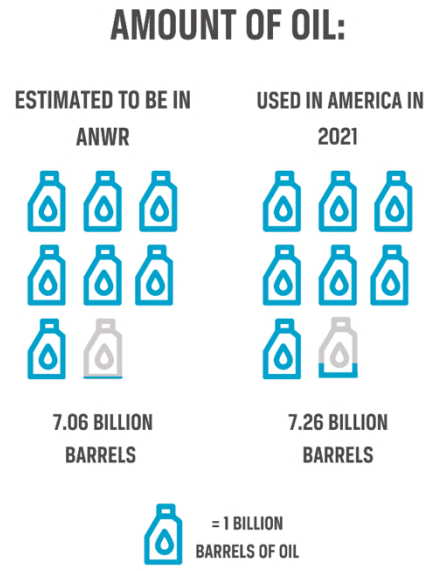
Drilling in the Arctic National Wildlife Refuge would cause a lot of environmental harm.[53] In 2006, groups of ecologists studied tropic and microbial changes to oil-drilled land in the North Slope of Alaska. They concluded that the hydrological processes and tundra surfaces, which are processes that maintain the ecosystems, were disrupted by arctic oil production.[54] Altering these processes that maintain the ecosystems causes ecological disruption. Anywhere that oil is drilled, the environment is affected specifically through aspects of drilling like discharge solids, drilling waste, and dirty fuels from trucks.[55] In the study done in the North Slope of Alaska, researchers also found that food and human waste from the oil drilling facility have altered predation patterns of brown bears and arctic foxes.[56]

Before oil drilling can begin, testing must be done on the land to see if the land contains oil. Testing for oil has its own environmental damage. In 2018, damage caused by heavy vehicles that are used in seismic testing for oil was seen in the ANWR. The damage is in a grid formation covering a portion of the ANWR in an area called Point Thomson.[57] These tracks can remain in the land for decades and change the surface water flows or accelerate the thawing of permafrost.[58] Changes to the surface flow of water mean changing or degrading the current ecosystem. In order to start drilling in the ANWR, the

Interior Department would need to construct 4 airstrips, major well pads, 175 miles worth of roads, ground pipelines, a seawater treatment plant, and a barge landing and storage site.[59]

Drilling for oil also includes other side effects like spills, which can endanger or kill native life. Oil completely destroys an animal's ability to insulate.[60] Oil spilling into waterways majorly affects the animals living in and around the contaminated water. Fracking can pollute ground and surface water.[61] Fracking requires using a fracking fluid that is injected into the soil and shale to extract oil further.[62] This process is more harmful to the environment and people. Fracking can pollute ground and surface water, which would only harm the people living in the area.[63]

There are three common reasons why oil drilling in this area would be beneficial. It would reduce reliance on Middle East oil, strengthen the economy, and increase the jobs and welfare of Alaskans. Some believe that this can all be done with little harm to the environment.[64] These claims are based on the environmental impact of the Trans-Alaska Pipeline, which was implemented in the 1970s and had very little environmental impact. Only 2% of the developed land experienced alteration.[65] The pipeline itself only affects 2% of land and does not include the land damaged from spills or the other land surrounding it being affected by the pollution of the line.[66]

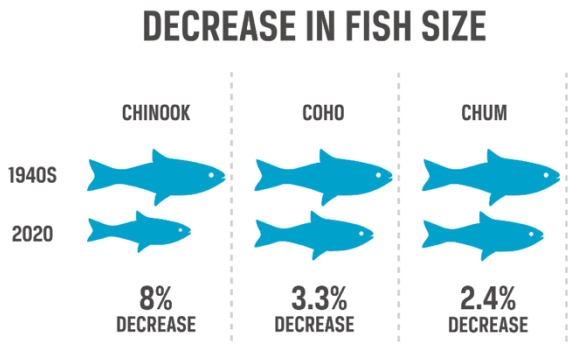


# Consequences

## *Wildlife*

Ecological disruption means the physical earth is changing and is affecting wildlife. The porcupine caribou herd that migrates all around the ANWR holds a lot of importance in the lives of the community as a source of food and as a cultural value passed down from ancestors.[67] The potential risk of oil drilling in the ANWR is estimated to be a 19% decline in the current herd population within 10 years after the development of oil drilling.[68] The herd population is already declining, as 164,000 caribou were counted in the herd in 2022, a decline of 24,000 from the previous year.[69]

There is not a clear reason as to why the herd's population has been declining, but it is suggested that oil drilling would hurt the already declining population. One area in the ANWR that is a potential target for oil drilling is "Iizhik Gwats'an Gwandaii Goodlit," or "the sacred place where life begins."[70] This is where the porcupine caribou return to every year for breeding, and it is a land full of traditional value for the Gwich'in tribe in the ANWR. Further threats to the ecosystem of the ANWR (such as through oil drilling) would further decline the size of this herd.[71]



The fresh and saltwater fish population is also declining due to ecological disruption. The population size as well as the actual size of each fish are decreasing.[72] Chinook, which is a common type of salmon in Alaska, saw the biggest decline between the 1940s and 2020 in body size, with an 8% decline in body length compared to other salmon like coho (3.3%) and chum salmon (2.4%).[73] Part of the effect of ecological disruption is the oceans and other waterways becoming less habitable for animals that live in the water. The oceans around the world are heating up, including Alaska. Between 2014–2016, the upper 100 meters of the Pacific Ocean that touches Alaska rose 2.5 degrees C, which is equal to a 36.5 degrees F increase in just 2 years.[74] New invasive species are moving from colder parts of the ocean to Alaskan waters.[75] These new invasive species are using up the resources of the native fish, causing a decline in the native population.[76]

Any type of change in an ecosystem affects the rest of the organisms making up the ecosystem. Wildlife in the ANWR faces intense alterations to their habitat and food sources due to the ecological disruption occurring in the ANWR.[77] The changes in their habitat due to climate change or oil drilling will change their behavior as they adapt to survive the new environment. The native animals have to adapt to a loss of food because the loss of ice changes the quantity and quality of ice-dependent marine animals.[78] Ecological disturbances, especially intense forms like wildfires, have the ability to destroy an animal's ecosystem and food sources.[79] Much of the ecological disruption occurring in the ANWR affects the wildlife negatively; however, for land animals who have successfully adapted, the warming and longer growing periods caused by climate change are sometimes good since it allows them to get more nutrients.[80] However, overall, the disruption negatively affects wildlife.

### *Humans*

The native people of the ANWR are greatly affected by the ecological

disruption. Loss of permafrost also means landslides and lake disappearances.[81] Permafrost landslides can relocate huge amounts of sediment, nutrients, and soil, which completely alters the structure of the land.[82] This affects humans because of the effect it has on agriculture and the structure of homes. Climate change is actually causing longer growing seasons, but with permafrost melting, the available land to grow on is diminishing as it melts into unusable swamps.[83] So, 19% of the entire Alaskan population and 20–25% of rural towns are experiencing food insecurity.[84] This statistic does not specifically measure food insecurity among ANWR natives, but ANWR natives are considered rural communities, which is the focus population of the study. This food insecurity can be connected to the ecological disruption caused by melting permafrost. Melting permafrost creates bogs and thermokarsts and is replacing forests.[85] These forests were home to native animals that the indigenous people needed to hunt for food. Because of the loss of habitat, the animals are relocating and making it harder for people to find food. Ecological disruption also decreases the availability of traditional foods in the ANWR,[86] some of the traditional foods being caribou, wild fish, and native plants.[87] Additionally, some natives worry that melting permafrost is causing underground food cellars to lose their food-saving ability, a phenomenon that would exacerbate food insecurity among locals.[88]

Physical health is not the only thing in danger to the natives of the ANWR: mental health is also an issue because of ecological disruption and climate change. Mental health issue rates have increased in areas of Alaska that are affected by climate change and, therefore, ecological disruption.[89] Alaskan natives are vulnerable to climate change effects because they have a high reliance on land resources and well-described health disparities that are connected to the land, and climate change can cause a reduction in economic opportunity due to high rates of unemployment from environmental damage.[90] It's been broadly proven that there is a necessity for mental health services after the occurrence of a climate-related disaster,[91] so we know that changes in one's environment can cause mental health issues. Indigenous people, especially in the ANWR, have a deep and personal connection to the physical land and have for generations. Because of the connection to the land, when the land gets altered unnaturally, natives feel like they are not just losing land but a connection to their ancestors.[92] Ecological disruption is also causing a loss of some aspects of the culture in the ANWR and all of Alaska, and studies show that the deterioration of community well-being (like culture) is causing emotional and mental impacts.[93]

Ecosystem disruption from wildfires can also cause human health problems.[94] Fire smoke can cause lasting pollution that remains in the ecosystem, leading to respiratory and heart diseases, as well as mental health issues like PTSD, which arise from being close to the fire or having to be relocated because of a wildfire.[95] Unhealthy pathogens are released from the soil when wildfires occur, and anyone in the area will breathe in these things, which can cause respiratory problems as well.[96]

# Practices

One way for the native people of the ANWR to help themselves battle the ecological disruption affecting their homes is to have their voices heard and

to let government officials know that they are suffering. An organization, Native Americans Right Funds, helps with these issues. NARF is a nonprofit 501(c)(3) organization that provides legal advice and aid to native Alaskan communities for issues including environmental health.[97] Tribes and individuals can receive help filing lawsuits and settlements against companies and governments who are interfering with the Alaskan ecosystem. Sixteen attorneys are a part of the staff that works on 50 cases at any given time.[98] One of the main reasons why NARF exists is because the indigenous Alaskans are not regularly included in federal policy creation. The federal government has created an initiative called Navigating the New Arctic (NNA)—a program set in place to help the federal government understand the environmental changes in the Arctic.[99] However, indigenous people in the ANWR often feel like they are not included in the research process that the NNA completes, so the personal effects of ecological deterioration on tribes in Alaska are not truly represented.[100] Through NARF, the people in the ANWR are able to help themselves as they receive advice regarding their rights and their options for action.

NARF had 42 active cases at the end of 2022, consisting of minor to major issues that natives want to change legislation or law for.[101] Their website does not include any nuanced or robust outputs but has some of their goals listed, including the following: protecting and establishing the inherent sovereignty of tribes, obtaining official tribal recognition for numerous Native tribes, helping tribes continue their ancient traditions by protecting their rights to hunt, fish and use the water on their lands, upholding Native American religious freedom, assuring the return of remains and burial goods from museums and historical societies for proper and dignified re-burial, and protecting voting rights of Native Americans."[102]

A large amount of information on their interventions can be found in the 2022 annual report.[103] The outcomes are not

clearly laid out, but in the annual reports, NARF lays out the cases they worked on and why they did what they did to help people in specific ways. NARF applies existing laws to make sure that the national and state governments live up to their promises.

# Endnotes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