SPECIAL ISSUE

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UNITING THE GLOBAL WILDLAND FIRE COMMUNITY

WILDFIRE

An official publication of the INTERNATIONAL ASSOCIATION OF WILDLAND FIRE

WILDFIRE IN THE ARCTIC

International Association *of* Wildland Fire

ARCTIC COUNCIL

WELCOME

Welcome to this very special issue of *Wildfire* magazine focused on wildland fires in the Arctic, one that we hope won't be the last. We are aware that at first glance this issue might seem strange – fire in a place typified by being cold and icy – but we think by the time you've finished you'll agree that the content is timely in nature, surprising in scope, and important to address together.

We have curated an issue showcasing insights into the Arctic Council as well as into wildland fire in the Arctic. The Arctic Council is a body composed of Canada, The Kingdom of Denmark, Finland, Iceland, Norway, The Russian Federation, Sweden, The United States, and Permanent Participant organizations of Indigenous Peoples from around the circumpolar north including Aleut International Association, Arctic Athabaskan Council, Gwich'in Council International, Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North and the Saami Council. We've brought forward scientists, policy experts, leaders of Arctic Council working groups, Indigenous voices, and community voices to help highlight what's occurring with wildland fire in the Arctic, the nature of the crisis, possible responses, how states are working together on the issue, Indigenous Knowledges around wildland and cultural fire, and more. Thank you to all the special contributors for this issue of *Wildfire* magazine.

Over the last two years, Norway has chaired the Arctic Council. During that time, we created a Chairship Initiative on Wildland Fires in the Arctic along with Gwich'in Council International to raise the profile of the many facets of the wildland fire crisis in the Arctic. According to NASA MODIS data, some 174 million hectares have burned across the circumpolar Arctic in the last 20 years, creating problems for communities across the north from evacuations to suffocating smoke events, to the destruction of the wilderness upon which northern communities depend. What happens in the Arctic does not stay in the Arctic however, and the smoke from Arctic fires can darken skies thousands of miles from its source, and the emissions of these fires and the subsequent permafrost thaw has significant climate implications for the rest of the planet that must be accounted for.

Through the articles compiled here, we hope you'll find a new interest in wildland fires in the Arctic, in research regarding the issue, in governance and emergency response in the unique settings of the Arctic, and most of all, we hope you'll find a new spirit kindling within you to help us address the circumpolar wildland fire crisis. Thank you to all the contributors in this special issue, to Laura King, managing editor of *Wildfire* magazine, Mikel Robinson, executive director of the International Association of Wildland Fire, Anna Degteva of the Indigenous Peoples Secretariat, Kristina Bär former head of communications at the Arctic Council Secretariat, and special thanks to former IAWF president Charles "Chuck" Bushey for his special assistance.

Kind regards,

The Co-Chairs of the Wildland Fire Initiative,

Chair of the Arctic Council Senior Arctic Officials,
Ambassador Morten Høglund

Gwich'in Council International
Head of Delegation, Edward Alexander

ON THE COVER

The Riley fire started on June 30, 2024, near the entrance to Denali National Park and Preserve in Alaska. Photo by Troy Bouffard. See story page 32.

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ARCTIC COUNCIL

CULTURAL BURNING

THE IMPORTANT ROLE OF TRADITIONAL PRACTICES IN THE MODERN ARCTIC

BY EDWARD ALEXANDER

Thirty-two thousand years ago this spring, in the eastern interior of Alaska, during an ice age so severe that the Laurentide Ice Sheet covered most of the continent of North America a mile thick, a Gwich'in man, dressed in neatly tailored, tanned, caribou skin pants and a shirt, walked around the forested edge of a lake, dragging a stick through the tall grass. At the end of the stick flickered a flame that leapt to the grass. The snow in the shadows of the trees blocked the fire's path, so the flames could travel only into the dead grass that had accumulated, thinning some of the dead willows out in its maw.

The man continued to walk with his torch, through the portage to another lake, and then another, and another. All the while the flames did the work, clearing away the thick grass, making it easier to walk, getting rid

A cultural burn in Fort Yukon, Alaska in May 2024. The wildland fire community, along with governments, policy makers, and citizens, need to take a critical look at the role of culture file in the landscapes of northern Alaska, Canada, Russia and across the circumpolar Arctic. Photo by Edward Alexander.

of the early coverage for mosquitoes and biting insects where the people would camp through break-up and the summer season in their caribou skin tents.

The plants that grew back, he knew, would be a bit different than what had burned: all nature of flowers and thicker, greener, more lush plants. The areas near the berry patches would grow more berries; the bees and the birds would take the place of the gnats and the mosquitoes; and instead of a thick mat of grass that could sustain a fire that could race away, the land was neatly trimmed, down to its very root top – a black mat.

The fire was doing its work. Not perfectly, as there were areas away from camp where the fire had dwindled due to the ground being too wet, or from the wind blowing in a certain direction. The man saw his kids following him, trying to start their little sticks on fire, and one throwing snowballs at the flames.

Migrating birds would soon arrive and would find good food to greet them; the burn would help make browse so nutritious that the birds would all be fat. The people would have good eggs to eat, birds to hunt, and the muskrat would be plentiful. Maybe the moose would have two calves, or three, instead of one. There wouldn't be a fire to come racing down through the grass, not this summer; it could still come through the timber, the man thought, but the mosaic of lakes and meadows and sloughs that had been burned should be

Today, we call this man's activity a cultural burn, and, sadly, all too often, the wisdom in that man's actions has been forgotten, outlawed or not implemented in our landscape that sorely needs the presence of Dinjii Zhuh K'yaa, our traditional Gwich'in ways of life.

enough to break up any threats the family might face that summer. The man enjoyed the walk, and the way back would be an easier path, one that could help his whole family, his whole tribe.

Today, we call this man's activity a cultural burn, and, sadly, all too often, the wisdom in that man's actions has been forgotten, outlawed or not implemented in our landscape that sorely needs the presence of Dinjii Zhuh K'yaa, our traditional Gwich'in ways of life.

The man didn't have to cut a fireline with a Pulaski or a chainsaw; he didn't have to work in a bulldozer cutting a dozer line; and he didn't have to have air support to keep the fire out of the trees. The snow did the work. The season did the work of keeping the fire cool and controllable, and the fire did its work of clearing the land and creating a green fire break for the summer. The man didn't have to apply amendments to the soil to make the plants more nutritious, and he didn't have to apply pesticides to keep biting insects at bay – the ash did all that for him. The man didn't have to do anything except take a walk while his kids tired themselves out behind him inventing games along the edge of the burn.

The wildland fire community, along with governments, policy makers and citizens, need to take a critical look at the role of cultural fire in the landscapes of northern Alaska, Canada, Russia, and across the circumpolar Arctic. The Pyrocene has met the cryosphere, and the results over the last 20 years have been conclusive: NASA's MODIS data documents some 174 million hectares of burned area in the circumpolar Arctic Boreal Zone, an area greater than Iceland, Norway, Sweden, Finland, Denmark, and Greenland. While most of these acres have burned in Russia, Canada, and the United States (Alaska), the message written in flame and ash is clear: our environment is changing, and we need to change too.

To protect the Arctic and its people, we need mildfire, not wildfire. We need a healthy environment, not a stagnant monoculture of dead grass. We need solutions that make economic sense. There aren't enough wildland firefighters in the world to fight fires in the north. How do we tie in a fireline for fires that are larger than U.S. states, or that burn in duff that thickly covers and insulates the soil but readily dries? We must consider the economics of the responses to these fires, and whether mitigation activities are successful at the scale that is needed. To maintain the land and its people, there needs to be a cultural revitalization of Indigenous Knowledge and Indigenous mitigation techniques, not wildland fire suppression born of arbitrary rules, written for the south, and incapable of doing what Indigenous

The Council of Athabascan Tribal Government's fire crew, which consists primarily of Gwich'in firefighters, outside of Fort Yukon, Alaska, learning to do prescribed burning in preparation for renewning cultural burning practices. Photo courtesy of Tim Boese, Silverback Films.

practices have proven they can: stop a fire crisis before it happens, and replace it with a sustainable, fire resilient landscape.

In the modern context, everyone in the wildland fire community has heard of, worked extensively in, or planned for wildland-urban interface (WUI) events. In the sparsely populated north, we do have traumatic WUI incidents, such as the evacuation of the capital city of Yellowknife in the Northwest Territories in 2023. People fled on the only escape route out, sometimes with fire on both sides of the only highway; the fire advanced 70 kilometers in one day and was a mere 15 kilometers from burning the largest city in the Canadian north to the ground. Usually, in the north, fires are in sparsely populated rural areas larger than any national park and they're left to burn. These fires fill the air with smoke that threatens the health of people in the north, and, at times, it pours into cities far from the Arctic Boreal Zone – in one instance making the Statue of Liberty's torch seem snuffed out in the orange haze that descended on New York; it looked apocalyptic, and the truth is it probably was, in ways we don't yet understand.

We need new tools in the Arctic to help us better understand wildland fire in the circumpolar context, and what's occurring with cultural landscapes. Ideally, a Wildland Cultural Interface, and / or an Arctic Wildland Cultural Interface could be developed, so we don't respond to fires in the Arctic by saving the cabin – the traditional structural protection value at risk – but miss the reason the cabin is there: for the activity of trapping, and the trapline was allowed to burn over. A trapping cabin can be built in a few days. A trapline, however, is another story; imagine cutting 60 miles of fireline by yourself, and having your income taken out of the equation. We need to reframe cultural resources and values at risk into a matrix of action; we need to understand the cultural structures that need protection – which are different in the Arctic context than elsewhere – and they need to be fully accounted for.

Ideally, a Wildland Cultural Interface, and / or an Arctic Wildland Cultural Interface could be developed, so fires in the Arctic, and the responses to them, are better understood, and cultural burning is considered and as part of land management. Photo courtesy of Tim Boese, Silverback Films.

We need to see, and protect, cultural resources on the land; we must understand that cultural landscapes have a lot of intrinsic and naturally developed value. A stand of spruce trees in the north may take hundreds of years to develop to the point that lichen grows thickly on the branches, which feeds caribou on which northern people depend.

Lichen in stands like these help these populations of caribou be resilient in winter rain events that are becoming more common and block these animals from reaching ground browse covered in ice. Shouldn't we use a Wildland Cultural Interface to understand and protect myriad critical values like these?

Development of a Wildland Cultural Interface or Arctic Wildland Cultural Interface, co-produced by Indigenous leaders, elders, fire leaders and fire keepers with fire managers, can help us see the true picture of values at risk in the Arctic, and what we need to do to protect.

The Arctic is changing four times as quickly as southern areas; in fact, wildland fires in the Arctic Boreal Zone have become so massive the region has become a major climate change driver. We need to frame our understanding of the gravity of this correctly. We need to understand that a global climate stability is a value at risk by massive wildland fires in the largest forest on planet Earth: the Arctic Boreal Zone. Another value at risk is the collective health of communities that are choking on toxic smoke for months at a time. We need to understand the fact that the largest carbon storage device anywhere on Earth happens to be the living, biological system of the Arctic Boreal Zone, which has sequestered more carbon in its forest soils than humans have ever released from all sources since industrialization, and this system is now aflame. We need to collectively understand that a value at risk is the immense store of carbon in permafrost, which contains more than twice the amount of carbon that humanity has contributed to the atmosphere and is now rapidly collapsing in a thawed state after fire has removed the insulating layers. There is a special kind of ancient permafrost in the north called yedoma, which, due to the new severity of wildland fires in the north, is

Pyrocumulonimbus cloud / smoke from the MacDonald fire south of Fairbanks, Alaska, which ignited on June 8, 2024. The fire burned the Tanana Flats Military Training Area and grew to more than 172,000 acres before merging with the Clear Creek fire. The fire was caused by lightning and was propelled by strong winds and dry conditions.

thawing abruptly from losing its deep layers of protective vegetation, duff, and top soil, releasing not only carbon dioxide but also methane and nitrous oxide, which are far more potent greenhouse gases. Yedoma thaw is an imminent global threat to climate stability, and global carbon budgets, and it too is a value at risk, but today is virtually unaccounted for in how wildland fires are managed anywhere in the Arctic except in Gwich'in homelands. We need new tools for the Arctic.

We need a Wildland Climate Interface that can help managers, communities, leaders, firefighters, and policy makers understand how to respond to these issues. An interface can be built to increase our understanding about what we need to do to protect our world, which, when the largest terrestrial carbon storage system is burning and thawing, is a value at risk. Gwich'in have long felt that the answer lies with our ancestors, with that man and his children who passed along cultural burning techniques that are now more important than ever to remember.

Edward Alexander represents Gwich'in internationally as the co-chair of Gwich'in Council International and has been appointed by the Chiefs of Alaska for multiple terms in this role. He serves as the Head of Delegation to the Senior Arctic Officials, and to the Conservation of Arctic Flora and Fauna (CAFF) and Emergency Prevention, Preparedness, and Response (EPPR) Working Groups of the Arctic Council. He works for Woodwell Climate Research Center as the senior Arctic lead. Additionally, he served as the co-lead of the Arctic Council's Chairship Initiative on Wildland Fire. Alexander also served as the 2nd Chief of the Gwichyaa Zhee Gwich'in for seven years. Alexander has a master's degree in secondary education from the University of Alaska Fairbanks, and a current Type A Alaska teaching certification. He found wildland fire for eight seasons across Alaska and the western United States. He has worked as a secondary teacher, principal, in administration, managing the University of Alaska's Yukon Flats Campus, and as the Education Director for the 37 tribes of the Tanana Chiefs Conference. Alexander founded and operates The Village Consultants, which is focused on tribal sovereignty, village development, Indigenous education, and climate issues. Additionally, Alexander founded and operates a small family farm, Gwich'in Grown, which is dedicated to organic and regenerative agricultural and land management practices, which produces broiler chickens, eggs, and seasonal vegetables. Alexander loves to be on the land in Gwich'in country, fishing, hunting, and exploring cultural sites with his wife Alisa and their children.

THE NORWEGIAN CHAIRSHIP'S WILDLAND FIRE INITIATIVE

HOW NORWAY LIFTED WILDFIRES TO THE TOP OF THE ARCTIC COUNCIL'S AGENDA

BY AMBASSADOR MORTEN HØGLUND

During one of my first public engagements as Chair of the Senior Arctic Officials of the Arctic Council in August 2023, Yellowknife, the capital of the Northwest Territories, was evacuated due to wildland fires. It was the first time a territorial capital in Canada faced such an evacuation. Nearly 70 per cent of the Northwest Territories' population, including many of our friends and their families, were temporarily displaced. Colleagues attending an event with me in Norway struggled to reach their loved ones.

Looking back, the 2023 Canadian wildfire season was unprecedented, with more than 6,600 fires burning across 15 million hectares, setting a record. Yet, this was not an isolated event but rather part of a growing trend. Since 2018, the number of wildfires in the Arctic has more than tripled. Record-breaking fire seasons have swept across Russia, Sweden, and even Greenland, where peat fires occurred following an unusually warm and dry summer.

It has become increasingly clear that wildland fires are not just a consequence of climate change but also a significant driver of it. These fires reshape landscapes, threaten biodiversity, and endanger human lives

and livelihoods. Recognizing that wildland fires had become a prime example of why circumpolar cooperation is critical, Norway – in our capacity as Chair of the Arctic Council – established the Chairship's Wildland Fires Initiative (WFI) in October 2023, in collaboration with Gwich'in Council International (GCI), one of the Indigenous Permanent Participants in the Arctic Council.

Our goal was to elevate Arctic wildland fires as an urgent climate-change issue on the Arctic Council's agenda and beyond. We aimed to deepen understanding of fire causes and impacts on Arctic ecosystems and communities, while building on the excellent work already underway within the council.

The Arctic Council has a strong history of wildfire-related research. Key assessments such as the 2004 Arctic Climate Impact Assessment and the Arctic Monitoring and Assessment Programme's (AMAP) 2015 report on black carbon laid a foundation for understanding wildfire emissions. Yet, it is fair to say that it was GCI, under the leadership of Edward Alexander, that drove momentum to make wildland fires a crosscutting council priority during the Finnish chairmanship (2017 to 2019). GCI's efforts spurred groundbreaking projects on fire ecology mapping, real-time monitoring, and emergency response, developed with the council's Conservation of Arctic Flora and Fauna (CAFF) and Emergency Prevention, Preparedness, and Response (EPPR) Working Groups.

With the Wildland Fires Initiative, we sought to build upon these efforts, ensuring that these projects and efforts would help inform and shape discussions and strategies for wildland

The Arctic Indigenous Peoples on Fire Practices, Changes and Impacts Sharing Circle at the Arctic Frontiers Conference in February 2024. Photo by David Jensen / jensenmedia.

Launch event of the Wildland Fires Initiative at the Arctic Circle Assembly in 2023, Arctic Circle.
Photo courtesy of the Arctic Council.

fire resilience across the Arctic region. As the premier forum for Arctic collaboration, we saw a need for the council to continue to provide robust recommendations to policymakers and offer practical solutions to help communities prepare for this growing threat.

The Wildland Fires Initiative was designed around three guiding objectives: identifying knowledge gaps and best practices; enhancing knowledge generation and sharing; and improving overall understanding and awareness of Arctic wildland fires. By bringing together experts, Indigenous Knowledge Holders, and policymakers, the initiative sought to foster improved knowledge sharing and strengthened partnerships with Arctic Council Working Groups, Observer States and Observer International Organizations, as well as the European Union.

Key deliverables included a discussion series and an outreach campaign, which created a vital platform and unique knowledge hub to raise awareness, deepen understanding, and reinforce international cooperation on wildland fires. Through more than 10 events, including sharing circles, plenaries, and keynote addresses, we facilitated the exchange of stories, experiences, project findings and ideas. By pooling in-house expertise, this

collaborative approach enhanced the council's ability to engage in informed dialogue to the escalating threat to Arctic ecosystems, communities and the global climate.

When we started the initiative, I wasn't deeply familiar with the complexities of wildfire. There are so many facets that the initiative has been able to cover, from the cultural burning practices of Arctic Indigenous Peoples to the need for international cooperation – from the social impacts of fires and evacuation orders to the unparalleled effects fires can have on the global climate system. Yet, what struck me most were maybe the personal stories we heard: ashes raining from the sky; a pregnant woman trapped in her home because of smoke; young people fearing for their incomes as they evacuated. These stories vividly illustrated how wildfires affect everyday lives, mental and physical health, and even simple joys, such as spending summer's first days outside after a long, dark winter.

At its core, the Wildland Fires Initiative was about learning from one another, but it also emphasized that there is no easy fix, no quick solution, and that fires will always occur. The challenge is to prevent catastrophic consequences. I believe we've shown that the Arctic Council is committed to this issue and uniquely positioned to unite diverse voices, from Indigenous perspectives to civil society and emergency preparedness expertise.

As the Wildland Fires Initiative concludes, we can reflect on the progress made, but we also recognize the urgent need to continue to address the increasing threat of wildfires in the Arctic due to climate change. The initiative emphasized the importance of sustained cooperation, coordinated efforts, and stronger outreach. I trust we have laid a foundation for this vital work to carry on at the highest levels of the Arctic Council.

Ashes raining from the sky; a pregnant woman trapped in her home; young people fearing for their income — these stories brought home the human cost of wildfires.

For now, I would like to thank everyone who has contributed to the Wildland Fires Initiative, the council's Permanent Participants, Working Groups, Observers, External Experts, and Knowledge Holders, as well as the Arctic Council Secretariat and the Indigenous Peoples' Secretariat. My special thanks go to Gwich'in Council International and my co-chair in this initiative, Edward Alexander. We look forward to working closely with you all in the coming years. We have a lot of important work ahead of us.

Morten Høglund is Norway's ambassador for the Arctic, holds the Norwegian Chairship of the Arctic Council (2023 to 2025), and is co-lead of the Wildland Fire Initiative. Høglund has been Norway's senior Arctic official at the Ministry of Foreign Affairs since September 2021. Høglund is a former politician and was a member of the Norwegian Parliament from 2001 to 2013. From 2010 to 2013, Høglund served as the chair of the Standing Committee of the Parliamentarians of the Arctic Region. From 2013 to 2015 Høglund served as state secretary for foreign affairs.

WILDFIRES IN ALASKA

SHIFTING LANDSCAPES AND FIRE MANAGEMENT STRATEGIES

BY JESSICA COOK

Fires are a natural part of Arctic ecosystems. But with climate change leading to more intense and destructive wildfire seasons, and wildfire emissions contributing to further climate change, is it time to re-think fire management?

Lisa Saperstein is the regional fire ecologist for U.S. Fish and Wildlife Service in Alaska, where she has worked since 2010. Saperstein is a United States representative in the steering group for the Arctic Council's Conservation of Arctic Flora and Fauna Working Group (CAFF) project, ArcticFIRE.

Saperstein speaks about what wildfire seasons look like in Alaska, the impacts of more frequent and intense fires on the landscape, and how this is leading to new ideas around fire management in Alaska.

The Swan Lake fire on the Kenai Peninsula, one year post fire. Regional fire ecologist Lisa Saperstein is seen in an area with moderate burn severity in black spruce. A continuous duff layer is visible, and shrubs, sedges and grasses are resprouting. Photo courtesy of the U.S. Fish and Wildlife Service.

In 2014, 10 years post fire. Willow and birch have seeded in the landscape, with some small spruce seedlings. Photo courtesy of the U.S. Fish and Wildlife Service.

What does a typical wildland fire season look like in Alaska?

Our large fires typically start in late May, and they usually die down in late July. However, we are seeing our fire seasons starting earlier. The official start of the Alaska season has moved a month earlier than previously, starting April 1. We are seeing more fire in the southwestern part of the state in recent years, particularly in the Yukon-Kuskokwim Delta tundra, attributed to warmer springs and earlier snowmelt.

We consider a large fire season to be over a million acres burned. In 2024 we were below that, so it's been more or less an average fire season. Fires in Alaska tend to be episodic. We'll get some big fire years followed by a few years where we don't get much of anything. For example, in 2022 we had a big fire year and then not so much in 2023.

Can you describe some of the key habitats impacted by fires in Alaska?

Most of Alaska's fires are in the interior boreal forest that lies between the Brooks Range to the north and the Alaska Range to the south. The most common forest type is black spruce, which can be mixed with deciduous trees, primarily birch and aspen. One difference between the boreal forest in Alaska and Canada is that in Alaska we don't have pine trees, while they do in Canada. Along with the forest are numerous wetlands, shrublands and tundra.

Fire has been the primary large-scale disturbance agent here for about 5,500 years – ever since black spruce came onto the landscape, which increases the flammability of the land. Fires do occur on the tundra in the north and to the west in Alaska, but tundra fires are less common.

How do wildland fires affect these habitats in Alaska?

Fire can create a shifting mosaic of different vegetation types across the landscape, with vegetation of different ages and stages of growth. What comes back after fire depends a lot on what was there before and how severe the fire was. The nature of this mosaic is going to change as fire occurrence changes. And as fire increases, you're going to have less mature forest on the landscape, [fewer] spruce trees, and an increase in younger successional types, which means vegetation is changing as plant communities are still establishing themselves. These successional communities can be dominated by different vegetation such as herbs, graminoids and shrubs. In some cases, you can even get a permanent change in the vegetation type.

Black spruce is easily killed by fire at low intensities. Despite this, black spruce is still considered a fire-adapted species. They have serotinous cones, which means they need heat to open. The seeds are stored in the cones for years and they're clustered on the treetops where they have a better chance at avoiding direct flame, which can destroy them. When the fire comes through, the heat opens up the cones and they produce a large number of seeds that come down this freshly burned seed bed. Black spruce grows relatively slowly, but historically, black spruce sites usually revert back to black spruce over time, a process called self-replacement.

As wildland fires become more frequent and intense, how might that impact the Alaskan landscape?

A lot of changes to the landscape depend on how deeply fires burn. Fire isn't just killing the trees and above ground vegetation, it's consuming the forest floor and the organic layer of decaying plant parts beneath the surface, also called the duff layer. In boreal forest and tundra ecosystems, this duff layer can be quite thick – 40 centimeters or more – before you hit permafrost or mineral soil. When it's really dry, fire can completely consume this layer all the way down to the mineral soil. However, most of the time, it doesn't reach that far down and what's left is blackened duff, which is a really inhospitable seedbed for most plants. Most small seeds from birch, aspen or willows, for example, will dry out in burned duff and won't be able to germinate. Black spruce actually has an advantage here because the seeds are relatively large compared to others, so they'll get a toehold in the remaining duff. Birch, aspen, and shrubs can resprout even when their tops are burned if their roots are not killed by fire.

However, if most of the duff is burned up and more mineral soil is exposed, that's when the seeds from deciduous species like birch and willow come in and do well. They have a competitive advantage over the slow growing spruce seedlings, and the land will become deciduous. In these cases, black spruce can eventually come back and regain dominance. But this can take quite a bit longer – about 50 to 100 years.

So, as we get more fires, and if we get more severe weather that promotes deep burning such as droughts, we could see a shift toward more deciduous shrubs and trees in the landscape, and less of that black spruce replacement happening. We also see less resiliency in black spruce if there are re-burnings over short periods of time. It can take black spruce 30 years to produce a good quantity of seed. So, if there's a fire that occurs twice in the same spot within 30 years or so, it can mean black spruce doesn't have enough time to re-establish itself. There have been a couple of studies that have looked at satellite imagery and how vegetation is shifting across the landscape over time. While there is an increase in deciduous vegetation soon after fire in interior Alaska, spruce trees continue to repopulate disturbed areas over time for now.

> Fire is no longer just a local issue. It's a climate issue, a health issue, and an ecological tipping point.

What are the impacts from shifting vegetation in Alaska?

There are ramifications of shifting vegetation in terms of carbon storage. Most of the carbon in northern ecosystems is not stored in trees; it's stored in layers of organic matter beneath the surface. Slow decomposition in black spruce forest promotes a buildup of thick layers beneath them where they can store massive amounts of carbon. However, deciduous vegetation doesn't work the same way – those trees store carbon in their trunks, leaves, and branches rather than in their soil. So when you get more deciduous trees moving in, that carbon storage then moves from soil layers to above ground.

In 2005, one year after a very severe burn with exposed mineral soil. Fireweed, a native species that colonizes disturbed areas, and a liverwort that comes in on mineral soil can be seen growing.
Photo courtesy of the U.S. Fish and Wildlife Service.

Lisa Saperstein is the regional fire ecologist for Fish and Wildlife Service in Alaska, where she has worked since 2010. Photo courtesy of the U.S. Fish and Wildlife Service.

That thick organic mat also acts as insulation for permafrost. When fire comes in and burns deeply into it, the permafrost is more vulnerable to thaw. Some of this permafrost has been holding carbon for millennia. When permafrost begins to thaw, it releases greenhouse gases into the atmosphere over a much longer period than what's released through smoke during a wildfire. This leads to a feedback mechanism where an increase in greenhouse gases leads to more climate warming, which leads to more fires and permafrost thaw. Globally, permafrost holds at least two times the amount of carbon that's currently in the atmosphere. Some of that permafrost is thawing just from climate change alone, and fires will then exacerbate that. A lot of global climate models don't account for permafrost thaw and the greenhouse gases that it will release. This is a really big concern that I don't think is getting enough attention in the media.

There are studies looking at how quickly deciduous vegetation can sequester carbon to see if it could offset the losses from the burned organic matter. It may not help insulate permafrost, but it does suck up carbon at a faster rate. Deciduous vegetation is also less flammable, but it can burn when conditions are right. Firefighters are noticing that deciduous plants aren't always acting as a natural firebreak like they had in the past.

As wildland fires intensify, are there changes to fire management in Alaska?

In Alaska, federal policy called for suppression of wildfires from about 1940 to the mid-1980s. Alaska tried to suppress fires, but it quickly became apparent that you can't get them all – total fire suppression doesn't work. Recognizing that fire is a natural part of forest ecosystems, they divide the state of Alaska into four different initial attack options: critical; full; modified; and limited, depending on risk to values.

Initial attack is when action is taken to control a fire within around 72 hours after ignition; this time frame has the best chance for successful suppression. Critical areas occur around communities and villages where life and property are at risk. Full suppression areas tend to be adjacent to communities or areas with human and cultural value around them, and it's not quite as critical to get the fire out quickly, but you still get there as soon as possible. In limited management areas, fires are allowed to play their ecological role, but they are monitored, and specific sites will be protected as needed but there is generally not an attempt for more widespread control of the fire. Most of the state is in limited management. Modified management is treated like full suppression early in the season until around mid-July in interior Alaska, when it's treated as limited because there is less chance of a fire getting really big after that time period.

As fire occurrence increases, some land managers are rethinking this fire-management approach for their area. While fire is a natural part of the ecosystem in Alaska, at what point might fire be detrimental?

One example is a pilot project that was instigated in 2023. The manager of the Yukon Flats National Wildlife Refuge in northeast Alaska changed the fire management option on some areas due to human health and carbon sequestration concerns. There are quite a few villages within that area where people are exposed to a lot of smoke, and it's a remote region with no roads so they can't easily escape poor air quality. But we're also looking at it from a climate change standpoint. The smoke and greenhouse gas emissions from the fires themselves can be massive. But in this area, we also have a lot of Yedoma permafrost – around 4 million acres – that stores very old organic matter from the Pleistocene epoch, and it's also ice rich, meaning it's more susceptible to rapid thaw. So, looking at these different factors, we changed some of the Yedoma areas from the limited to the modified management option to protect permafrost. This region is about 1.6 million acres, so it's a very large area.

Implementing fire suppression as a climate solution is a novel concept for modern fire management. Before, fire in this region would be suppressed only if it posed a threat to humans or property. There were stipulations involved in enacting this change. First is recognizing that life and property are always going to come first for fire protection. Also, we don't want to send firefighters to really remote locations where it would be hard to extract them if they were injured, so these areas were excluded. We only looked at areas that hadn't burned since about 1989, so fairly mature forests with a thick organic mat. Another stipulation is that only fires ignited in the yedoma would be initial attacks; fires moving into the area would not be suppressed. This is still an experiment now – we're looking to see how it works. We have limited resources, and it's expensive to respond to remote fires. But if you look at the emissions saved, the expense may not be so different from climate measures being taken in other places.

Ultimately, people are thinking about boreal fire management differently. The idea is that this wouldn't be a permanent change, but that it will play a role in reducing carbon emissions and essentially buys us time while we aim to reach our climate goals.

How are you involved in CAFF and the ArcticFIRE project?

I am a U.S. representative on the steering committee for the ArcticFIRE project. It has been a really interesting project. A lot of initial discussion involved mapping fire locations for different Arctic nations and Indigenous Permanent Participants. Alaska and Canada have good fire perimeter mapping databases, and we weren't sure which other countries have those. Such databases are really useful for documenting change. Gwich'in Council International initiated and leads the project, so there's a strong Indigenous fire management component to it.

One of the goals is to increase the awareness of fire in Arctic nations. I think it has been successful in that Arctic Council now has picked up this important issue, and there's work being done also in the Emergency Prevention, Preparedness and Response Working Group's Circumpolar Wildland Fire project. There are a lot of different directions this work can go in, and a lot of great potential for collaboration with others.

Jessica Cook is a public relations officer at the Arctic Council Secretariat, where she has worked since 2020. Cook has 10 years of experience in strategic communications. Prior to her current role, she worked at PR agencies Racepoint Global (2017-2020) and Matter Communications (2015-2017) in Boston, Massachusetts.

EMBERS OF RESILIENCE

YELLOWKNIFE'S 2023 WILDFIRE EXPERIENCE

BY THE CITY OF YELLOWKNIFE

Nestled in the vast expanse of the Canadian wilderness, Yellowknife, the capital of the Northwest Territories, is a thriving hub of activity, home to a tight-knit community of more than 21,200 residents (2024).

In the summer of 2023, the City of Yellowknife faced an unprecedented mass evacuation of around 19,000 residents due to a severe wildfire season. On Aug. 16, 2023, the city was placed under a mandatory evacuation order due to a territorial state of emergency, with residents and visitors advised to leave the area. The risk management strategy ensured that everyone was safely evacuated, with many evacuating to nearby communities.

The City's emergency operations centre was activated, and a team of experts from various departments, including fire, emergency management, and communications, worked around the clock to monitor the situation and respond to the threat. The City's emergency response team worked closely with the Government of Northwest Territories and the Yellowknives Dene First Nation to coordinate relief efforts, communicate with residents, and provide critical support to those in need.

COMMUNITY SPIRIT

In the face of crisis, the spirit of cooperation, compassion and community that defines the North emerged as a vital pillar of resilience. As wildfires threatened the city, its residents, organizations, and emergency responders came together, demonstrating a profound capacity for collective action and support.

Local businesses, organizations, and individuals collaborated to create fuel breaks during the fire in the summer of 2023, and provide essential support to those displaced. Photo courtesy of the City of Yellowknife.

In the face of crisis, the spirit of cooperation, compassion, and community that defines the North emerged as a vital pillar of resilience.

Local businesses, organizations, and individuals collaborated to create fuel breaks and provide essential support to those displaced. The integration of representatives from the Yellowknives Dene First Nation into the emergency operations centre exemplified cooperation, enhancing communication and coordination; local organizations serving vulnerable community members worked hard to ensure their safe evacuation. These collective actions not only mitigated the immediate impacts of the fires but also reinforced relationships within the community, fostering a sense of belonging and mutual reliance.

REVIEW AND ENGAGEMENT

In the aftermath of the 2023 wildfires, the City of Yellowknife embarked on a comprehensive review of its emergency management program that included the commissioning of an independent after-action assessment to evaluate the City's emergency response to the North Slave Complex wildfires. The assessment identified 19 key strengths and successes, as well as 35 areas for future improvement, across five themes: cross-agency coordination; public communication; considerations for vulnerable populations; emergency operations centre and continuity management; and evacuation planning, response, and recovery. The assessment can be found at https://www.yellowknife.ca/publicsafetyreports/.

The key strengths and successes highlighted in the report include effective cross-agency coordination among the City, the Government of the Northwest Territories, and the Yellowknives Dene First Nation, as well as robust public communication and support for vulnerable populations. The report also identified areas for improvement, including emergency operations centre training and continuity management.

In response to the assessment and the review of emergency response procedures implemented at the time of the 2023 wildfires, the City of Yellowknife invested resources to create a new division for emergency preparedness. The City also engaged in a series of community outreach and engagement initiatives aimed at educating residents on wildfire risk, promoting preparedness, and fostering a culture of resilience. These efforts included public workshops, social media campaigns, and partnerships with local organizations to promote wildfire safety and awareness. Robust training programs are in place within the City to provide advanced training for staff on emergency management and responsiveness.

As Yellowknife looks to the future, the lessons learned from the 2023 wildfires play a critical role in shaping the City's approach to emergency preparedness and capacity to respond to future events. By embracing cooperation, community spirit, and a proactive approach to wildfire management, this resilient city is ready to face whatever challenges come its way.

FIRE STEWARDSHIP

UPHOLDING INDIGENOUS SOVEREIGNTY

BY AMY CARDINAL CHRISTIANSON, ALEX ZAHARA, DAVID YOUNG, JACI GILBERT, JOSHUA MITCHELL, JORDAN TWIST, MIRIAM SAINNAWAP, NATASHA CAVERLEY, PAUL COURTOREILLE, PEARL DORIS MORIN, AND WINSTON DELORME

In recent years there has been a steep rise in Arctic fire activity, including the unprecedented 2023 Arctic wildfire season that captured worldwide attention. Due to a warmer climate and extended spring and summer seasons, permafrost tundra and peat defrost, and fires are occurring in new areas with greater intensity and burn durations. This trend is expected to continue as the Arctic region continues to warm in the coming decades, narrowing the window for implementing proactive prevention and

Good fire by Jordan Twist. This piece depicts an Indigenous fire practitioner setting fire to the land as part of a cultural burn. Good fires associated with cultural burns reduce fire risk, promote biodiversity, build community connections, and enable cultural resurgence.

mitigation strategies. Indigenous Peoples in the Arctic, such as the Sámi, Inuit, First Nations, and various Siberian Indigenous groups, have deep-rooted knowledge of their environments and established Indigenous fire stewardship practices that can contribute to sustainable fire management.

Indigenous Peoples have stewarded the environment by using fire practices deeply tied to their cultural traditions, ecological knowledge, and spiritual relationships with the land. These cultural practices continue to be disrupted through colonization, under which Indigenous land stewardship practices are restricted and colonial authorities assume jurisdiction over Indigenous lands and people.

Colonization has disrupted burn cycles enacted by Indigenous Peoples and degraded landscapes by removing both natural and cultural fire as an agent of renewal. In this context, the efforts of Indigenous Nations, Peoples and communities to return fire to the land, to have greater control over emergency management including fire fighting and evacuation processes, and to document Indigenous fire knowledge for their communities, are an act of re-asserting governance over their territories. Indigenous fire stewardship is an act of decolonization – where land back, the return of Indigenous jurisdiction and governance over Indigenous life, land, and culture – requires reinstating cultural or traditional use of fire to protect the landscape, or fire back.

DEFINING INDIGENOUS FIRE STEWARDSHIP

As a collective of Indigenous and non-Indigenous practitioners working in the field of Indigenous fire stewardship, the REDfire Lab (Reciprocity, Ecology and Diversity in Fire lab) has recognized the need for a definition that accurately recognizes the assertion of Indigenous sovereignty that is central to many Indigenous-led fire stewardship practices. Within the REDFire lab and affiliated projects, Indigenous fire stewardship is defined as a range of practices, informed by Indigenous Knowledge, through which Indigenous Peoples, Nations, and communities exercise their rights and jurisdiction with fire.

REDFire follows University of Alberta scholar Kim TallBear, who defines Indigenous Knowledge as “any knowledge that helps us survive as Peoples.” The definition includes traditional and contemporary land-based knowledge from elders and knowledge keepers, including knowledge gained from scientific

Wildland firefighter by Jordan Twist. Having the training, equipment, and decision-making authority to action wildland fires through fire fighting is a component of Indigenous fire stewardship.

study and firefighting experience. By rights, we mean the inherent rights linked to Indigenous Peoples through the natural law of the land, our governance systems, and international and colonial legal agreements (including constitutional and treaty rights). By jurisdiction, we mean having the authority – based on inherent, constitutional, and other legal rights – to make decisions regarding how a particular area of land and people are governed.

Indigenous Peoples are not merely stakeholders in land management; they are rights holders with inherent rights to their territories. This distinction is critical in shifting from tokenistic inclusion in discussions to meaningful partnership and decision-making authority in wildfire management.

Embracing a broad scope of practices and activities that fall under the definition of Indigenous fire stewardship is crucial as there are many interrelated facets to building fire resilience within a community or region just as there are numerous activities and practices that fall under the umbrella of Indigenous fire stewardship. Integrating Indigenous fire stewardship into contemporary Arctic fire management requires ensuring Indigenous Nations, Peoples and communities have the resources and authority to engage in Indigenous fire stewardship practices. In this way, embracing Indigenous fire stewardship is a form of restorative justice, acknowledging the value of Indigenous Knowledge and rectifying past wrongs.

EXAMPLES OF STEWARDSHIP

Indigenous fire stewardship activities are not static in time nor limited in scope or application; they are inherently adaptive to changing environmental, political, and scientific conditions. Indigenous fire stewardship includes a variety of activities through which Indigenous Peoples assert their rights and jurisdiction with fire.

Indigenous fire stewardship is an act of decolonization — where land back also means fire back.

CULTURAL BURNING

Cultural burning is one of the most recognized expressions of Indigenous fire stewardship. Cultural burning involves the direct and intentional application of fire to a landscape using Indigenous Knowledge to manage landscapes, mitigate catastrophic wildfire risk, promote biodiversity, build community connections, and enable cultural resurgence. For example, the Muskrats to Moose project (www.wearefire.ca), an Indigenous-led cultural burning project, focuses on reviving land stewardship practices and restoring balance to ecosystems by bringing good fire back to the land.

Cultural burning has been limited by numerous barriers that prevent Indigenous Peoples from engaging in Indigenous fire stewardship, including access to a land base, settler regulation over different types of land (private, public and Crown land), insurance costs and liability, and access to sustained funding structures to support cultural burning activities. Accordingly, cultural burning groups have had to develop unique strategies to assert their jurisdictions with fire, ranging from purchasing private land to developing agreements with non-Indigenous governing bodies and corporations to burning outside of settler legal frameworks.

REDfire logo by Jordan Twist. All images were created by Twist over a series of feedback meetings with the REDfire lab. Designs came from personal experiences with fire and teachings from Indigenous fire stewardship researchers and practitioners.

PREPAREDNESS, RESPONSE AND TRAINING

Consistent with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) Article 18, which emphasizes Indigenous Peoples' rights to participate in decision making affecting their lands, Indigenous-led practices regarding fire preparedness, training and response are a crucial component of Indigenous fire stewardship; this may include Indigenous-led community preparedness projects such as traditional knowledge documentation, fuels mitigation work near communities or culturally important areas, or FireSmart ™ practices developed by Indigenous Nations and communities (see FireSmart Canada's *Celebrating Indigenous Fire Stewardship* guide at www.firesmartcanada.ca).

An example of Indigenous fire stewardship within fire response includes Indigenous-led values-at-risk protection practices, which prioritize protecting cultural, ecological, and spiritual values as deemed important by Indigenous Nations, Peoples, and communities. Values at risk may include those requiring protection from fire (through fire suppression) but may also include those values that are at risk from fire's exclusion (see www.wearefire.ca). Enabling Indigenous rights to values-at-risk protection is an essential element of Indigenous fire stewardship but remains a barrier when settler agencies retain sole decision-making authority over values protection or when Indigenous organizations do not have resources to identify or protect values on their own terms.

Training is central to enabling Indigenous-led fire preparedness and response practices and may include a variety of initiatives aimed at intergenerational sharing of Indigenous fire stewardship knowledge within and among Indigenous Nations; this may include training and employment of Indigenous firefighting crews, fire behaviour analysts and scientists, and the development of fire guardian programs by Indigenous organizations. Having trained personnel ensures Indigenous Nations, Peoples and communities have the expertise to prepare for and respond to fires and supports decision-making and governance efforts.

INDIGENOUS FIRE RESEARCH

Lastly, Indigenous-led fire research projects are a form of Indigenous fire stewardship when Indigenous Nations, Peoples and communities define research questions, objectives and methods. Indigenous research can take many forms but ultimately provides information that is useful to the goals of Indigenous Peoples and can support their governance objectives; this may include traditional fire knowledge

documentation, scientific study, or expressive arts. As with all research, opportunities for trial and error are necessary to test research hypotheses.

Indigenous fire stewardship research follows best practices for Indigenous data sovereignty, which involves ensuring Indigenous groups have control over how data is stored, shared and interpreted. Various tools exist to guide researchers in how to do so. For example, Inuit Tapiriit Kanatami has published the National Inuit Strategy on Research (2018) to guide how research is done in Inuit homelands, known as Inuit Nunangat. Many Indigenous Nations have their own research guidelines that should be followed when co-developing Indigenous fire stewardship projects.

Where does this leave us?

Now is the time for Indigenous communities to exercise their jurisdiction with fire and reaffirm their sovereignty over their lands and people. As stated by Kira Hoffman, Amy Cardinal Christianson and others in a 2022 journal article, titled *The Right to Burn, barriers and opportunities for Indigenous-led fire stewardship in Canada,* "Correcting power imbalances, increasing capacity, and supporting [Indigenous fire stewardship practices] without significant agency oversight are necessary steps in respecting Indigenous governance structures and community practices while upholding UNDRIP." To accomplish this, collaborative policy frameworks should be developed where Indigenous Peoples and Nations equally share decision-making authority with government agencies and other stakeholders. These collaborative frameworks should develop policies that explicitly recognize Indigenous fire stewardship as a legitimate and valuable approach to wildfire management, ensuring Indigenous Peoples have a seat at the table in decision-making processes.

Supporting Indigenous fire stewardship in the Arctic could proactively address the prevention and mitigation of Arctic fires while benefiting Arctic ecology, fire regimes, and residents. Supporting proactive wildfire prevention and mitigation activities requires the allocation of consistent funding and the provision of technical support for Indigenous fire stewardship activities. Importantly, supporting Indigenous fire stewardship is necessary for respecting the inherent rights and sovereignty of Arctic Indigenous Peoples, Nations and communities.

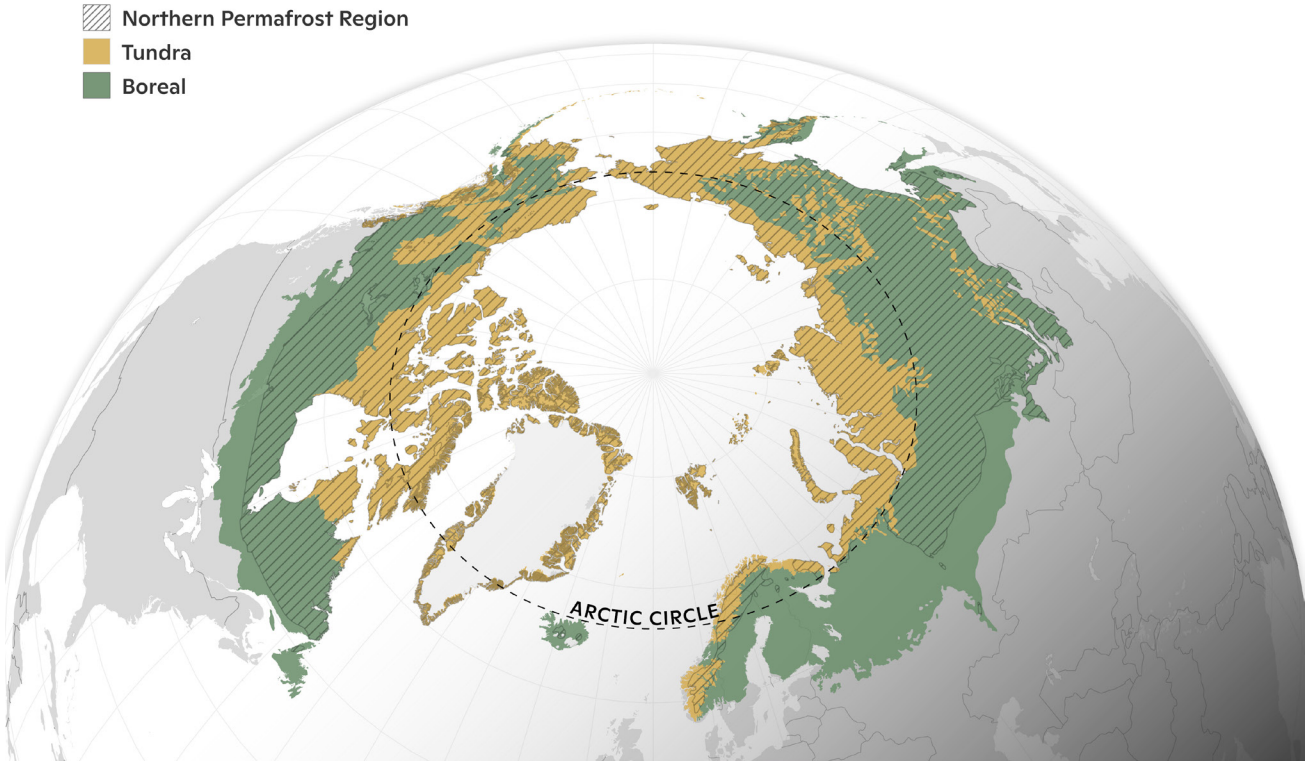
Increasing Indigenous fire stewardship and Indigenous land management in the Arctic requires a multifaceted approach that aligns with the principles of UNDRIP and advances Indigenous rights. By supporting Indigenous fire stewardship in Arctic fire regimes, governments and societies can not only address the growing wildfire crisis but also uphold justice, reconciliation, and the rights of Indigenous Peoples; this approach fosters a more inclusive, equitable, and sustainable future for all Arctic people.

The REDfire Lab is an interdisciplinary research collective of Indigenous fire stewardship practitioners. All authors are affiliated with the REDfire Lab as members or advisors. Author affiliation is as follows: Amy Cardinal Christianson (Indigenous Leadership Initiative); Alex Zahara, David Young, Jordan Twist, Joshua Mitchell, Miriam Sainnawap (Natural Resources Canada); Jaci Gilbert (First Nations' Emergency Services Society of British Columbia); Pearl Doris Morin (Prince Albert Grand Council); Paul Courtoreille (Gift Lake Development Corporation); Natasha Caverley (Turtle Island Consulting Services Inc.); Winston Delorme (Rocky Mountain Cree). The REDfire lab functions as Natural Resources Canada's Centre of Expertise in Indigenous Fire Stewardship. REDFire is guided by the following principles: Responsiveness to Indigenous community needs; respect for sovereignty of Indigenous Nations, people, and communities; and strengthening relationships through fire research.

CIRCUMPOLAR WILDLAND FIRE AND PERMAFROST THAW

GLOBAL CLIMATE IMPLICATIONS

BY BRENDAN ROGERS AND SUSAN NATALI



Our definition of Arctic refers to circumpolar tundra and boreal ecosystems; within this lies the northern permafrost region. Image by Christina Shintani, Woodwell Climate Research Center.

Wildfires have been a natural part of Arctic ecosystems – including tundra and boreal forests – for thousands of years. As in other regions, wildfire helps to shape and maintain these ecosystems, impacting plant traits, ecosystem diversity, and composition. However, climate change is making Arctic fires more frequent, intense, and widespread. The Arctic is warming two to four times faster than the rest of the planet, leading to longer fire seasons, more extreme fire weather, and increased lightning strikes that ignite fires.

In addition to combusting vegetation, wildfires in the Arctic also burn the organic soil layers, which play an important role in insulating and protecting the permanently frozen ground, called permafrost, that underlies the tundra and much of the boreal forest. When vegetation and soils are removed by fire, this can trigger or accelerate permafrost thaw.

Most permafrost has been frozen for hundreds to thousands of years. Over time, organic carbon derived from plants has slowly accumulated in permafrost soils because the frozen conditions slow decomposition, leading to the accumulation of an immense amount of carbon – on the order of 1,600 billion tons, or roughly three times the amount of carbon contained aboveground in all the world's forests. With climate warming, permafrost is thawing, and microbes are decomposing this ancient carbon and releasing it into the atmosphere as greenhouse gasses, carbon dioxide and methane. The release of greenhouse gasses from permafrost thaw, referred to as the permafrost carbon feedback, could be a major accelerant of global climate change in the coming decades and centuries.

Wildfires amplify the permafrost carbon feedback. At the time of burning, Arctic wildfires release large amounts of carbon in the form of carbon dioxide, methane, and other gases and aerosols due to the combustion of organic soils. In fact, the levels of carbon emitted per unit area from Arctic wildfires are among the highest on Earth, rivaled only by tropical peatland and deforestation fires. For the most part, this carbon can ultimately be removed from the atmosphere by vegetation regrowth and stored by ecosystems over a period of decades to centuries. However, by burning the upper soil layers that otherwise keep permafrost cool, Arctic fires also initiate and exacerbate permafrost thaw. In some cases, this is barely noticeable from the surface but can still generate greenhouse gas emissions. In other cases, permafrost with high ice content can thaw abruptly, leading to dramatic features such as thermokarst lakes and permafrost thaw slumps, generating even higher levels of carbon emissions.

HOW ARE ARCTIC FIRES CHANGING?

Many studies have documented the links between Arctic fires and climate change. The best long-term observational data come from Alaska and Canadian government databases, which detail fires and their area burned since the mid-20th century. From the databases, we know the average yearly burned area across Alaska and Canada during the past two decades is roughly twice that of pre-climate change levels. By far, the most severe fire season was 2023. Canadian wildfires in 2023 burned more than twice the area of any other year on record and emitted between 480 and 760 million tons of carbon. For perspective, that's three to five times higher than annual emissions from all other sectors in Canada combined, and higher than every country's annual emissions except China, the United States, and India. It should be noted that regrowing forests from these fires are unlikely to re-sequester much carbon by the mid-21st century – when the world otherwise needs to be approaching net-zero emissions to limit the

most damaging impacts from climate change – and that these estimates do not include post-fire permafrost emissions.

Novel fire years are not limited to Canada. Russia, for instance, experienced unprecedented wildfire activity in eastern Siberia and north of the Arctic circle in 2019, 2020, 2021 and 2024, which has been linked to warming temperatures, early snow melt, and polar jet dynamics associated with climate change. If current climate warming trends continue, Arctic fires will likely become even more frequent and intense. Studies project a 75 per cent increase in Arctic burned area for every degree Celsius of global warming.

The carbon released by these fires, combined with emissions from permafrost thaw, could rival those of major global economies. Yet these emissions are not currently accounted for in global climate models nor are they fully accounted for in the "accounting framework" used to assess progress toward the Paris Agreement goal of limiting warming to well below two degrees Celsius above pre-industrial levels.

Carbon and climate are not the only causes for concern over increasing Arctic wildfires. These fires emit smoke that degrades air quality and threatens human health for communities near and far. Wildfires impact habitat and subsistence activities for Indigenous communities, can shut down aviation and overland travel, damage infrastructure, and lead to mass evacuations.

WHAT TO DO?

The situation is urgent, and solutions exist. Governments can prioritize wildfire preparedness and community protection plans, fuels treatments and fire breaks around

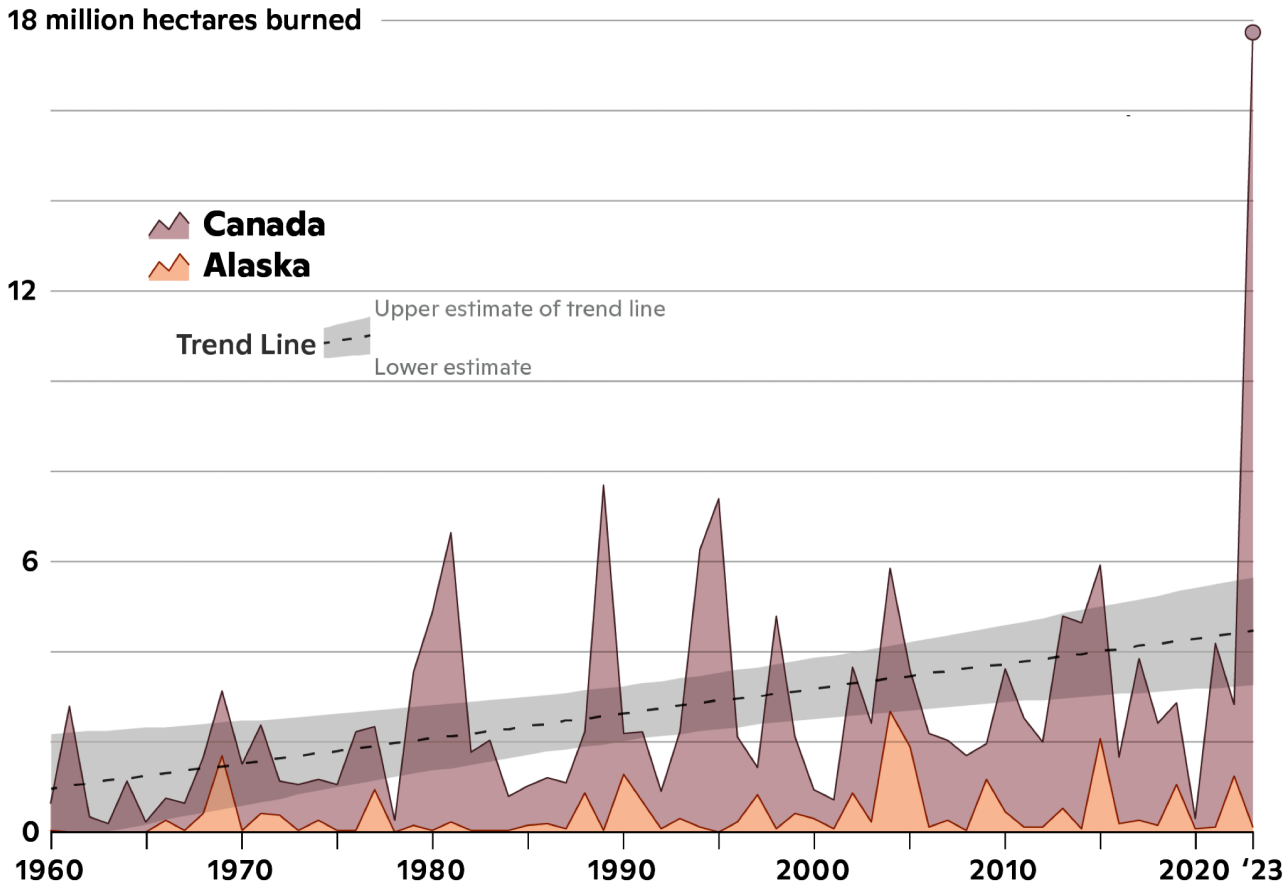
Ground slumping in yedoma permafrost after a wildfire, in the interior of Alaska. Yedoma permafrost generally contains large amounts of ground ice, making it vulnerable to abrupt thaw after fires. Fires can accelerate permafrost thaw and carbon emissions in many different types of permafrost. Photo by Torre Jorgenson.

fire-prone communities, and improve real-time forecasting and information sharing, especially with rural and Indigenous communities. Supporting cultural burning practices, where Indigenous communities conduct controlled burns to manage landscapes, can also reduce the risk of severe wildfires. Finally, the combination of improved satellite detection and emerging technology such as autonomous firefighting aircraft presents opportunities for early action suppression of the most damaging wildfires.

However, the most critical solution lies in reducing global greenhouse gas emissions. Cutting global emissions will slow Arctic warming, reducing the conditions that fuel these fires and making other wildfire prevention efforts more effective. Arctic fires are a growing global concern with wide-reaching implications for the climate and communities worldwide. By investing in local adaptation, embracing Indigenous knowledge, and tackling the root cause – climate change – we can work toward a more resilient future.

Brendan Rogers is an associate scientist at the Woodwell Climate Research Center in Massachusetts. Rogers uses a combination of field measurements, satellite remote sensing, and modeling techniques to diagnose the impact of increasing Arctic fires on carbon and climate. Rogers uses science to inform natural resource management and policies for improved climate mitigation, adaptation, and ecosystem protection.

Susan Natali is a senior scientist at the Woodwell Climate Research Center whose research on permafrost thaw is motivated by an acute awareness of the risks it poses. Natali has worked extensively across the Arctic, in Alaska, Siberia, and elsewhere, combining field research of permafrost and carbon cycling with remote sensing and modeling to assess current and future climate impacts across the Arctic. Natali works with Indigenous communities, scientists, resource managers, and policymakers at all levels to craft just and effective strategies for limiting harm from Arctic warming.



Long-term trends in area burned across Canada and Alaska, developed with data from the Canadian Wildland Fire Information System and the Alaska Interagency Coordination Center. Image by Greg Fiske, Woodwell Climate Research Center.

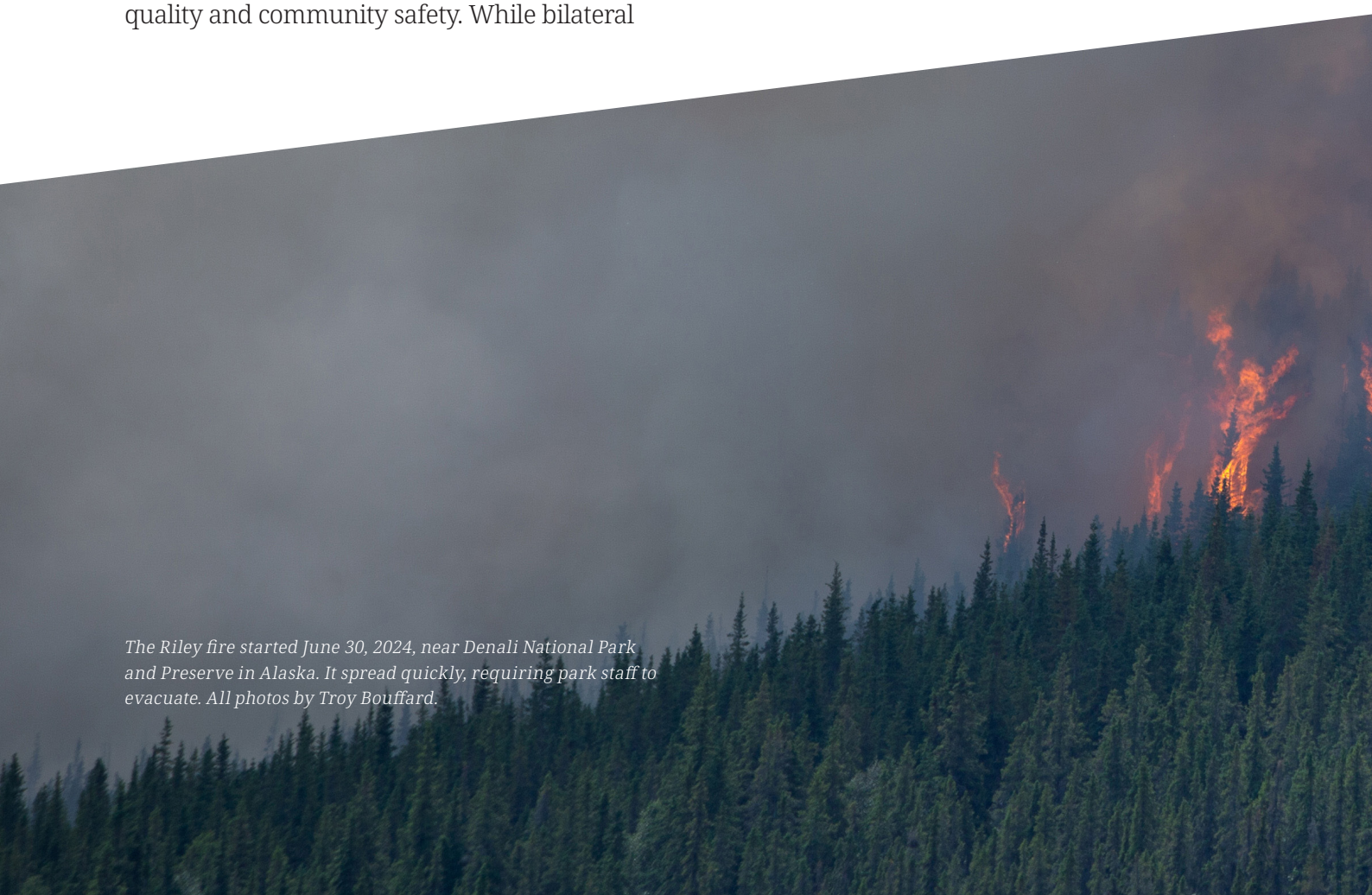
OPERATIONS

UNDERSTANDING CIRCUMPOLAR WILDLAND FIRE CAPABILITIES

BY TROY BOUFFARD AND EDWARD SOTO

The Arctic is undergoing profound environmental shifts, marked by unprecedented warming and ecosystem changes. A critical consequence of this transformation is the rise of extreme wildland fire events across all eight Arctic states, especially the United States (Alaska), Canada, and Russia. These fires represent a shared northern challenge, transcending borders and impacting everything from carbon release and permafrost degradation to air quality and community safety. While bilateral cooperation on firefighting resources exists, notably between Canada and the United States, a comprehensive, circumpolar platform for collaboration on wildland fire preparedness, mitigation, and response has yet to develop. This gap highlights the need and opportunity for a shared understanding of how each Arctic nation manages wildland fire events.

The Arctic Council Emergency Prevention, Preparedness, and Response (EPPR) Working



The Riley fire started June 30, 2024, near Denali National Park and Preserve in Alaska. It spread quickly, requiring park staff to evacuate. All photos by Troy Bouffard.

Group publication, *Circumpolar Arctic Wildland Fire Operational Baseline Report,* aims to fill this research gap by establishing a foundational understanding of the existing operational capabilities and primary information sources for wildland fire response within each Arctic state.

The report's value lies in presenting each nation's operational picture, identifying potential areas for enhanced collaboration, and providing policymakers, operational decision makers, and researchers with the necessary baseline knowledge to engage in further studies and activities. By surveying existing governance operational structures, response systems, information resources, and logistical support mechanisms, the report serves as an important information source toward developing more integrated and effective circumpolar wildland fire management strategies in a rapidly changing Arctic.

OPERATIONAL LANDSCAPES

The report details the diverse approaches each Arctic nations takes toward wildland fire management, reflecting differences in operational governance, geography, and historical fire regimes, which can vary significantly depending on traditional management approaches and risk levels.

CANADA

Wildland fire management primarily falls under provincial and territorial jurisdiction, with the federal government responsible for Parks Canada and military lands. The Canadian Interagency Forest Fire Centre (CIFFC) plays a crucial coordinating role, facilitating resource sharing (personnel, equipment, aircraft) and information exchange both domestically and

By July 7, the Riley fire fire was 31 per cent contained, and evacuation status in the Denali Borough was lifted. The park resumed normal operations but some areas remained closed while crews continued to fight the fire.

internationally, particularly with the United States through compact agreements.

Canada uses the Canadian Wildland Fire Information System for predictive services and situational awareness, incorporating data from the Meteorological Services of Canada and the Canadian Forest Fire Danger Rating System. The Canadian Armed Forces may provide support to civil authorities when requested and civilian resources are overwhelmed. Response uses a standardized incident command system, adapted for Canadian use, ensuring interoperability. Resource warehousing is also decentralized at the provincial / territorial level.

THE KINGDOM OF DENMARK (INCLUDING GREENLAND)

Denmark presents a unique structure where both civil and military emergency response capabilities reside under the Ministry of Defence, primarily executed by the Danish Emergency Response Agency (DEMA). Response follows the Emergency Preparedness Act and the National Crisis Management System, adhering to a sectoral principle for assigning responsibilities.

Given Greenland's vast ice cover and Denmark's relatively low wildland fire frequency, the focus is largely on an all-hazards approach with a structural fire emphasis. The Danish Meteorological Institute provides weather data, contributing to fire danger indices, often focused on agricultural settings. Response typically starts at the municipal level, escalating to DEMA if needed. Specific wildland fire equipment exists but is integrated within the broader rescue service resources.

FINLAND

The Ministry of the Interior, through its rescue services and regional rescue departments (managed by wellbeing services counties), leads wildland fire response as part of an all-hazards mandate under the Rescue Act. The Finnish Defence Forces provide assistance (equipment, personnel, expertise) when requested by civil authorities. The Finnish Meteorological Institute provides essential weather and predictive services, including

a forest fire index, which can trigger aerial surveillance flights. Due to intensive forest management, large wildland fires are relatively rare. Resource coordination occurs between wellbeing services counties, with the ministry coordinating international aid. Finland uses the Virve communication network, interoperable with Nordic counterparts via TETRA., the public safety telecommunications network. Training is conducted via the Emergency Services Academy Finland, emphasizing all-hazards response.

ICELAND

Civil authorities, specifically the Department of Civil Protection and Emergency Management under the National Commissioner of the Icelandic Police within the Ministry of Justice, have the sole lead for emergency response. There is no military, though the Icelandic Coast Guard assists in maritime areas and can be involved in suppressing remote wildland fires. The Civil Protection Act provides the framework for an all-hazards response structure from national to municipal levels. Wildland fires have been historically rare due to fuel types, though this may change with climate warming. Consequently, specific wildland fire information sources and specialized training are limited.

The Icelandic Meteorological Office provides general weather forecasting but focuses on more prevalent hazards such as volcanoes and avalanches. Response follows established civil protection plans, resourced locally first, with escalation pathways nationally and through the EU Civil Protection Mechanism.

NORWAY

Responsibility is shared between the Ministry of Justice and Public Security (primary authority via the Directorate for Civil Protection - DSB) and the Ministry of Defence. The DSB provides administrative oversight, while operational response resides with municipal fire and rescue services. The Norwegian Civil Defence and the Armed Forces / Home Guard can provide reinforcement and disaster assistance when needed, forming the total defence concept. Norway uses a unified management system, adapted from the incident command system, but command typically remains at the municipal level. The Norwegian Meteorological Institute collaborates with DSB, utilizing an adapted Canadian Fire Weather Index for risk assessment specific to Norwegian conditions. Resources are primarily municipal, with some national assets such as DSB-administered helicopters available during fire season or high danger periods. Norway also uses European resources such as the Copernicus

Every aircraft in Alaska that has a tank has been active on this fire today," Danali Park public information officer Paul Ollig told alaskasnewssource.com on June 30, 2024.

Emergency Management Service (CEMS) and the Emergency Response Coordination Centre (ERCC).

THE RUSSIAN FEDERATION

The Federal Forestry Agency (FFA), under the Ministry of Natural Resources and Environment, is the lead agency for wildland fire protection and suppression, operating through territorial authorities. The Forest Code and federal law *On Fire Safety* define responsibilities, assigning coordination functions to the FFA, which establishes federal and regional headquarters. The Ministry of Emergency Situations, known as EMERCOM, handles fires in populated areas and provides support, while the Ministry of Defense's Forestry Department manages fires on defense lands. Authority is delegated to the subjects (regions) of the Russian Federation, which develop annual consolidated fire suppression plans detailing resources (personnel, machinery, equipment) from various state, municipal, and other involved entities. The FFA oversees information reliability and coordinates interregional maneuvering of resources. The Russian government's Aerial Forest Protection Service (Avialesookhrana) provides specialized aviation resources, including aircraft and parachute firefighters.

SWEDEN

The Swedish Civil Contingencies Agency (MSB), under the Ministry of Defence, holds responsibility for civil protection, public safety, and emergency management, including coordinating and supporting roles in large wildland fires. Operational response is led by municipal fire and rescue departments. Sweden employs a total-defence concept incorporating emergency preparedness and civil defense, involving collaboration among government agencies, municipalities, regions, industry, and NGOs. The Swedish Meteorological and Hydrological Institute provides fire risk assessments using the Canadian Fire Weather Index during the fire season. Response is resourced locally / regionally, with cross-border municipal agreements and support from MSB, which maintains equipment depots and coordinates national / international aviation assets, including rescEU resources hosted in Sweden. If resources become scarce, MSB can prioritize allocation.

THE UNITED STATES

Wildland fire response is characterized by extensive interagency cooperation, coordinated nationally by the National Interagency Fire Center (NIFC). NIFC integrates federal agencies within the departments of agriculture and interior, state forestry agencies, and others under common incident command procedures and safety guidelines. The Department of Defense provides support to civil authorities upon request from NIFC, typically as a surge capability. Information sources are coordinated, with National Oceanic and Atmospheric Administration / National Weather Service providing key weather and predictive services. Firefighter qualifications and operational standards are standardized nationally through the National Wildfire Coordinating Group. Resources (personnel, aviation, equipment, supplies) are managed through interconnected interagency systems – Incident Qualifications and Certification System (IQCS), Interagency Resource Ordering Capability (IROC), National Fire Equipment System (NFES) caches – allowing for efficient mobilization from local to national levels. Unmanned aerial vehicles are increasingly integrated into operations.

CROSS-BORDER COOPERATION: NORDRED, RESCEU AND THE NORDIC REGION

Beyond national capacities, regional cooperation mechanisms significantly enhance response capabilities, particularly in the Nordic region. Nordred facilitates rescue collaboration (information sharing, operations) among Denmark, Finland, Iceland, Norway, and Sweden, supported by agreements at both national and cross-border municipal levels. Additionally, these nations, along with other European countries, participate in the EU Civil Protection Mechanism and its rescEU component, which provides a reserve of resources, including firefighting aircraft, coordinated through the Emergency Response Coordination Centre for international assistance. These frameworks are integral to Nordic preparedness and response culture.

This baseline report illuminates the diverse, yet often complementary approaches Arctic nations employ to manage wildland fires. While significant operational collaboration already exists within subregions such as North America and the Nordic countries, facilitated by shared systems (such as variations of the incident command system), common standards, and established agreements (such as forest fire compacts and Nordred), the frameworks and capabilities are not yet fully interoperable across the entire circumpolar Arctic.

The inventory reveals each Arctic state's operational governance structures, key information sources (weather, predictive services, geospatial data), response protocols, and resource management systems. This foundational knowledge is crucial for identifying commonalities that can be leveraged for broader cooperation and gaps that require attention and development.
As the Arctic continues to warm and wildland fire regimes intensify, understanding these national operational baselines is paramount.

Troy Bouffard, U.S. Army (Ret.), has a master's degree in Arctic policy and a PhD in Arctic defense and security from the University of Alaska Fairbanks. He is the director of the UAF Center for Arctic Security and Resilience. Bouffard is a research fellow with the United States Military Academy – Modern War Institute. He was also the former Arctic Advisor to U.S. Senator Lisa Murkowski as a congressional fellow.

Edward M. Soto, Col, USAF (Ret.) has a forest engineering degree with a graduate certificate in Arctic securities and currently works as a project manager for the Alaska Division of Forestry. His military service includes two command tours in civil engineering and aircraft maintenance. Soto has also worked as a forest engineer and in wildland fire management throughout Alaska when not in military service.

ARCTIC EMERGENCY MANAGEMENT CONFERENCE 2025

BY OLE KRISTIAN BJERKEMO, HANS KRISTIAN MADSEN AND NINA ÅGREN

The Norwegian Chairship of the Arctic Council organized the inaugural Arctic Emergency Management Conference (AEMC) in Bodø, Northern Norway, March 18-20. The conference was part of the official program of the Norwegian Chairship of the Arctic Council (2023 to 2025) and featured a robust program with a dedicated section on Arctic wildland fire prevention, preparedness and response.

The Arctic Emergency Management Conference was one of the first international conferences dedicated to a broad view of Arctic emergency management. There have been conferences covering different thematic areas of Arctic emergency response arranged by multiple stakeholders, but no space for a comprehensive venue dedicated to bringing together various sectors of Arctic emergency management landscape, so Norway took the initiative to arrange this event during its Chairship of the Council. The conference provided a platform for discussions, information exchange and advancing work on emergency management in the region. The program highlighted the importance and interconnectedness of different aspects of emergency prevention, preparedness and response in the Arctic.

The Emergency Prevention, Preparedness and Response (EPPR) Working Group of the Arctic Council, also under the leadership of Norway, was assigned to lead the conference program planning and organization in cooperation with Nord University as the local partner. The conference was held at Nord University campus, consisting of three full days, beginning with a plenary day setting the scene followed by two days of thematic parallel sessions. The conference gathered more than 200 participants, plus more than 130 people registered to follow the online streaming; this ensured a mix of varied backgrounds and areas of expertise providing opportunities for cross-cutting discussions and networking. The audience was a unique combination of subject-matter experts, public-sector officials, knowledge holders, researchers, practitioners,

students and industry representatives. The conference program also included an academic poster exhibition organized by Nord University, and an exhibition space for organizations and industry relevant to the AEMC topics.

Emergencies in the Arctic are a growing concern, and the region faces unique circumstances such as vast distances, scarce infrastructure and resources, and sometimes challenging environment and weather that affect and complicate emergency preparedness and response. Further, climate change and emerging risks in the region add to the complexity and frequency of possible incidents and disasters. As Arctic inhabitants, particularly Indigenous Peoples, face the effects and risks posed by the changing environment, better understanding, capacity building and cooperation on all levels from local to global must be strengthened. Community safety and preparedness, as well as social resilience, are essential parts of prevention of emergencies, and enhanced cooperation is needed for acknowledging the hazards and informed decision making and actions. Changing environment, besides exacerbating natural hazards, may lead to increased activities, increasing risks in the region. Prevention and preparedness, as well as knowledge-based response in emergencies contribute to both safeguarding the sensitive environment and protecting lives, livelihoods and cultures.

WILDLAND FIRES IN THE ARCTIC

The AEMC program covered multiple thematic areas from marine environmental response to search and rescue, and radiation-related preparedness to health preparedness and community perspectives, while wildland fires were one of the main focus areas on the conference program. According to the objectives of the conference, a variety of

The Norwegian Chairship of the Arctic Council launched a Wildland Fire Initiative in 2023, with a concluding dialogue between the co-chairs of the initiative, Ambassador Morten Høglund, Norway, and Edward Alexander, Gwich'in Council International. Photos courtesy of the Arctic Council Secretariat.

wildland-fire related topics from different angles were covered during the three days.

The Norwegian Chairship of the Arctic Council launched a Wildland Fire Initiative (WFI) for 2023 to 2025, co-chaired by Norway and Gwich'in Council International, to elevate the topic in Arctic and global discussions. The initiative highlights Arctic Council work related to wildland fires and encourages information exchange and capacity building. A concluding discussion of the WFI, between the co-chairs, was arranged during the plenary day of the conference for a full audience, recapping the developments over the past years, and providing reflections of the achievements of the initiative.

During the following two days, stories from Sweden, Northern Europe, and the Nordic countries about past and potential future fires, together with the accounts of the devastating fires in Canada in the summer of 2023 – which forced the entire city of Yellowknife in the Northwest Territories to evacuate – set the scene. The program aimed to give space for stories shared and for the knowledge experienced and brought forward the dramatic risk picture and challenges. Wildland fires threaten the Arctic Indigenous Peoples' ways of life and raise serious concerns for the future.

As a summary of the program, the following three key points were noted by the wildland fire program leads.

1. *Wildland fires create crisis situations that consist of a host of different perspectives, whether it be that of individual, local community, the regional and national entities or authorities, or international.*

To understand the nature of wildland and forest fires we need to approach all the identified challenges inclusively; this can be done through lessons learned – be it planning, prevention, mitigation, preparedness, or response. Research on what comes next, what types of plans need to be prepared, and how future impacts of wildland fires should be mitigated, is crucial. The Arctic climate and the changes of the climate play an active role in the development of wildland and forest fire behavior and the threat they pose. Extended fire seasons and their impacts, for example, on emissions

The Arctic Emergency Management Conference was held at Nord University Campus March 18-20 in Bodø, Norway.

and air quality create risks not only to local communities and the people in the Arctic, but globally as well.

2. *The tools used in planning and prediction, such as weather forecasting, climate surveillance, and land management practices, need to be adapted to prepare for future challenges.*

Data-heavy services need to transform the data gathered and received and the knowledge brought forward into applications that are practical to use in planning, preparing and learning how to react and respond.

3. *In addition to risks and hazards that are a part of major wildland fires threatening communities and urban areas, such as risk to lives or loss of infrastructure, health effects of fires should also be in focus.*

The massive fires during 2023 season in Canada severely impacted people's ways of life, causing mental strain and fear for their families, income, friends, pets, and homes. These health effects are relevant for the planning of upcoming crises simply to be able to be better prepared next time and to plan for adequate measures. From the presentations, one key takeaway was the importance of acknowledging that the consequences of wildland fires will have different impacts on different people and communities.

The wildland fire program of the AEMC highlighted the unique combination of stories, Indigenous knowledge, subject matter expertise, state-of-the-art research, planning, and practices, and provided an overview that sheds light on the complexities and far-reaching impacts the wildland fires in the Arctic have, not only locally but also globally.

Thematic days at the Arctic Emergency Management Conference included 11 wildland fire focused sessions. Jenny Sander from the Swedish Civil Contingencies Agency presented on lessons learned from fires in 2014 and 2018 in Sweden.

Ole Kristian Bjerkemo serves as the Chair of the Arctic Council's Emergency Prevention, Preparedness and Response Working Group from 2023 to 2025. Bjerkemo led the organization of the Arctic Emergency Management Conference and has a long history with EPPR, including previously chairing the group from 2011 to 2015. At Bjerkemo's daily work he is an International Coordinator at the Norwegian Coastal Administration.

Hans Kristian Madsen is the executive director at the Fire and Rescue Department of the Norwegian Directorate for Civil Protection. Madsen is an experienced professional and has held various positions within the directorate since 1990. He led the planning of the wildland fire focused program of the Arctic Emergency Management Conference.

Nina Ågren is the executive secretary of the Arctic Council's Emergency Prevention, Preparedness and Response Working Group. Ågren has been with the Arctic Council Secretariat since 2018 and supported Norway in the organization of the Arctic Emergency Management Conference.

A GROWING PROBLEM IN SIBERIA

CLIMATE AND HUMANS CONTRIBUTE TO RISE IN WILDFIRES

BY LENA POPOVA

In the harsh conditions of the coldest region on the planet – the Republic of Sakha (Yakutia), in north-east Siberia – we hold great respect for fire. We, the northern Indigenous Peoples, have survived for thousands of years in these unforgiving lands thanks to the warmth and light that fire provides during the long winters. Fire is life – it replaces the sun for us in the dark, cold months; it gives us warm food, and there is deep joy in gathering around the fire with family. Some of my warmest childhood memories are tied to the sound of burning wood in the stove.

Before 2015, fires occurred as a natural part of the ecosystem. Today, federal law prohibits controlled burning (Decree of the Government of the Russian Federation of November 10, 2015, №1213). This prohibition, along with a combination of increasing temperatures, dry years, stronger and more unusual winds, leftover grass from the previous year that serves as fuel, and reduced rainfall all create favorable conditions for large, unpredictable wildfires that can quickly spread across vast areas.

We used to carry out controlled burnings, which stimulate the growth of new, nutrient-rich grasses; this not only helps restore the ecosystem but can also help control insects, pathogens, and bacteria in the grass. In the Arctic, grass does not have enough time in a single short summer to decompose and turn into soil. That is why controlled burnings are essential – not only to improve pastures and forage lands for our traditional activities, but also to reduce the risk of large wildfires. Old, dry grass acts like kerosene – it ignites very easily. Just imagine how much of this kind of land exists across the vast northern territories.

In addition, light coniferous forests prevail in the Republic; they are formed mainly by two species – pine and larch – of which larch occupies almost 90 per cent of the forest ecosystem of the Republic. Pine and larch forests catch fire more easily than dark coniferous forests.

All of this has led to most of the wildfires in Siberia over the past decade occurring in

the Republic of Sakha (Yakutia), the largest region in Russia by territory, yet one of the lowest in population density. Our region has experienced some of the largest and most dangerous fires. Smoke from these fires even reached the North Pole and spread across a large part of the Arctic. The combination of frequent forest fires and climate warming is creating critical conditions for the fragile Arctic ecosystem, the economy, and our Indigenous subsistence practices, such as reindeer and horse husbandry. Undoubtedly, wildfires significantly contribute also to the accelerated changes in the global climate.

Moreover, in 2020, so-called zombie fires, or holdover fires, were observed in eastern Yakutia; these fires burned deep in the peatland soil, even at temperatures as low as -50 C. The winter burning of such northern peatlands will have significant consequences. If the fires continue into the spring, they will spread over vast areas, destroy the environment and release carbon into the atmosphere.

Wildfires occur due to various reasons and factors, but the most common is the increasing number of dry thunderstorms. Human activity plays a significant role as well. Fires often start near power lines, roads and pipelines, during construction or logging operations. In many cases, the exact cause remains unknown, but the pattern is clear: as the temperatures increase and human activities expand, the risk of wildfires grows. Wildfires, along with human activities, negatively impact Indigenous practices. Mining and deforestation are growing in the region, putting even more pressure on the land and making it more difficult for Indigenous Peoples to continue their traditional ways of life.

Fire is life — it replaces the sun for us in the dark, cold months. But today, without the ability to carry out controlled burns, fire has become something to fear.

To reduce the risk of forest fires, it is important to take several key steps. First, a well-developed forestry network should be established across as much of the Republic's territory as possible; this would help remove dry grass, dead trees, and other plant material from the forests, as these can easily catch fire. Second, controlled burning of dry grass must be allowed at safe times – at the very least, for Indigenous communities. These planned fires can help prevent larger and more dangerous wildfires in the future.

Working with the Earth – as our ancestors have done for millennia – rather than against it, we can live with fire without fearing it.

Lena Popova is from the Republic of Sakha (Yakutia). Popova is a PhD student at the University of Fribourg in Switzerland doing research in human geography, focusing on the Arctic.

MAKING THE CASE

THE NEED FOR A WILDLAND FIRE EXPERT GROUP IN THE ARCTIC COUNCIL

BY MICHAEL YOUNG

Studies show that wildland fires around the world are increasing in size, frequency and intensity due to the effects of climate change. This trend is even more pronounced in the Arctic region. Temperatures in the Arctic are increasing at four times the rate of the global average, causing increases in drought, permafrost thaw, lightning strikes and changes to vegetation. These changes all combine to make wildland fires in the Arctic more likely and more severe. For example, the 2023 wildfire season in Canada burned more than 15 million hectares of land, the most ever recorded, with 3.4 million hectares in the Northwest Territories.

The Arctic Council is the premier intergovernmental forum to discuss pressing issues in the Arctic, especially those related to the environment. The topic of wildland fires was introduced to the Arctic Council by Gwich'in Council International (GCI) when it proposed projects in the Conservation of Arctic Flora

and Fauna (CAFF) and Emergency Prevention Preparedness and Response (EPPR) working groups in 2019. As work on these projects progressed over the last five years, it became apparent that the issue of wildland fires in the Arctic was relevant to several more of the Council's working groups, and that it was urgent.

Work in the Arctic Council occurs by projects and assessments conducted by each of the six working groups. Of the six working groups, five have remits that intersect with the topic of wildland fires.

- The Arctic Contaminants Action Program (ACAP) works to reduce pollution and contaminants in the Arctic through demonstration projects. Smoke from wildland fires poses a serious human health risk in the form of particulates and noxious gases. ACAP can support projects that help mitigate the effects of smoke to human health.

- The Arctic Monitoring and Assessment Programme (AMAP) measures and monitors pollutants and climate change effects on ecosystems and human health in the Arctic. The effects of climate change that create an increased risk of wildland fires, as well as how the effects from wildland fires amplify climate change, are both areas of study AMAP can support.

- The Conservation of Arctic Flora and Fauna (CAFF) Working Group conducts projects to provide data about Arctic ecosystems that can inform decision making on species and habitat management and utilization. Vegetation is changing in the Arctic as temperatures increase, changing the types of fuels for fires. Wildland fires also change the ecosystem. Understanding these changes is important to land managers to make informed decisions with respect to wildland fire.

Wildland fire is the most cross-cutting issue in the Arctic Council today.

- The Emergency Preparedness Prevention and Response (EPPR) Working Group is charged with studying prevention, preparedness, and response to environmental and other emergencies, accidents, and search and rescue operations in the Arctic. Wildland fires are a new area of focus for the group, but one that will become more important due to the increasing size and severity of wildland fires in the Arctic.

- The Sustainable Development Working Group (SDWG) focuses on improving environmental, economic and social conditions of Indigenous Peoples and Arctic communities. Wildland fires have a significant impact on the health of Arctic residents through smoke, evacuations, the destruction of property and impacts on food security; this is especially true for remote Arctic communities.

There is no permanent home for the issue of wildland fires in the Council — yet the urgency has never been greater.

It is not an exaggeration to state that the issue of wildland fires is the most cross-cutting among the Arctic Council working groups. The ACAP, AMAP, CAFF and EPPR working groups all have projects or assessments related to wildland fires. However, by and large, these efforts are not formally coordinated within the existing council structure. There is also no permanent home for the topic of wildland fires. Working groups develop projects organically, without any specific strategy with respect to the issue as a whole. The United States, in conjunction with GCI, proposed the creation of a Wildland Fire Expert Group (WFEG) within the Arctic Council to address these concerns. Given the council's existing structure, the most effective and acceptable location for the expert group would be as an expert group within the EPPR Working Group.

What should the expert group's purpose be? What should its composition be? How should it fit within the Arctic Council organizational structure? To answer these questions, the United States and GCI collaborated on a proposal to submit to the Arctic Council. The text below is drawn largely from that proposal.

PURPOSE

The WFEG reports to the EPPR as a guiding body. The purpose of the WFEG is to facilitate and enhance work across the Arctic Council working groups on wildland fires; it will accomplish this through the following mechanisms, among others:

- Provide a permanent body within the Arctic Council to address the issues of wildland fires;
- Encourage communication among the working groups on wildland fires;
- Generate and help develop ideas on wildland fire work appropriate to working groups;
- Provide a source of expert information and networks to working group projects;
- Conduct regular seminars and workshops on wildland fires;
- Facilitate multilateral table-top exercises on wildland fires;
- Facilitate state-to-state personnel exchange programs.

ADMINISTRATION AND ORGANIZATIONAL STRUCTURE

- WFEG meetings will be scheduled as appropriate by the WFEG.
- Projects and activities to be undertaken by the WFEG will be presented to and voted on by EPPR Member States and Permanent Participants during regularly scheduled EPPR meetings or intersessionally.
- The WFEG will present updates on projects and activities undertaken by the WFEG at EPPR meetings.
- The WFEG reports to the EPPR chair.
- EPPR Member States, Permanent Participants, Observers and other Arctic Council working groups, as appropriate, should endeavor to participate in WFEG activities as per the Arctic Council Rules of Procedure.
- Subject matter experts in various aspects of Arctic wildland fires may be invited to participate in WFEG projects and activities, as deemed appropriate by the WFEG chair.
- To facilitate communication on wildland fire work among working groups, Arctic Council working group secretariats from ACAP. AMAP, CAFF, EPPR, and SDWG will be designated as the points of contact for the WFEG on relevant projects and activities in their respective working groups. Direct contact among project leads in other working groups with the WFEG is also allowed, so long as the respective working group secretariat is informed.
- The Experts Group will be chaired on two-year terms by a representative from one of the EPPR Member States as recommended by the WFEG through consensus approval of the EPPR. A Co-chair position may be a representative from one of the EPPR Members States or Permanent Participants not holding the position of WFEG Chair.
- The Chair and Co-chair responsibilities include the management and facilitation of WFEG meetings (both in person and teleconferences), projects and activities. Even though project leads may differ from the WFEG Chair, the WFEG Chair should report project status to EPPR when appropriate. The Chair should inform the EPPR executive secretariat in the administration, agenda, and outcomes of WFEG activities as appropriate.

The creation of a WFEG within the Arctic Council is essential and urgent. The Council needs to act now so work on Arctic wildland fires can be conducted consistently and effectively.

Michael Young was the U.S. Coordinator for Arctic Council Wildland Fire Projects, working part-time in the U.S. Department of State's Office of Oceans and Polar Affairs from January 2021 until he resigned in February 2025. Young was a Foreign Service Officer from 2008 to 2019 and served as the U.S. Head of Delegation to the Arctic Council's Sustainable Development Working Group from 2013 to 2015.

THE ARCTIC MONITORING AND ASSESSMENT PROGRAMME

MEASURING THE IMPACT OF SMOKE, SOOT AND EMISSIONS

BY SIMON WILSON AND ROLF RØDVEN

Wildfires are a natural part of the boreal system and of some Arctic ecosystems. However, in recent years, increases have been observed in the frequency and intensity, as well as the timing and characteristics of Arctic wildfires. These observations are consistent with the higher temperatures that are a result of the rapid climate change that is affecting the Arctic in so many ways.

With continuing climate change, the risk of wildfires in the Arctic is projected to further increase as drier conditions, more fuel, and more lightning strikes increase

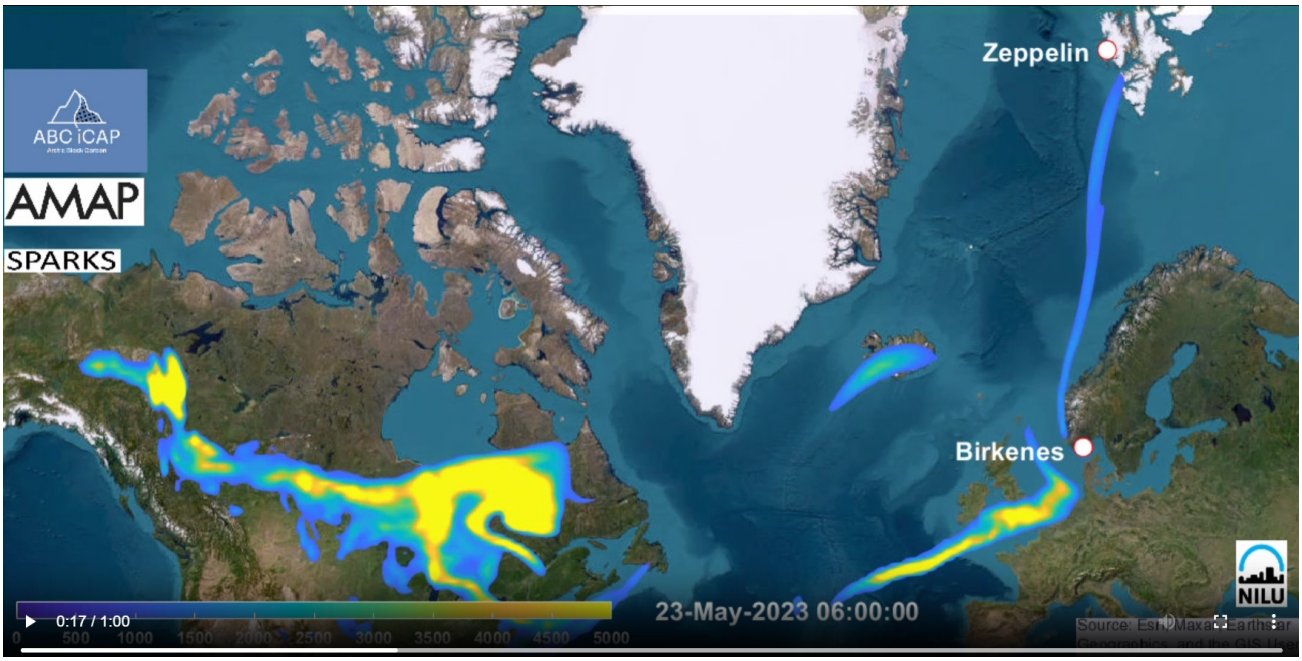
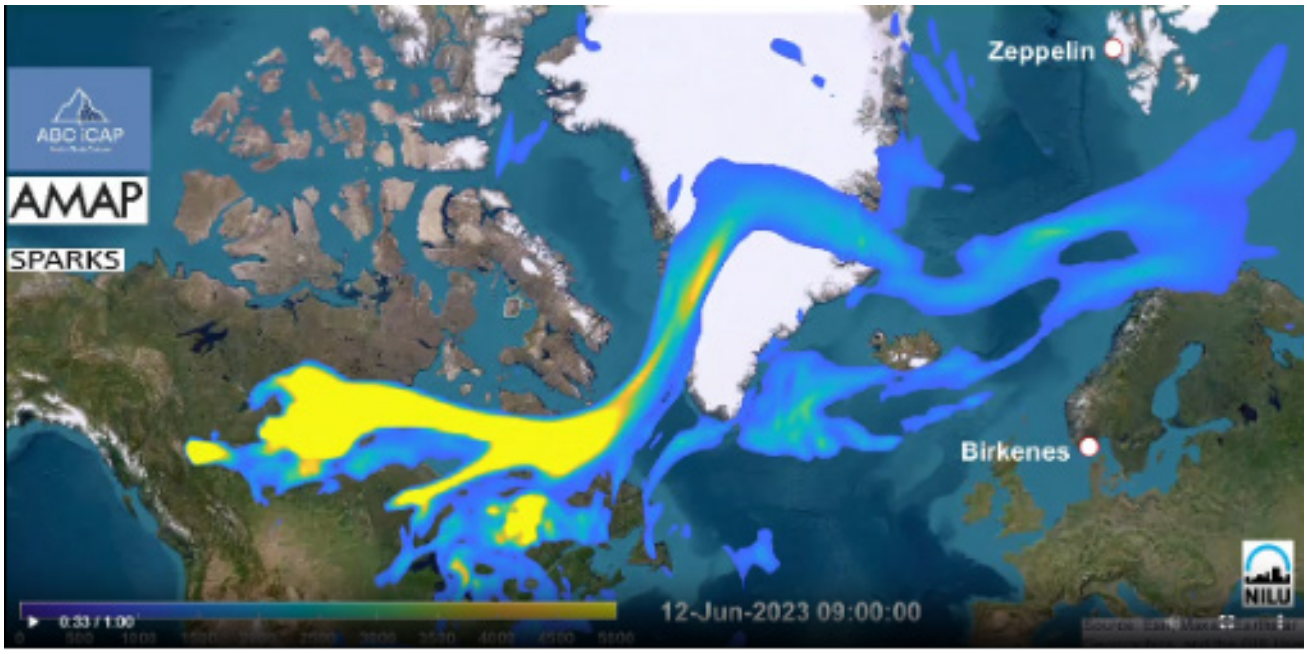


Figure1



Smoke transport to the Arctic from Canadian wildfires in May/June 2023. Credit: NILU, Norway (for full sequence see: https://nilu.com/2023/06/smoke-from-canada-still-coming-in-over-norway/).

Figure2

the likelihood of major fires. The expansion of human activities into wilderness areas adds increased risks of accidental ignition of wildfires to the natural causes such as lightning strikes. Humans, either intentionally or unintentionally, are responsible for about half of Canadian wildfires and more than 90 per cent of wildfires in Europe. Due to their remoteness and limited access, wildfires in some parts of the Arctic are almost impossible to combat using traditional firefighting techniques.

The Arctic Monitoring and Assessment

As climate change accelerates, Arctic wildfires are becoming more intense, more frequent — and harder to fight.

Programme (AMAP) – the working group of the Arctic Council that is responsible for monitoring and assessing the state of the Arctic with respect to pollution and climate issues – undertakes work to better understand causes and impacts of wildfires and other types of open burning impacting the Arctic and its people. Of particular interest to AMAP are the emissions of carbon dioxide, soot and other potentially harmful substances that arise from wildfires impacting the Arctic. For example, in June 2019, Arctic wildfires emitted 50 megatons of carbon dioxide, equivalent to Sweden's total annual emissions of carbon dioxide (CO2).

Wildfire emissions can further enhance climate change through climate feedback mechanisms and impact the health of populations through exposure to smoke as well as the direct risk from the fires. AMAP's work has a particular focus on providing insight into both current and future emissions associated with changing Arctic and boreal fire regimes. Timing of fire emissions relative to the presence of snow and ice is an important factor in relation to Arctic climate impact. Wildfires emit black carbon and organic carbon particulates. Black carbon, a so-called short-lived climate forcer (SLCF), warms the atmosphere through its radiation absorbing properties and, like organic carbon, scatters light in the atmosphere. When soot (black carbon) is deposited on snow and ice, it reduces reflectivity – or albedo – leading to enhanced surface warming. Altered seasonality and locations of fires could lead to either more soot deposition (earlier fire regimes) or less soot deposition (fires later in the season) on Arctic snow and sea ice. It has been estimated that 12 per cent to 15 per cent of the total deposition of black carbon in the Arctic originates from boreal forest fires in Siberia, Canada, and Alaska.

Smoke and soot from wildfires can spread far from the burning site and create a serious health hazard when they reach populated areas. A study of Siberian wildfires in 2012 showed that about one quarter of the huge emissions of black carbon from these fires were transported into the Arctic. In May 2023, the major wildfires in Canada resulted in transport of smoke to the Arctic that was modelled by the Norwegian Institute of Air Research (called NILU) as a contribution to AMAP and the ABC-iCAP project (Figure 1 and 2).

Emerging concerns for Arctic wildfires are peatland and tundra fires that tend to smoulder, producing greater amounts of particulate matter emissions compared to open fires. Some peat fires can persist for years, burning underground and re-emerging to ignite surface vegetation the following fire season. Climate change is shifting the fire regime in ways that could turn boreal peatlands into a net source of carbon dioxide instead of a carbon sink. Additionally, climate warming is leading to permafrost thaw, which, exacerbated by burning peatlands, is releasing methane – resulting in another feedback that warms the climate faster and further.

While Arctic wildfires, in particular, are difficult to control, proper management can reduce emissions of CO2 black carbon and methane and their associated impacts on climate, prevent loss of natural resources and property, and reduce risks to human health. How wildfires are best managed depends very much on local ecological conditions, weather patterns, site access and proximity of people and infrastructure, as well as the national and sub-national regulatory and fire management systems.

Mitigating risks associated with Arctic wildfires involves development of monitoring and surveillance systems that help to detect fires when they are still manageable. Monitoring systems that can detect small fires, peat fires, open burning in croplands, or early and late season fires from satellites are largely lacking. Establishing a more reliable monitoring and surveillance system requires improved satellite and ground-based observation networks for the boreal and the Arctic, co-produced with Indigenous and local populations who live with the fire risk.

AMAP's work will continue to contribute to the development of tools that can be used to estimate emissions from wildfires and assess both their climate and air quality impacts, complementing other work by Arctic Council groups and other initiatives that addresses the human dimension of Arctic wildfires and their consequences and work to reduce the risks to Arctic human populations.

Simon Wilson is deputy executive secretary, Arctic Monitoring and Assessment Programme (AMAP). Wilson studied environmental sciences at Lancaster University and holds a PhD in environmental pollution. Prior to joining AMAP, Wilson worked at the International Council for the Exploration of the Sea and has extensive experience in data management, international environmental assessment work and science-based policy development.

Rolf Rødven is the executive secretary of the Arctic Monitoring and Assessment Program (AMAP). AMAP is mandated to monitor and assess the state of the Arctic region with respect to pollution and climate change issues, as well as their impacts on ecosystems and human health, and to provide policy recommendations to the Arctic ministers. Rødven holds a PhD in northern populations and ecosystems and an MBA in strategic leadership and finance from UiT – the Arctic University of Norway. Rødven has authored several scientific papers on Arctic socio-ecological systems and environmental impacts. Rødven is a member of the executive board of the Antarctic Monitoring and Assessment Programme (AnMAP) and Nansen Legacy. Rødven's previous positions include research director and center director at the Norwegian Institute of Agricultural and Environmental Research – Northern Department, research director at the Norwegian Institute of Bioeconomic Research, and head of research section at Faculty of Biosciences, Fisheries and Economy, UiT – The Arctic University of Norway, as well as leading positions in environmental management.

Sharing Circles are essential elements of Indigenous Peoples' cultures and decision making. In the Circle, everyone is equal and invited to share information and worldview, facilitating a sense of unity, good communication, learning, and finding consensus. Sharing Circles are therefore necessary in Arctic Indigenous societies for making and implementing decisions.

The Arctic Council is the leading intergovernmental forum that promotes cooperation and coordination among the Arctic States and Indigenous Peoples on issues of common concern, particularly environmental protection and sustainable development. The unique feature of the Arctic Council is that in its political and expert-level work, it equally welcomes all perspectives and knowledge available, including scientific and Indigenous Knowledge from the circumpolar Arctic.

More than 500,000 Indigenous Peoples live in the Arctic, spanning three continents, 30 million square kilometers, and seven of the eight Arctic States. The Permanent Participant organizations represent Indigenous Peoples in the Arctic Council.

SHARING CIRCLES

CIRCUMPOLAR INDIGENOUS PERSPECTIVES ON WILDLAND FIRE

BY ANNA DEGTEVA AND CAMILLE VOURC'H

The Arctic, home to Indigenous Peoples who have stewarded its lands since time immemorial, is facing escalating wildland fires.

Thanks to the persistent advocacy of the Gwich'in Council International and Norway's support, wildland fires emerged as a priority issue in the Arctic Council, leading to the launch of the Wildland Fires Initiative during Norway's Chairmanship (2023 to 2025).

All six Indigenous Permanent Participant organizations of the Arctic Council actively engaged in the Wildland Fires Initiative: the Aleut International Association (AIA), Arctic Athabaskan Council (AAC), Gwich'in Council International (GCI), Inuit Circumpolar Council (ICC), Russian Association of Indigenous Peoples of the North (RAIPON), and Saami Council.

To address the rising frequency and intensity of Arctic wildfires, the Permanent Participant organizations led a series of Sharing Circles (see sidebar). These events gathered Indigenous representatives from across the Arctic, alongside researchers, Arctic State officials, observers, and other stakeholders beyond the Arctic Council.

Sharing Circle on Wildland Fire
online
November 2021

Wildland Fires Sharing Circle: Arctic Indigenous Peoples on Fire Practices, Changes, and Impacts
Arctic Frontiers Conference
February 2024

Living with the Fire: The Overlooked Community Stories from Arctic Wildland Fires
Arctic Circle Assembly
October 2024

Sharing Circle on the Role of Indigenous Fire Management in Climate Mitigation and Adaptation
Conference of the Parties to the United Nations Framework Convention on Climate Change – COP29
November 2024

Indigenous Sharing Circle on Arctic Emergency Management Conference
March 2025

Sharing Circle: Arctic Indigenous Peoples on Fire Practices, Changes, and Impacts took place in Tromsø, Norway, in February 2024 and became one of the decisive contributions of the Wildland Fires Initiative. Building on earlier collaborations, including the 2021 online sharing circle, the discussion during the Tromsø event powerfully affirmed the value of circumpolar Indigenous perspectives on fire.

> **"Wildland fires in the Arctic should matter to everybody, this isn't just an Arctic problem!"**
>
> *- Edward Alexander, Gwich'in Council International*

ARCTIC WILDFIRES AS GLOBAL ISSUES
EDWARD ALEXANDER, GCI

Edward Alexander, co-chair of Gwich'in Council International and co-lead of the Wildland Fires Initiative, set the scene by emphasizing that boreal wildland fires in the Arctic are not just a local crisis, but threaten the entire planet. Since 1965, Alexander reminded participants, more than 65 per cent of his homeland has burned due to increasingly severe wildland fires, and he warned that boreal burnings in Alaska, Yukon, and Siberia expose yedoma (ancient and ice-rich permafrost), which holds hundreds of gigatons of greenhouse gases, enough to drastically alter life on Earth.

Fire is essential to the Gwich'in Nation for heat and gathering, culture and language, ways of life, and renewal of the landscape, Alexander shared. For millennia, the Gwich'in practiced cultural spring burns in meadows and grasslands, timing them just before the ground defrosts so the roots and seeds are not damaged. These cultural burns promoted biodiversity, created healthier habitats, and crucially, prevented larger, uncontrolled fires later in the season.

Edward Alexander was critical of fire suppression policies over the past 70 years that have led to dangerous fuel buildup. Instead of preventing fires, these suppression policies have made the fires more explosive, he explained. The solution, Alexander said, is to revive Indigenous cultural burning, treating fire as a tool for prevention and stewardship rather than just an emergency to suppress.

FIRE AS SURVIVAL AND CULTURE
PATRICIA LEKANOFF-GREGORY, AIA

Okalena Patricia Lekanoff-Gregory, vice president of Aleut International Association, highlighted fire's profound significance for the Unangan (Aleut) People. In the treeless Aleutian Islands, fire was essential for survival, providing warmth through stone lamps, aiding hunters in kayaks, and enabling food preparation and traditional healing practices.

Though the Aleutian Islands lack forests and wildfires, Lekanoff-Gregory noted that distant fire smoke still impacts communities. Volcanoes, another form of fire, have shaped the history of Unangan People, both destroying and renewing the land.

Lekanoff-Gregory underscored that fire is harmful but still essential, both a danger and a vital part of Aleut life, and that non-Indigenous societies could learn from better understanding this duality.

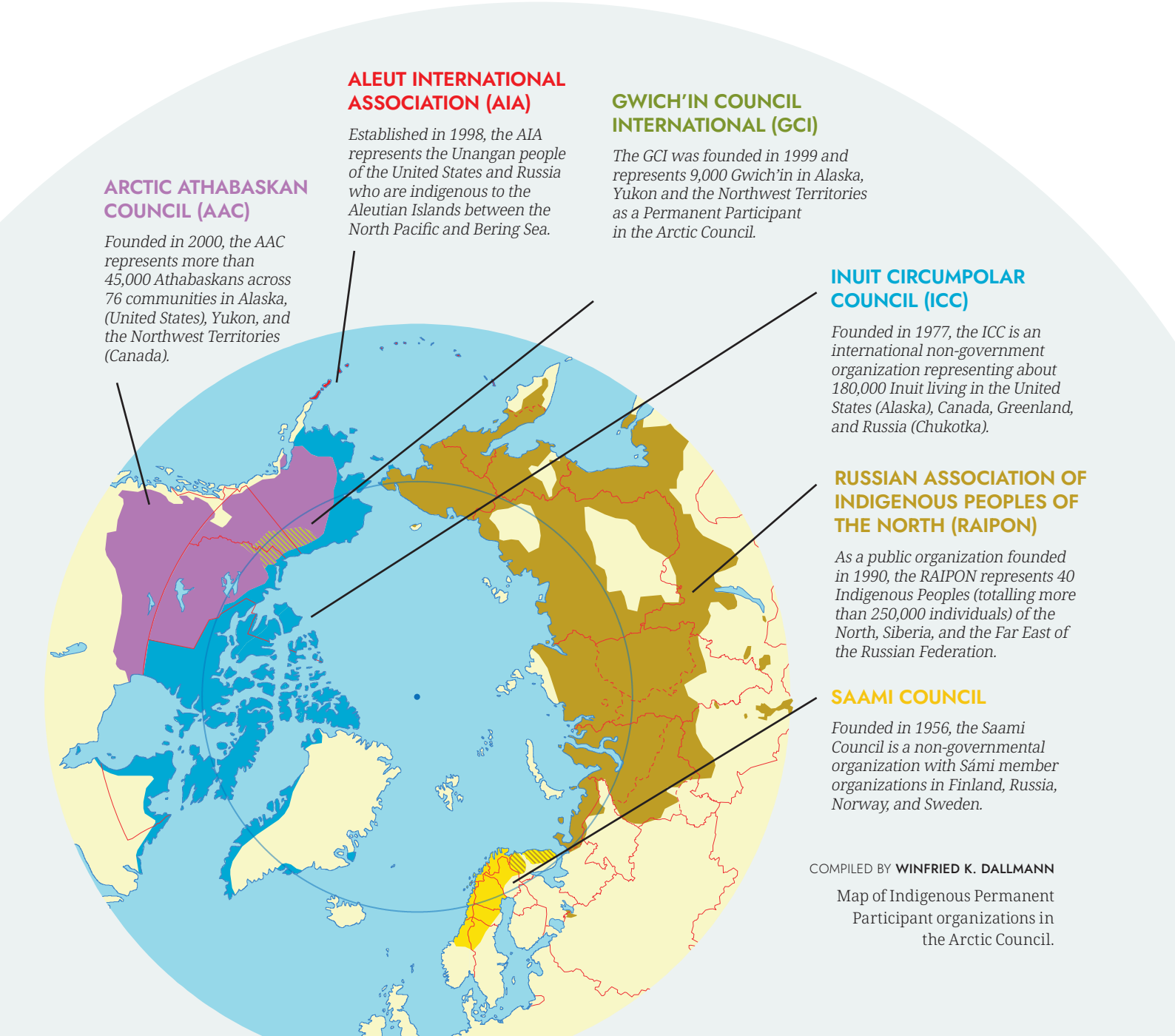
FIRE IN CULTURE AND REINDEER HERDING

GUNN-BRITT RETTER, SAAMI COUNCIL

For the Sámi, fire is both a spiritual and practical force. Gunn-Britt Retter, Saami Council's Head of Delegation to the Arctic Council, pointed out fire's dual nature by sharing the Sámi saying, "Fire is both a helpful friend and a strong master!," echoing Lekanoff-Gregory's statement that fire can be both damaging and regenerating. Retter described how fireplaces serve as communal spaces for sharing coffee, storytelling, and decision making.

Retter noted that controlled burns were used strategically in reindeer herding in the Sámi area (Sápmi) in northern Europe, particularly to create smoke to control the herds' behaviour and protect reindeer during mosquito season. Retter also clarified that while large-scale burning to improve grazing lands for reindeer was uncommon, historical records suggest some herders used controlled burns to enhance biodiversity, as evidenced by Sámi place names, such as *Buollenoaivi,* which indicate past wildland fires and subsequent nutrient-rich regrowth.

Gunn-Britt Retter emphasized that understanding fire's ecological impacts is essential for sustainable forest management and



COMPILED BY **WINFRIED K. DALLMANN**

Map of Indigenous Permanent Participant organizations in the Arctic Council.

Wildland Fires Sharing Circle: Arctic Indigenous Peoples on Fire Practices, Changes and Impacts at the Arctic Frontiers Conference on Feb. 1, 2024. Photo by David Jensen @jensenmedia

Sharing Circle on Emergency Management in the Arctic, at the Arctic Emergency Management Conference on March 18, 2025. Photo by Jessica Cook.

highlighted the need to integrate Indigenous Knowledge into modern environmental strategies. Retter raised a critical question for researchers and climate policy: Do controlled cultural burns emit less carbon dioxide than catastrophic wildfires?

VULNERABILITY OF INDIGENOUS COMMUNITIES

VLADIMIR KLIMOV, RAIPON

Vladimir Klimov, vice president of the Russian Association of Indigenous Peoples of the North, began his testimony by sharing about the Mansi People in Siberia and their dual-natured fire goddess who nurtures when respected but ravages when ignored.

According to Klimov, this metaphor reflects Siberia's fire crisis with record-breaking burns in 2021 and 2023. Klimov highlighted the dangerous disconnection between traditional fire practices and modern policies. While Indigenous communities like the Mansi carefully managed fire risks – collecting only dead wood and conducting controlled spring burns – outsiders now disregard these safeguards.

Tourists and settlers often spark blazes through carelessness, while laws banning traditional burning allow flammable undergrowth to accumulate. In Klimov's homeland, rising temperatures (30 C in May), careless tourists, and abandoned land management of meadows have led to more frequent and intense wildland fires, while geographic isolation leaves Indigenous territories without timely emergency response.

Vladimir Klimov also mentioned intensified threats facing his region: underground peat fires (zombie fires) that smoulder for months, destroying plant roots and seeds, and species displacement. Changing conditions have driven black bears into Mansi lands, Klimov said, disrupting ecosystems. Unlike the brown bears – a sacred animal for Mansi – black bears are aggressive toward humans and push brown bears northward, where they attack reindeer herds of Nenets People – a dual crisis undermining both ecosystems and traditional livelihoods.

Klimov advocated restoring traditional fire practices such as controlled spring burns, and teaching youth fire stewardship as Elders once did. Klimov described community-led patrols monitoring high-risk areas as a necessary method to combat the wildland fires in critical periods and called for policy changes to legitimize traditional burning methods that successfully managed fire risks for generations.

COLONIZATION FUELS WILDFIRES

CHIEF GARY HARRISON, AAC

Chief Gary Harrison, Alaska's Chair of Arctic Athabaskan Council, shared how traditional burning practices – summer grassland fires and winter dead spruce burns – once safeguarded forests, waterways, and food sources. In Chief Harrison's Alaskan community, these controlled burns reduced forest fuels, prevented catastrophic wildfires, and managed spruce bark beetles. Harrison warned that without such practices, modern wildland fires burn deeper, sterilizing soils and washing ash into streams, harming salmon and trout. In addition, deforested riverbanks also raise water temperatures, further stressing cold-water salmon already impacted by climate change.

Chief Harrison highlighted that colonization and criminalization of Indigenous burning practices have disrupted traditional Athabaskan land management practices, particularly controlled burning, leading to increased wildland fire risks and environmental degradation.

Additionally, boarding schools suppressed

> "And together as we gather around this fire that we share in common, we can come up with the solutions that we need."
>
> *- Edward Alexander, Gwich'in Council International*

Indigenous Knowledge and language. "Today, even our own people sometimes don't understand why we burned," Chief Harrison said, noting that the community is now in the revitalization process thanks to the knowledge of few Elders held from the boarding schools.

Chief Gary Harrison also stressed the need for better community planning, particularly in evacuation procedures. Reflecting on the Yellowknife area evacuations in August 2023, Chief Harrison criticized the failure to coordinate with Indigenous governments, noting how Elders were "shipped off alone to other communities" and young people were separated from their families and support systems.

Chief Harrison called for revitalization and legal recognition of Indigenous fire practices, and genuine collaboration between Indigenous Knowledge holders and scientists. Chief Harrison urges scientists to "push governments to legalize our practices" rather than just study them. "Our knowledge isn't data," he said, "It's the solution."

INDIGENOUS KNOWLEDGE MOBILIZATION

HERB NAKIMAYAK, ICC

Most Inuit communities are above the treeline, but with climate change accelerating growth and shrubification, tundra fires occur at an

Living with the Fire: The Overlooked Community Stories from Arctic Wildland Fires at the Arctic Circle Assembly on Oct.18, 2024. Photo by Rosa-Máren Magga.

unprecedented rate – a problem that requires the equitable and ethical engagement of Inuit People and their knowledge. To promote coexistence and recognition of multiple knowledge systems, the Inuit Circumpolar Council convened an Indigenous Knowledge Mobilization session led by Herb Nakimayak, Vice President of ICC Canada, at the Arctic Emergency Conference 2025 in Bodø, Norway. Nakimayak has joined the call of other Permanent Participants to establish a mechanism to address wildland fires issues across different levels and Working Groups of the Arctic Council.

SOLUTIONS: POLICY CHANGE AND INCLUSIVE FIRE MANAGEMENT

Indigenous perspectives on wildland fires gathered though the sharing circles show that wildland fires in the Arctic are not just a regional problem, but a global burning issue. Indigenous perspectives highlight that fire has a deep dual nature, both a danger and a necessity.

While modern wildland fires endanger food security, livelihoods, and cultures, Indigenous Knowledge and perspectives offer useful tools for collaboration on wildland fire management, knowledge sharing, and education of younger generations.

From Indigenous viewpoints, it is the responsibility of Indigenous Peoples to maintain ecological balance for all beings – not just humans – through intentional land stewardship practices such as cultural burning.

Arctic Council Permanent Participants pointed out during the sharing circles that wildland fires modify the relationship between humans and animals in unpredictable ways: as landscapes are radically altered, biodiversity is impacted and invasive species spread. Indigenous participants expressed the difficulty of overcoming 70 years of fire suppression, alongside the dramatic changes in the landscape and climate.

The Sharing Circles emphasized how deeply interconnected Indigenous Knowledge and fire management practices are, stressing the necessity to fully include Indigenous perspectives in national and global management and policy approaches. Collaboration among researchers, practitioners, governments and Indigenous Peoples will be key to inclusive and efficient wildland fire management.

The solution lies not in suppression but rather in stewardship and revival of ancient practices to prevent future disasters. In this respect, Sharing Circles serve as a powerful tool for empowering Indigenous governance and amplifying Indigenous perspectives in the policy making of the Arctic Council and beyond.

Anna Degteva is executive secretary of the Arctic Council Indigenous Peoples' Secretariat (IPS), supporting Indigenous Permanent Participants' organizations in the circumpolar North. In this role, Degteva facilitates the active participation and full consultation of Indigenous Peoples in the Arctic Council's work. Degteva is a member of the Indigenous Vepsian People from the Republic of Karelia in Northwest Russia; her professional work has focused on fostering Indigenous cooperation in the Arctic, while her academic research and interests have centered on knowledge systems in reindeer husbandry and adaptation and resilience in the Arctic.

Camille Vourc'h is a student in the Master of Governance and Entrepreneurship in Northern and Indigenous areas (GENI) program at UiT/USask. As part of Vourch's studies, she is working on an applied project focused on Indigenous perspectives in the Arctic Council's work. Vourc'h also holds diplomas in philosophy, anthropology, English literature, French teaching and literary translation. Vourc'h has been the owner and manager of the second-hand English Bookshop and Tearoom in Avignon for seven years, and now spends most of her time between studies and making arts and crafts in a remote village high up in the French Alps. Vourch's first literary translation (Kate Chopin) was published in 2016.

PREPARATION AND PREVENTION

DEVELOPING COMMUNITY EMERGENCY MANAGEMENT PLANS IN REMOTE ALASKA

BY JEFF ENNENGA, LISA AMANIQ SHIELD, KENNI PSENAK AND REBECCA BRAUN

Aerial view of Igiugig alongside Lake Iliamna at the mouth of the Kvichak River. The FIRE GAP program was piloted in Igiugig in 2024 and launched in January. The program is offered by Alaska Venture Fund's Alaska Wildfire Resilience Initiative. Photo by Bill Kane, Igiugig Village Tribal Stewardship Lab.

A steady burr fills the small, twin-engine, turboprop airplane – currently seating seven – as it glides above the stunning and steep snow-covered mountain slopes of the narrow and winding Lake Clark Pass on a clear, sunny day.

The pass connects Western Alaska with Alaska's biggest city, Anchorage. The western end of Lake Clark Pass opens onto Lake Clark and just beyond is Alaska's largest lake, Lake Iliamna. Indigenous communities with thousands of years of place-based knowledge and ties live in the surrounding Lakes Region. And many of them, like the small Village of Igiugig – about 70 people – at the mouth of the Kvichak River on the southwestern end of Lake Iliamna, are accessible only via small aircraft or barge. Flight time varies from one hour to three hours to days depending on the weather, the size of the small plane and the number of stops made to other communities along the way. This is remote Alaska, lying at the southwestern edge of Alaska's boreal, where taiga meets tundra.

Rural communities and tribes all over Alaska face significant and increasing challenges in addressing all types of climate-related disasters, including the devastating impacts of structural and wildland fires. The scale and complexity of Alaska's geographical, cultural, and economic landscape complicates all types of fire management and response efforts, creating an urgent need to enhance and build upon community capacities and resources.

FIRE GAP instructor Paul Pellegrini training Igiugig community members on the use of water extinguishers. Photo by Bill Kane, Igiugig Village Tribal Stewardship Lab.

Like Igiugig, many of Alaska's rural and tribal areas are often accessible only by air or water, which limits rapid deployment of firefighting resources and the accessibility of mutual aid. About 60 per cent of Alaska communities (170 of 285) do not have a state-registered fire department, limiting opportunities for funding to obtain appropriate and much needed infrastructure. Nearly all 235 rural Alaska communities lack basic firefighting infrastructure, including fire stations, equipment, and reliable communications systems. In some cases, the limited infrastructure makes it difficult to quickly access water for fire fighting; this often results in significant property damage and loss of life during emergencies. According to Alaska civilian fire fatality statistics, rural Alaska communities have endured 8.7 times more fire fatalities in the last 20 years than areas with fire department capabilities.

On the wildland side, climate change is exacerbating the challenges in Alaska's carbon-rich boreal forests and tundra landscapes. Increasing Arctic temperatures, increasing permafrost loss, longer fire seasons, more lightning and changing precipitation patterns are leading to more frequent and severe wildfires. According to the Alaska Fire Science Consortium's 2025 edition of the report *Alaska's Changing Wildfire Environment* by the University of Fairbanks, these trends are expected to continue, putting more communities at risk.

A 2022 report, *The Role of First Nations Guardians in Wildfire Response & Management: A Proposed National Strategy,* predicts that Alaska could experience an increase in annual acres burned by as much as 150 per cent by 2050, and these fires aren't limited to fire-dependent ecosystems like much of the arctic boreal. Over the past 20 years, the tundra, shrub and grass dominated-Bristol Bay region – located in salmon rich southwestern Alaska and covering 40,000 square miles – has experienced a 7,500 per cent increase in acres burned. In 2022, more acres burned in Bristol Bay than the entire previous 72 years combined.

A steady burr fills the cabin as the twin-prop plane glides through Lake Clark Pass — where taiga meets tundra, and fire response means survival.

In remote Alaska communities, evacuation routes – when they're available – are often limited, complicating emergency response efforts. Additionally, most communities lack response resources and community wildfire protection plans for effective defense and response effort; this impacts community member health, including from wildfire smoke. Evacuation and standard response tactics, such as retardant drops on subsistence landscapes, can also inhibit subsistence activities and jeopardize food security for years.

Fire safety education, including public health

information, is crucial in rural areas where access to emergency services is extremely limited. Communities are often unsure who to contact for specific fire training, prevention and information needs. A significant number of communities, nearly 83 per cent of which are rural, lack the resources and expertise needed to deliver effective fire safety education, contributing to the disproportionate rate of fire fatalities in these areas. Fire communications for prevention, education and response also need to reflect diverse audiences and be tailored for communities.

Traditional ecological knowledge, along with culturally appropriate and inclusive Indigenous knowledge, can play a crucial role in developing effective fire management strategies.

The in-community training course, Fire Incident Response Education, Guardianship and Preparedness (FIRE GAP), focuses on rural Alaska community fire resiliency, and mitigating the risks and impacts of all types of fire in rural Alaska. Launched in 2024, FIRE GAP is a pilot training program offered by Alaska Venture Fund's Alaska Wildfire Resilience Initiative. Trainers with extensive

Igiugig community members working through a tabletop simulation of responding to a structural fire, considering incident command structure, available resources, and scene safety. Photo by Bill Kane, Igiugig Village Tribal Stewardship Lab.

wildland and structural fire and fire education backgrounds travel to communities to offer in person training, as well as provide remote technical support. While currently waiting to secure additional funding, 10 remote rural Alaska communities are primed to launch their own FIRE GAP trainings.

The FIRE GAP training empowers community members to prevent and manage structural and wildland fires; it provides tools for community education and building a scalable training program. FIRE GAP includes mentoring individual community members to pursue additional emergency response training certifications and guidance on how to acquire the necessary firefighting equipment.

FIRE GAP bridges knowledge and skills gaps and builds upon limited or no response capabilities, so that rural Alaska communities can make informed and locally led decisions about emergency fire planning and response. Components of the training include outreach with youth to maximize a holistic approach to community engagement and foster potential future workforce opportunities.

To enhance community response resources and capabilities, appropriate fire prevention equipment is recommended by the FIRE GAP technical assistance team in partnership with federal and state agencies and when possible, provided, based on a community's capacity. Available equipment includes water

Nearly 60 per cent of Alaska's communities have no registered fire department. FIRE GAP can change that — one village at a time.

extinguishers, backpack fire pumps, home fire blankets, battery-powered weed blowers, weed trimmers, chainsaws, and hedge trimmers. In collaboration with the American Red Cross, home assessments and training courses are offered, including residential smoke alarm installations, and first aid and CPR training. Additionally, in partnership with the Alaska Native Tribal Health Consortium's Healthy Homes project, communities can install PurpleAir monitoring systems, which collect air-quality data.

FIRE GAP aims to enhance community-led capacity by implementing tailored fire gap training programs in Alaska's rural and tribal regions. Technical instructor teams, consisting of experts in wildland and structural response, and public education are trained to work in remote areas through a train-the-trainer course; this training includes developing comprehensive skills and cultural competence to foster respectful and effective collaboration with Indigenous communities.

In April 2024 Alaska Venture Fund's Alaska Wildfire Resilience Initiative team travelled to Igiugig to begin building the FIRE GAP training in partnership with the community. Over the next year, Igiugig and the team strategized, developed curriculum, trained trainers and built a menu of fire education and training options for rural Alaska communities to choose from. In January 2025, FIRE GAP lead Lisa Amaniq Shield and trainer Paul Pellegrini, a retired wildland and urban firefighter and trainer, travelled to Igiugig to pilot the co-created FIRE GAP training. This included components for the entire community as well as activities targeted for different ages and interests. Everyone who was in town was offered training. Activities occurred at the library, the school, and tribal offices. Community members who were housebound received one-on-one training in their homes.

The training included discussions, demonstrations, scenario modeling, and games. For part of the week, participants chose one of two tracks, (1) community preparedness and education and (2) fire response. Younger elementary school-aged children worked through a series of original stories written by Shield, illustrated by Iñupiaq artist Crystal Jackson, and published in a limited run for the Igiugig training.

Animals are the main characters in the books, which weave in Yugtun (Central Yup'ik) language and interactive activities. Children were given small drums, and in the first story, children beat the drums to the rhythm of the smoke alarm. Subsequent stories call on the children to create words and movements to pass on the animals' fire safety lessons using traditional ways of teaching, through song and dance and storytelling.

The training culminated in a community potluck where the children performed the dance, sharing the lessons they learned and inviting community members to learn the

dance. Martha Crow was one of the adults who joined the children. She said it was uplifting to see the children integrate Yup'ik language and use dance to diffuse the weightiness of the week's lessons: "It was heavy topics; we heard real-life experiences about deaths that could have been prevented. The music and the dance and the singing really did bring a healing finish."

Participants say they are already using what they learned. Crow said she plans to clear the wild sedge around her house to reduce fire risk and is evaluating her home electronics in light of what she learned about electrical fires. Another community member, Jeff Bringhurst, said he replaced a smoke alarm and ordered an extra length of hose to ensure water can reach every room in the house.

Bringhurst, who operates the community's water system and small farm, said the training helped the community address longtime concerns. "There's a lot of things we've been talking about for years in this village – we've been fearful about wildfires, so having [teachers] go through all our fire equipment and start to organize it into response-ready [condition] was super helpful. And tell us what we need to get to make us more effective."

No two communities are alike. Addressing the unique fire management challenges encountered by rural Alaska communities and tribes deserves a comprehensive approach that includes assessing the current capabilities of each community, enhancing or providing essential suppression equipment, and imparting critical knowledge related to structural and wildland fire management.

The FIRE GAP training enhances the safety and resilience of rural Alaska communities. FIRE GAP's community based collaborative approach better prepares for and prevents disasters by increasing individual preparedness and mentoring those in communities looking to organize around fire management, pursue grant opportunities and gain employment as wildland firefighters.

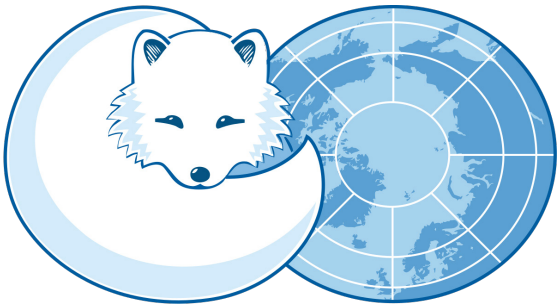
Crow said she hoped all communities in Alaska could get this training: "There's all kinds of different learning and thinking opportunities with this training. This is a very much-needed training for all villages in Alaska."

Jeff Ennenga is Alaska Venture Fund's wildfire resilience program director and has 30 years of fire training, wildland fire management and emergency preparedness experience in Alaska and Oregon. He is a planning sections chief and works in operations on one of Alaska's complex incident management teams, and has worked both as a wildland firefighter and volunteer structural firefighter with the State of Alaska Division of Forestry, the Alaska State Fire Marshal and the Alaska Division of Homeland Security and Emergency Management.

Lisa Amaniq Shield is Alaska Venture Fund's community wildfire resilience & workforce coordinator and has decades of fire safety and public education experience, and partnerships with more than 150 Alaska communities. Through listening to the needs of rural Alaskans, Shield has helped develop and tailored rural fire training programs for isolated communities across Alaska.

Kenni Psenak is Alaska Venture Fund's wildfire outreach & communications manager. Psenak is a recently trained wildland firefighter and interdisciplinary communicator with a background in behavior change marketing, crisis communications and public health communications tailored for Alaska audiences.

Rebecca Braun is Alaska Venture Fund's senior writer and policy advisor. She served as a consultant at McKinley Research Group and as policy director in the Alaska Office of the Governor. She spent many years in journalism, primarily as publisher-editor of the Alaska Budget Report, a nonpartisan publication that covered state government in depth.



ARCTIC COUNCIL

WILDFIRE

International Association of Wildland Fire