Mayo
Community Wildfire Protection Plan 2024

Wildland Fire Management

Adoption of the Mayo Community Wildfire Protection Plan

The Mayo Community Wildfire Protection Plan (CWPP) was developed between May 2023 and June 2024 and represents a collaborative effort between First Nation of Na-Cho Nyäk Dun, the Village of Mayo and Government of Yukon to take action to address the threat of wildland fire to the Mayo community.

This plan is intended to serve as a planning tool for residents and fire and land managers. It will enable them to assess risks associated with wildland fire, identify mitigation strategies, and make and implement recommendations for reducing those risks.

Feb. 24, 2025

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Date

Chief Administrative Officer

Village of Mayo

Feb 20. 2025

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Date

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Acknowledgments

We respectfully acknowledge that the land within this Community Wildfire Protection Plan is in traditional territory of the Na-Cho Nyäk Dun First Nation. We acknowledge with respect the diverse history and culture of the Na-Cho Nyäk Dun peoples of this territory.

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Executive Summary

The Mayo Community Wildfire Protection Plan and the accompanying Mayo Fuel Management Plan are a set of recommendations and actions for increasing the resilience of the community. The CWPP identifies the wildfire risks surrounding the community, potential consequences of a wildfire to the community, and recommends possible ways to reduce the risk. Although wildfire threat cannot be eliminated within the Area of Interest (AOI), the Community Wildfire Protection Plan (CWPP) can build on existing efforts to significantly reduce the potential impacts.

The recommendations in this plan are based on a review of best practices from other jurisdictions, gaps identified through community engagement, the local wildfire risk analysis, prevention of human-caused ignitions, and integration of FireSmart program principles. Forest fuels management is recommended both within the wildland-urban interface immediately surrounding developed areas, as well as at the landscape level.

A community meeting was held on May 16, 2024 with over 80 people in attendance from the community. Suggestions and ideas were gathered and will be incorporated in a future planning session to prioritize community education, awareness and other activities proposed in Appendix 3: Risk Management Strategies and Actions which makes recommendations to improve the wildfire-resilience of the community and its residents. These recommendations should be prioritized by the local, First Nations, and territorial governments depending on local strengths, opportunities, and the availability of human, financial, and physical resources.

Proposed fuels treatments in this plan are identified areas of interests using the best available spatial data, fire science research and local knowledge. Actual areas and treatment will be decided on a later date based on knowledge gathered including recreational and social values, wildlife, heritage, riparian features, etc. If applicable, proposed work will be subject to the Yukon Environmental and Socio-economic Assessment Board.

Mayo Community Wildfire Protection Plan

Contents

1. Purpose

Wildfire is an essential natural process in the Yukon's boreal forests. It is a key driver of ecological resilience and both plant and animal species rely on its occurrence. Wildfire also poses a threat to human life, homes, infrastructure and, when at unusually high severity or frequency, the natural environment as well. As human development expands further into natural ecosystems, more communities and industries are at risk of wildfire impacts.

The purpose of this Community Wildfire Protection Plan (CWPP) is to provide a sustainable wildfire risk management strategy and tools to increase wildfire resiliency and support the Village of Mayo, the Na-Cho Nyäk Dun First Nation, surrounding communities, and interested stakeholders.

This CWPP outlines the active governance, community, social and cultural aspects of the community as well as the environment in which it inhabits to identify the wildfire risk potential.

The CWPP then identifies the wildfire risk potential within and surrounding the Mayo CWPP Planning Area and describes the values at risk of wildfire impacts within the Area of Interest (AOI).

The plan then proposes tools to reduce factors identified in the risk assessment. The goal of these tools is to manage fuels surrounding the community, allow safe and operational spaces for wildfire crews to respond to fire, and prepare community members, stakeholders and local infrastructure to become fire resilient.

The recommendations and actions developed in this CWPP aim to be integrated with present and future land and community management plans, and be implemented with the involvement of community members and relevant stakeholders.

Source: Yukon News

2. Planning Area

2.1 Planning Area Description

The AOI is centred around the Village of Mayo and lies on the traditional territory of the First Nation of Na-Cho Nyäk Dun (FFNND) at the confluence of the Mayo and Stewart rivers, as shown in Figure 1. Since time immemorial the Na-Cho Nyäk Dun people have lived off the land, traveling throughout their territory and occupying the area around the AOI at various times of the year, hunting, fishing and gathering food to survive. For more on Na-Cho Nyäk Dun history visit their webpage[1].

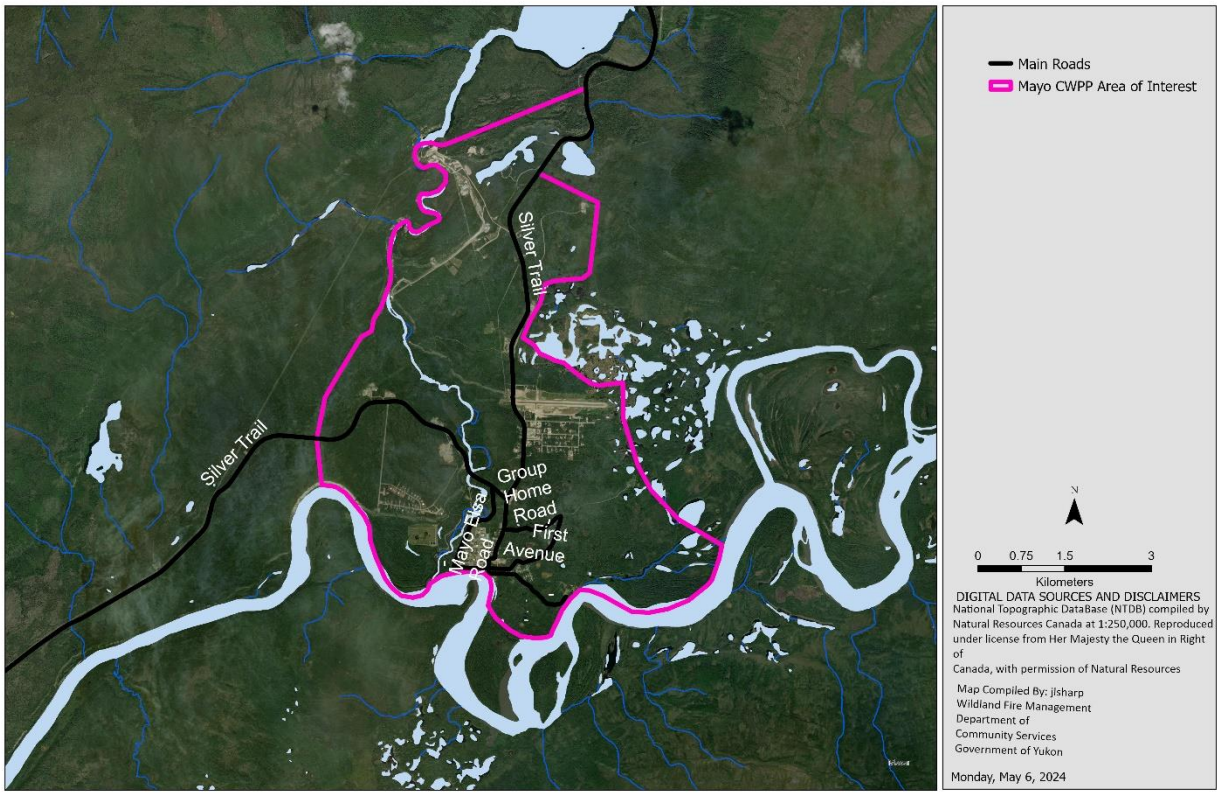

Figure 1. Mayo Community Wildfire Protection Plan Area of Interest (AOI)

Accessibily to the area via the Mayo and Stewart rivers made the location suitable as a service centre for the significant silver, zinc and lead mining activities in the surrounding area, and the town site of Mayo was established in 1903. The Village of Mayo was incorporated in June 1984 and today Mayo is a tourist destination with an emphasis on wildnerness tourism: canoeing, hiking, big-game hunting and fly-in fishing.

Today the Village of Mayo lies just over 50 km via the Silver Trial, a paved doube-lane road, from Stewart Crossing. Alternative egress route is to continue on Silver Trail, which shortly after leaving Mayo turns to gravel, to head to Keno City approximately 60 km away. With a summer population of approximately 20 residents, Keno City doesn't offer a lot of emergency service infrastructure or amenities.

[1] First Nation of Na-Cho Nyäk Dun website: https://www.nndfn.com/

Three institutions provide public services to the approximately 460[2] residents of the broader Mayo area: the FNNND, the Village of Mayo, and the Government of Yukon. FNNND provides a broad range of services to its citizens including: health and social services, capital and housing development, and the management of heritage and natural resources within the FNNND Traditional Territory. The Village of Mayo supplies the community with water and sewer, recreation, recycling, management of the landfill, volunteer fire fighting, land planning and administration, tourism planning and the management of heritage resources.

The Government of Yukon provides additional services in the community, including health care, infrastructure maintenance, ambulance service (staffed by community volunteers), environmental monitoring and management, justice, regulatory services for the monitoring and enforcement of conservation and mining in the region, and a suite of social services.

At present the community of Mayo is not growing. Its population is in fact lower than in 2016[2] and there is minimal new development.

2.2 Socio-economic description

2.2.1 Governance

The First Nation of Na-Cho Nyäk Dun (FNNND) signed a Land Claims and Self-Government Agreement with the Government of Canada in 1993 and shortly after had established the First Nation of Na-Cho Nyäk Dun Development Corporation. Today the FNNND hold council via one elected chief, one deputy chief, four councillors and one youth concillor. Elections are held every 4 years with the most recent council sworn in on April 22, 2023.

The Village of Mayo was incorporated as a municipality in 1984 and is run by a mayor and four councillors who meet fortnightly.

[2] Yukon Community Statistics. 2022. Available: https://community-statistics.service.yukon.ca/pages/mayo

Binet House Interpretive Centre. Source: Government of Yukon

2.3 Ecological Description

The Ecological and Landscape Classification (ELC) system is used across the Yukon to identify and describe landscape patterns into ecosystem units based on climate, landscape, vegetation, and soil conditions.

Mayo falls within the Yukon Plateau North Ecoregion within the Boreal Cordillera Ecozone[3]. Relative to other parts of Canada, the climate of the Boreal Cordillera is defined by its long, cold winters and short, warm summers. Mayo is also known for the temperature extremes it experiences-temperatures have ranged from -62°C in the winter to 36°C in the summer. The Stewart River valley can be one of the warmest valley's in the Yukon in the summer.

The physiography of the broader region surrounding the AOI consists of rolling uplands with steep slopes. Permafrost is discontinuous and irregular in the area. Near Mayo it has been measured at around 5-7 meters thick and in other ares up to 40 metres thick.

The Village of Mayo sits in the Stewart River valley on the floodplain of the Stewart River, where the elevation is mostly below 500 meters above sea level. Throughout the community, forests are commonly mixedwood: white and black spruce (*Picea glauca* and *Picea mariana*), trembling aspen (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*) with moderately developed understories. Wetlands are also present in and around the AOI.

For a detailed description of the physiography, geology, glacial history, climate, hydrology, soils, vegetation, and wildlife within the Yukon Plateau North Ecoregion refer to the *Ecoregions of the Yukon Territory* Technical Bulletin[3], pages 197 – 206.

[3] Smith, C.A.S., Meikle, J.C., and Roots, C.F. (editors), 2004. Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes. Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia, 313 p. Available at: https://yukon.ca/sites/yukon.ca/files/env/env-ecoregions-yukon-territory.pdf

2.4 Natural Disturbance and Forest Succession

Wildfire has historically been the dominant agent of disturbance of the boreal ecosystems found in and around the AOI.[4] These wildfire events can be characterized as relatively infrequent but burn with a high fire intensity and are stand replacing when they occur.

Other agents of disturbance such as pests, pathogens and windthrow have generally been incidental to forest succession in the Yukon; although, some insect outbreaks have caused stress and subsequent mortality to large tracts of forest. This could impact the wildfire resilience of an area as dead standing and fallen trees can significantly increase fire behaviour for a period of time.

Yukon's Forest Management Branch conducts annual aerial surveys to monitor forest health in the territory, though a zonation approach. Areas are surveyed once every 3-7 years.[5] The Mayo area (Forest Health Zone 2) was last surveyed in 2019[6] and two things of note were reported: incidence of eastern spruce budworm (*Choristoneura fumiferana*) attack near Mayo (roughly 30 km southwest along the Silver Trail highway) and severe defoliation of aspen due to aspen serpentine leafminer (*Phyllocnistis populiella*) in a similar area.

Spruce Health

While the incidence of eastern spruce budworm was not of significant concern in 2020[6] it did prompt a special follow-up survey done in 2021 in the same area and the recommendation of an additional follow-up in 2022[7]. This is something to keep in mind when doing fuel management treatments. Haphazard cuts to the bole (trunk) of spruce trees during pruning and brushing activities could decrease overall resistance to endemic pests.

Aspen Health

The 'aspen decline' complex is a phenomenon that has been found across Canada and the United States and was first detected in Yukon in 1987. It is unclear exactly what is causing widespread mortality of aspen stands but it is suspected to be induced by drought and exacerbated by a number of factors including insect and fungi attack, snow and ice damage, site and stand structure, land-use history, topography, and inter- and intra-specific competition. The Forest Management Branch has detected a steady increase in areas effected by aspen decline over the years. It is expected that a warming climate is only going to exacerbate this problem and widespread aspen decline could affect wildfire strategy in the area.

Trembling aspen has been known to reduce wildfire intensities such that in pure or nearly pure stands it has been regarded as a 'natural fuel break' on the landscape. This is in part due to the increased levels of foliar moisture in the leaves compared to coniferous trees. If leaves have been severely defoliated or if

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[4] Flooding is also a significant disturbance for low lying forests. It is most common in spring and can also occur dur to ice jams that form during spring break up or winter freeze up.

[5] Government of Yukon. 2020. *Yukon Forest Health Report*. Whitehorse. Accessible: https://yukon.ca/sites/yukon.ca/files/emr-2020-yukon-forest-health-report.pdf

[6] Government of Yukon. 2019. *Yukon Forest Health Report*. Whitehorse. Accessible: https://yukon.ca/sites/yukon.ca/files/emr/emr-2019-yukon-forest-health-report.pdf

[7] Government of Yukon. 2021. *Yukon Forest Health Report*. Whitehorse. Accessible: https://yukon.ca/sites/yukon.ca/files/emr/emr-2021-forest-health-report.pdf

large patches are experiencing aspen decline the result could alter the relationship between aspen and wildfire on the landscape. Aspen forests can also act as wind breaks, reducing the influence of surface winds on fire spread and reducing the ability for embers to spread. It is therefore crucial that aspen health continue to be monitored in the Mayo area and that a contingency plan be developed in the event of a large aspen dieback.

3. Wildfire Summary

3.1 Drivers of a wildfire

There are three interacting elements that drive a wildfire, commonly referred to as the 'fire triangle' (Figure 2): fuel, weather and topography. The interaction between these three factors determine how a wildfire behaves – how fast it spreads and how intensely it burns.

Fuel refers to any flammable material including vegetation (leaves, bark, trees, duff) that are burned by the fire. It can also include man-made fuels, such as buildings. The fuel type, dryness, size and arrangement can all influence the speed, size and severity of a wildfire. Fuel is the only component of a wildfire that we can control, and also the most significant (no fuel, no fire). Fuel treatment plans aim at changing the arrangement, size and even type of fuel in an area around an asset or a community to change how a fire behaves. Reducing fire behaviour to allow wildfire response crews to control or extinguish a fire is a critical objective of fuel treatment plans.

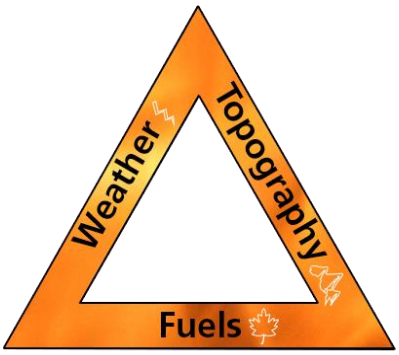

Figure 2. The fire triangle – interacting components that drive a wildfire.

Weather also influences how fast a fire moves and how intensely it burns. It also influences whether an ignition, like a lightning strike, will extinguish or develop into a large fire. Winds at ground level and at higher elevations will drive a fire forwards, enable the spread of embers and supply the fire with oxygen to increase combustion. Further, atmospheric dryness, lack of rain and high air temperature will contribute to the degree and rate of fuels drying, making them more available to burn. At extreme weather conditions, weather becomes a more significant factor in fire growth than the type of fuel.

Topography describes land shape, elevation above sea level, steepness and the direction of a slope (e.g. south facing). Topography also includes land features such as canyons and valleys. All of these features can help or slow wildfire spread. Elevation influences weather conditions (like air temperature). Slope aspect influences vegetation growth and dryness (south facing slopes have more heat from the sun and so are drier). Slope also influences how fast a fire moves: faster uphill due to pre-heating of vegetation from rising hot air and flame, and slower downhill. Features such as valleys influence wildfire spread by directing wind flow.

3.2 Components of a wildfire

Wildfire can negatively impact a value, such as a home, through direct flame contact, radiant heat exposure, convective energy output (i.e. 'fire smoke column'), embers and smoke exposure.

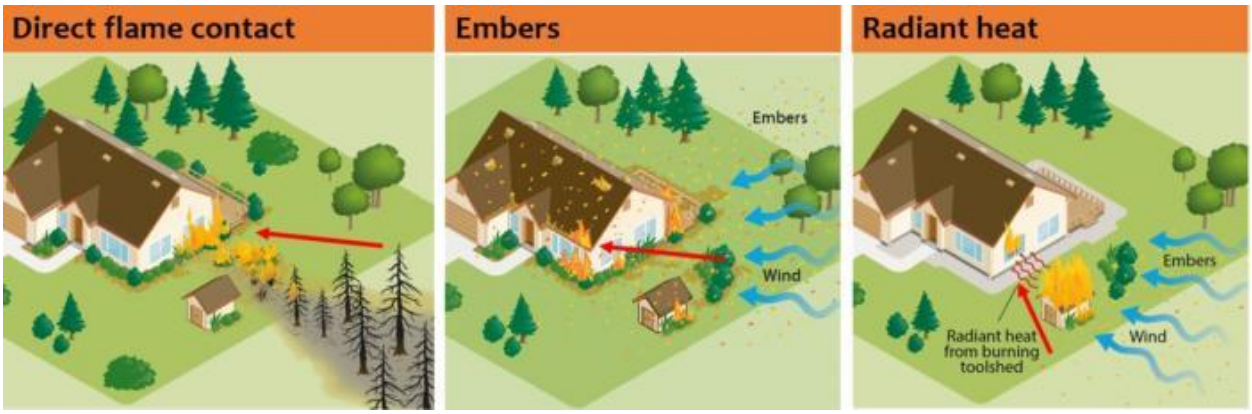

Figure 3. Example of how a wildfire can impact a home[8]

Figure 3 above illustrates how direct flame contact, embers and radiant heat from nearby fuel can impact a home. Convective energy refers to the heat energy produced by a wildfire that rises into the atmosphere (Figure 4). Visible as a fire smoke plume (or 'convection column') this energy can create strong winds that increase fire growth and damage structures. It can also generate lightning storms, sparking more fires.

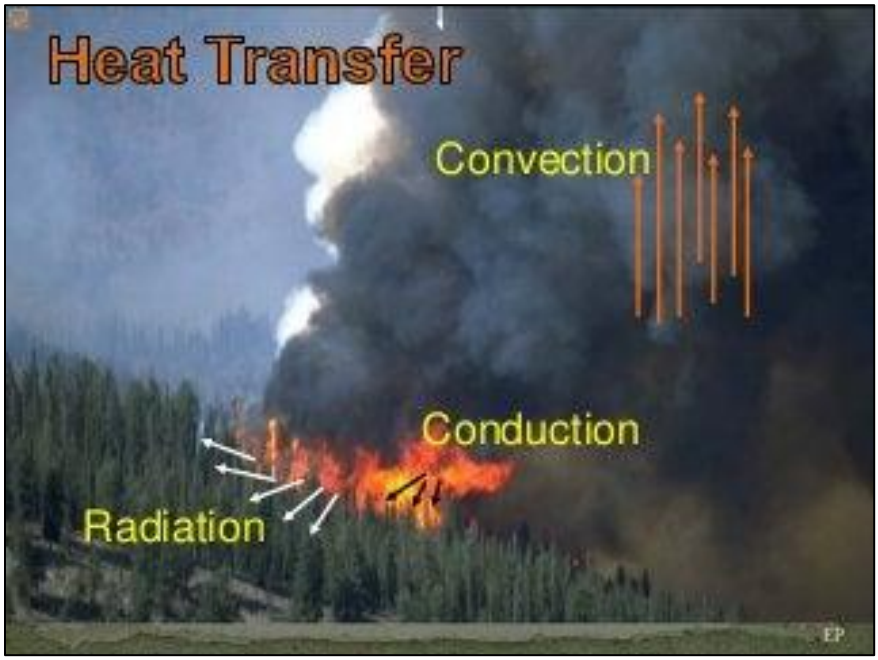

Figure 4. Example of three different types of heat and energy transfer.

[8] University of California. 2022. *Preparing Your Home*. Wildfire Preparation. Available: https://ucanr.edu/sites/fire/Prepare/Building/

3.3 What is Wildfire Risk?

Detailed wildland fire risk methods can be found in the following report, *Yukon Communities: Wildland Fire Risk Assessment Methodology Project* (WFRAM Report).[9] The WFRAM Report uses the internationally recognised risk management standard ISO 31000 "Risk Management – Principles and Guidelines" and applies it for wildland fire risk management using an adaptation of research by Al Beaver.[10,11] The following is a summary of key principles in the WFRAM Report.

Wildfire risk can be described as a function of the following risk components:

Wildfire Risk = Likelihood x Severity x Exposure x Values x Vulnerability

The following is a brief description of each of the risk components presented in the WFRAM Report:

Likelihood	The chance of a wildfire occurring, often examined by analysing past ignition trends, the frequency of destructive climatic and weather events and trends forecast under a changing climate.
Severity	Severity usually refers to how much fuel is consumed by the fire and how much heat energy is produced. A high severity fire consumes almost all vegetation, often moves quickly and produces enough energy to be difficult to suppress or control. Severity is driven by the fire triangle components: fuel, weather and terrain.
Exposure	The seasonal and diurnal time and duration a value that is vulnerable to the assessed likelihood x severity may be exposed. It is primarily determined by the proximity of the value to the likelihood, the topography, direction and rate of spread, embers, smoke dispersion and what the duration of fireline intensity will be upon arrival.
Value	A 'value' is any social, environmental or economic asset that is considered valuable by a community, land manager or industry.
Vulnerability	How predisposed to damage from a wildfire is a value if it is exposed to the assessed likelihood and severity discussed above.

It should be noted that this risk equation follows the zero properties law of multiplication that states any number multiplied by zero equals zero. In this case, if any one of the risk components can be eliminated (zero) then the wildfire risk is also eliminated (zero). For example, there is no wildfire risk if there is no vulnerability, such as the case where a structure is built with non flammable materials like concrete. Completely eliminating wildfire risk is usually extremely difficult to achieve and it is the task of land managers and communities to identify which controls or mitigations they can employ to reduce the components that make up wildfire risk to their area of interest and to their unique values. Table 1 below provides examples for each component of wildfire risk and some of their potential controls.

[9] Ember Research Services Ltd. 2017. *Yukon Communities: Wildland Fire Risk Assessment Methodology Project*. Report for Yukon Wildland Fire Management

[10] Note ISO 31000:2018 is a more recent version of the risk management standard discussed in the report.

[11] Beaver A. 2015. *Wildland Fire Risk Management and Decision Making*. Conference proceedings: 13th International Wildland Fire Safety Summit and 4th Human Dimensions of Wildland Fire Conference. April 20-24, Boise, Idaho.

Table 1. Wildfire Risk Matrix with examples for risk drivers (risk analysis) and mitigation examples (potential controls)[3]

	Likelihood	x Severity	x Exposure	x Value(s)	x Vulnerability
Risk Analysis	• Ignition History • *Lightning • *Human • Seasonality • Fuel Hazard • Fire Cycle • Fire Interval • Historic Weather • Climate Change	• Rate of Spread • Crown Fraction Burned • Fuel Consumption • Fire Intensity • Radiant Heat Flux • Embers • Smoke	• Proximity to value • *Direction • *Distance • *Topography • Length/Breadth Ratio • Property Density • Smoke transport • Severity Duration	• Public • Response Resources • Property (WUI) • Infrastructure • Industry • Cultural • Environment • Watersheds	• Human Physiology • Property Construction • Property Maintenance • Subdivision Design • Socio – Economics • Biodiversity • Fire Effects • Resilience
Potential Controls	• Education • Engineering • *Spark Arresters • *Power Grid Mgnt • Enforcement • *Fire Bans • *Area Closures	• Fuel Management • *Hazard Reduction • *Ecological Burning • *Mechanical	• Community Layout & Design • Defensible Space • Strategic Fuel Breaks • Area Closures • Fire Response • Warnings • Evacuations	• Education • Harvesting • Salvage	• Building Controls • Land Use • Resilience • Ecological prescribed fire

Source: adapted from Beaver 2015 conference proceedings[10]

3.4 Wildfire Regime

A wildfire regime is the pattern of fire frequency, size, intensity, type and severity in an area. Boreal forests are a fire dependent ecosystem, adapted to wildfire as the main forest disturbance and driver of ecological processes.

Boreal forests are closed canopy forests, with a moist and shaded forest floor, limiting most fires to small areas with high moisture levels and lowered wind speeds within forest stands. These conditions often result in surface and ground fires; however, the boreal forest is known for its high intensity crown fire potential (**Error! Reference source not found.**).

Figure 5. Examples of different wildfire types.

Ground fires burn beneath the surface (deeper duff layers, tree roots). These fires can 'overwinter', which means they can continue to smoulder underground during winter and, when the right conditions arrive, can appear above ground by burning up through drying fuels. These fires can be difficult to suppress completely and need monitoring.

Surface fires spread along the forest floor, burning fuels on the ground (leaf litter and duff layer) and woody debris. The rate of fire spread depends on many factors; however, intensity is usually at a manageable level for successful wildfire suppression.

Crown fires are those which travel through the tree canopies and most often completely burn fuel at all levels in the forest from the ground up. Crown fires are typically high intensity, large wildfires that occur during warm and dry weather patterns that remain long enough to dry out vegetation and cause extreme fire conditions.

Crown fires typically spread at an extreme rate and cause long-distance spotting of embers. Long-distance spotting occurs when significant embers are produced from burning material, which are lifted into the atmosphere due to strong winds and convective energy and then projected kilometers in front of the main fire. These embers can start new fires well in front of the main fire and rapidly increase fire spread. These fires are the most intense type of fire and are often difficult or possible to suppress without changes to fuel and/or weather conditions.

The fire regime also fluctuates with seasons. Spring wildfire risk can be high in between the time of snow melt, and when green-up occurs and grasses start growing. Green-up is when deciduous trees produce leaves with high moisture content making them harder to burn. When grasses begin growing they also increase their moisture content, turning green. Strong winds can dry vegetation and support wildfires in spring weather windows. Once deciduous trees reach the green-up stage, then the wildfire risk can lower for a period until warm summer conditions persist long enough to dry fuels.

While some of the Yukon's First Nations people used fire as a land management tool, the history of cultural burning practices in the Mayo area is unknown.

North Klondike Highway, 2022. Source: Government of Yukon

4. Wildfire Risk Assessment

4.1 Environmental Factors

4.1.1 Weather

The Mayo weather station is located at the Mayo airport and has 70 years of records that have been analysed to provide a history of fire weather patterns (Table 2). Weather data was analysed every year from 1st May until the station was turned off in winter.

Table 2. Mayo weather station details

Station	Agency	Latitude	Longitude	Elevation	Years with Records	Number of Years	Number of records
Mayo	MSC	63.617	-135.867	504m	1953 to 2022	70	12538

Weather data can be summarised into percentiles.[12] This is a useful way to compare weather records against the maximum and other percentiles to gauge how high or extreme values are (Table 3).

Table 3. Summary of high percentile weather data for Mayo weather station (daily values)

				Percentiles				
Variable	Mean	Max	Median	70th	80th	90th	95th	99th
Temperature (°C)	12.5	33.3	13.9	17.2	19.3	21.7	23.4	26.1
Relative Humidity (%)	56.5	11.0	55.0	43.0	38.0	32.0	28.0	22.0
Wind Speed (km/h)	7.8	50.0	7.0	10.0	13.0	16.0	19.0	26.0
Precipitation (mm in one day)	1.1	35.4	0.0	0.6	1.6	3.8	6.2	12.6

Mayo weather station also calculates Fire Weather Index (FWI) System values. The following chart (Figure 5), displays FWI values for the weather records available. The FWI is a rating of potential fire intensity. It uses weather observations to calculate the dryness of the fuel and expected fire behaviour should an ignitions start on that day. It does not consider fuel type or terrain.

Figure 5 illustrates that high FWI conditions occur most frequently in the spring and early summer. High FWI values gradually ease off during summer, the timing of which varies by the individual season.

[12] A percentile is a measure used to indicate the value below which a given percentage of observations fall (e.g. 70th percentile is the value below which 70% of the data can be found). A 99th percentile temperature value is one where 99% of other temperature values recorded are lower than the 99th percentile value.

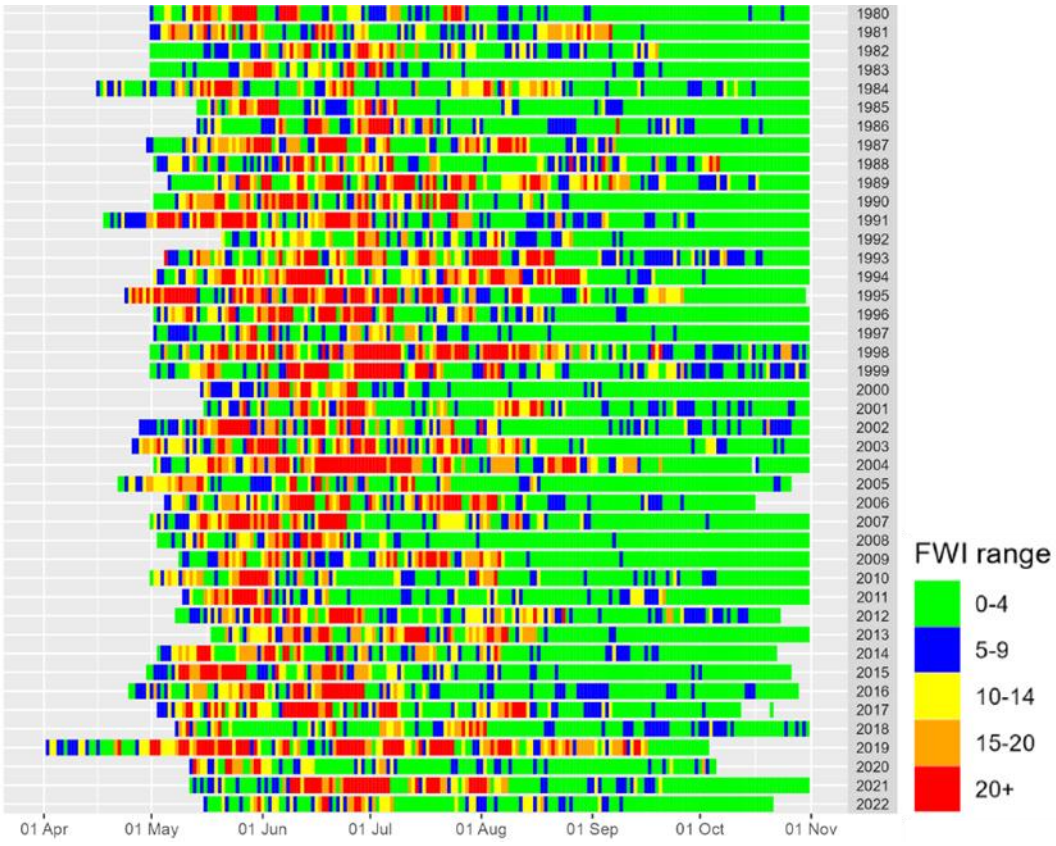

Figure 5. Recorded Fire Weather Index (FWI) values at Mayo weather station since 1980.

An important component of weather data is wind speed and direction. Wind is a key driver of fire behaviour and the path in which it spreads. The terrain surrounding Mayo influences wind direction, with the Stewart River valley to the east and south west of town, as well as the Mayo River valley directly to the north. Mountainous terrain will also have local impacts such as higher wind speeds as air flows over ridges and eddy effects on leeward slopes.

Wind records can be analysed to show the number of times a wind direction was recorded at the weather station to gain an understanding of which wind directions are most frequent. Wind records were formatted into a wind rose (Figure 6). These diagrams are informative to determine the most frequent wind direction and strength by season. The colour of the wind rose displays the frequency of wind speeds recorded in each direction. Figure 6 shows that Mayo weather station predominantly recordeds stronger winds from the east in spring, the south to west in summer and north to east in fall.

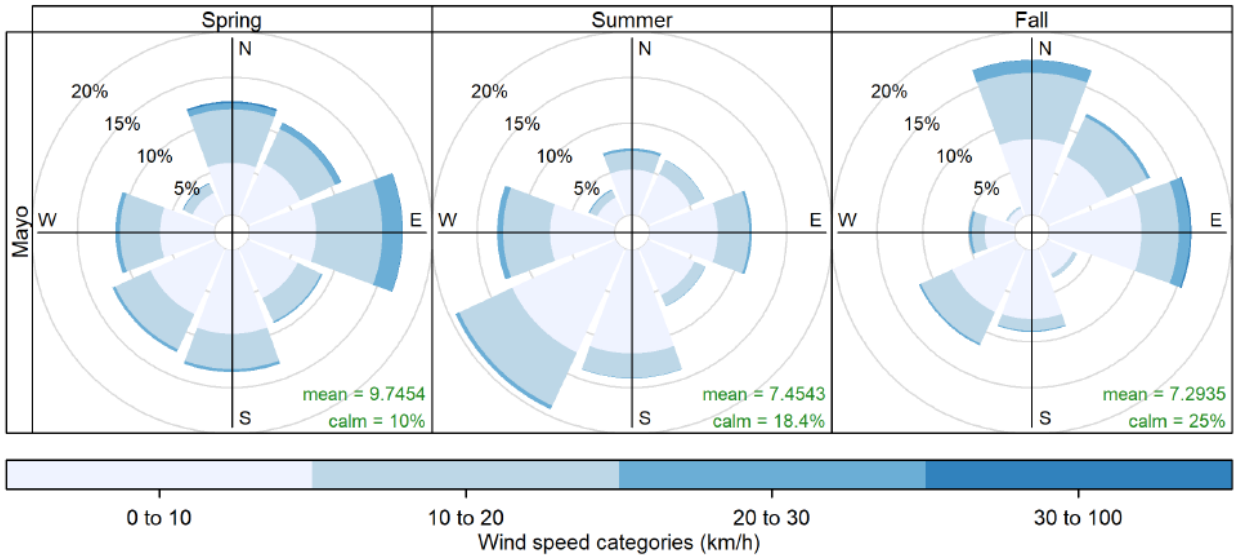

Figure 6. Wind rose showing historic wind speed frequency count by wind direction for each season (spring, summer and fall) as recorded at Mayo weather station.

Applying FWI data to wind rose charts enables an overview of whether high FWI values were recorded under a predominant wind direction. Figure 7 illustrates that for Mayo, high FWI days can occur under under any wind direction; however, there are dominant wind directions that occur during high FWI days, which differs across the seasons.

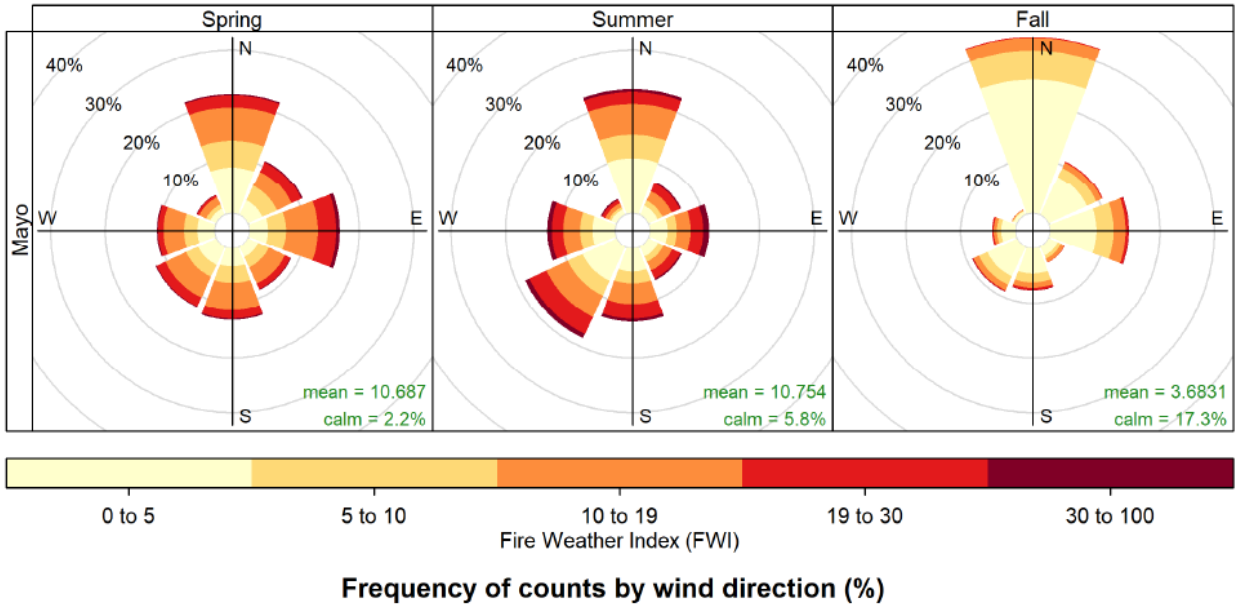

Figure 7. Historical Fire Weather Index (FWI) frequency count by wind direction for each season (spring, summer and fall) as recorded at Mayo weather station.

4.1.2 Fire History

There is significant fire history surrounding the Mayo AOI (see Figure 8) due to the village's proximity to the Tintina Trench. The topography of the trench influences weather in the region and from mid-June to mid-July, frequent lightning storms occur and cause multiple ignitions. Reviewing the wildfire history demonstrates that the Mayo AOI has been impacted in several ways:

1. **Direct impacts from wildfires igniting within the AOI or burning near the AOI**. The 2023 Talbot Creek Wildfire was over 5,000 hectares and had a major impact, resulting in the evacuation of the Village of Mayo and surrounding areas. The Victoria Gold mine site was also evauated twice due to wildfire. Recent large fire history by decade is shown in Figure 9.
2. **Indirect impacts by cutting off supply access to the village and evacuation from the village.** Within the last 5 years, several evacuation alerts and orders have impacted the broader region encompassing the AOI including Steward Crossing, the Silver Trail, Mayo and Keno. Wildfire impacts cut off supply and access routes to the village, while evacuation alerts and orders are disruptive, displacing people from their homes and livelihoods.
3. **Direct impacts from smoke** caused by wildfires elsewhere settling in the valleys surrounding the AOI. Several communities in the Yukon were impacted by wildfire smoke during the 2023 fire season. In 2019 the Yukon's chief medical officer issued an air quality advisory throughout the territory, with Mayo impacted with a small time period of heavy smoke.[13]

[13] Azizi, J. 3 July 2019. Wildfire Smoke Leads to Air Quality Advisory Across the Yukon. Yukon News [website]. Available: https://www.yukon-news.com/news/wildfire-smoke-leads-to-air-quality-advisory-across-the-yukon/

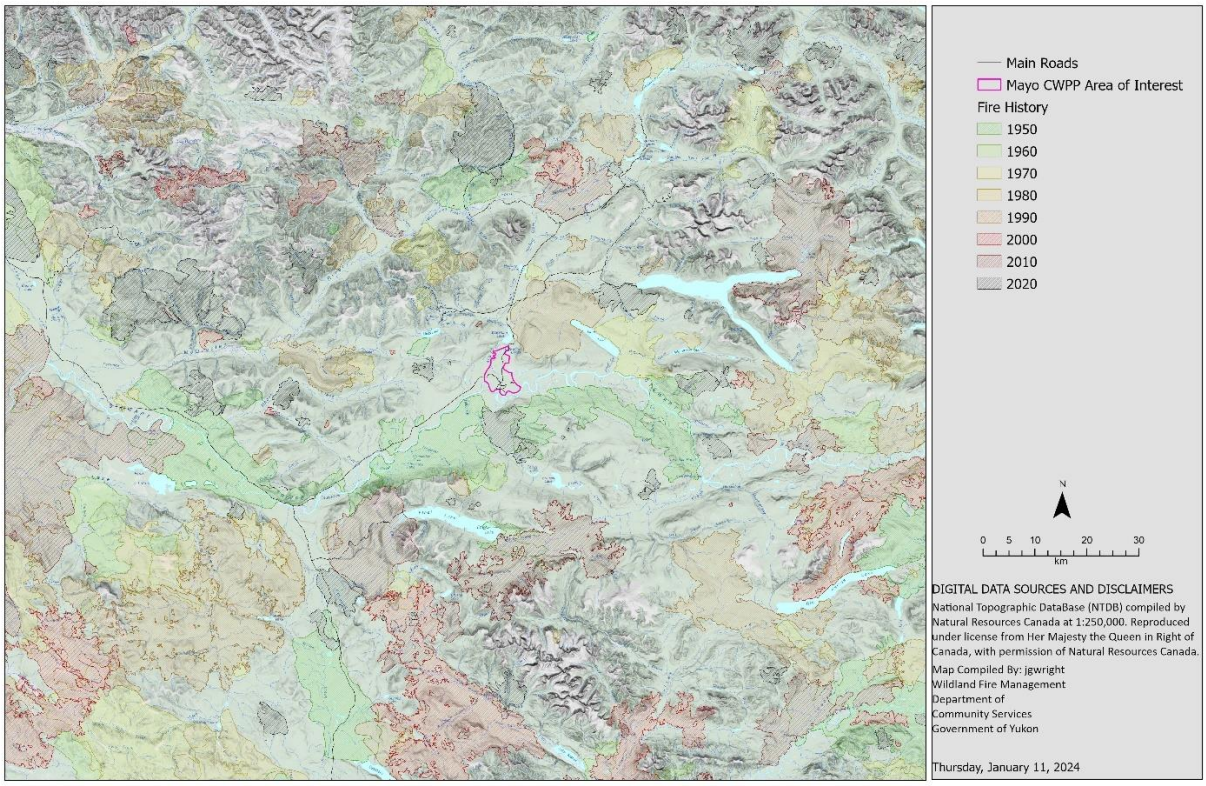

Figure 8. Fire History in the broader landscape surrounding the Mayo Area of Interest.

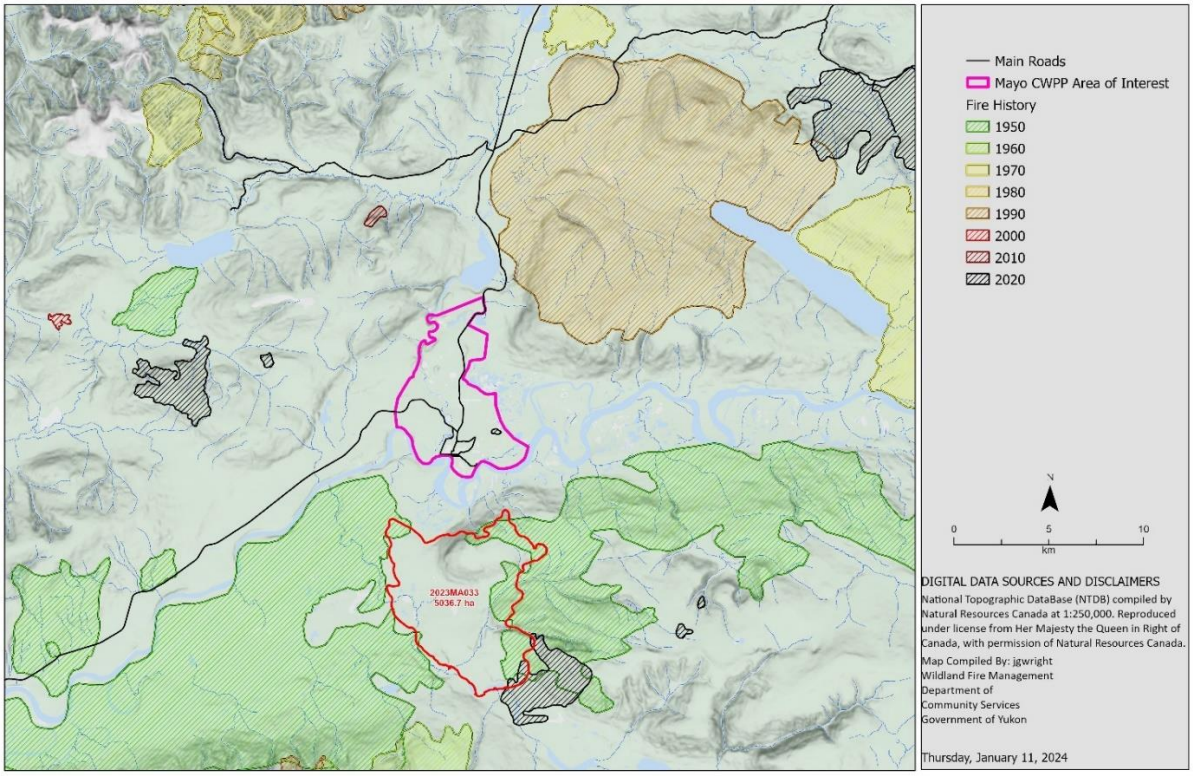

Figure 9. Fire History within and close to the Mayo Area of Interest.

Talbot Creek Fire August 2023, Source: WFM

Talbot Creek Fire August 2023, Source: WFM

4.1.3 Ignition Causes

The vast majority of wildfires in the area were caused by lightning. However, wildfire ignitions from human causes are still prevalent near villages and along roadsides, see Figure 10.

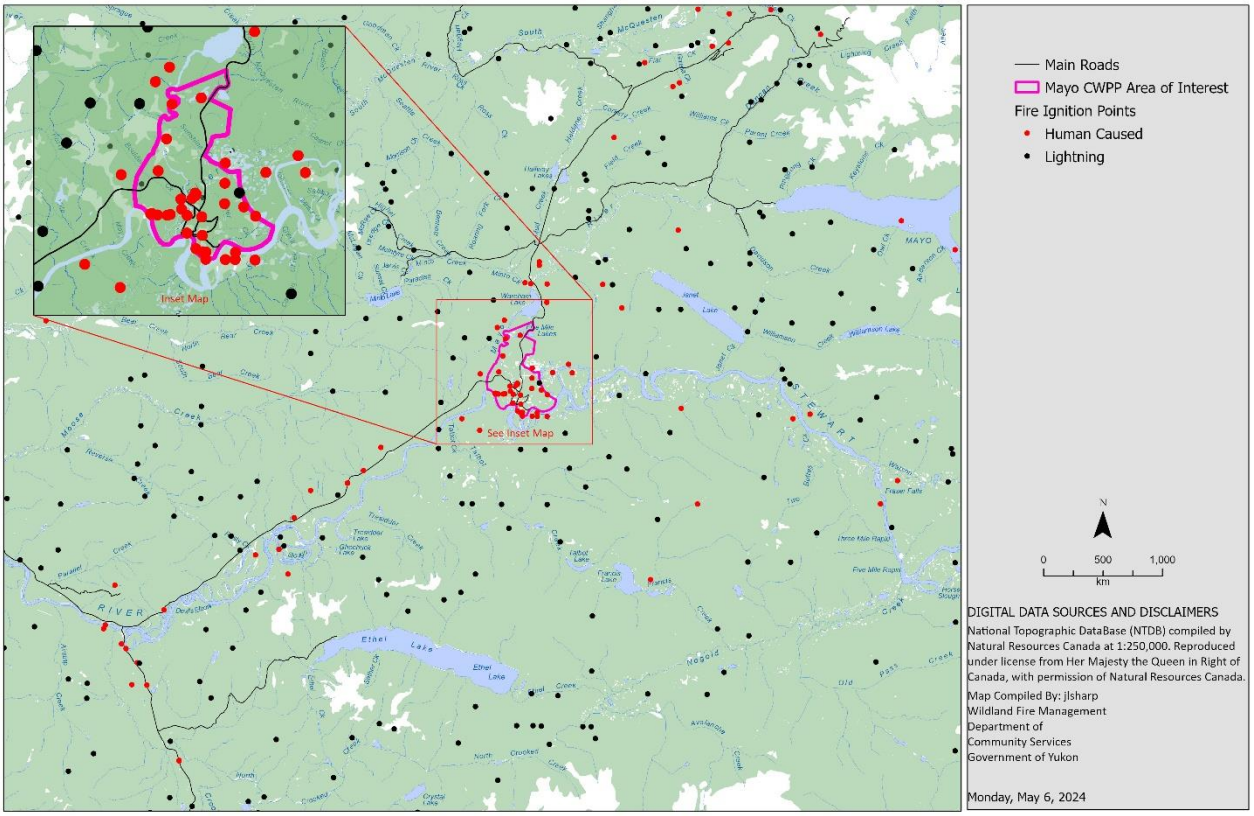

Figure 10. Wildfire ignition locations and their sources (1940 - 2023). Inset shows close up on Mayo AOI.

In the Mayo AOI, human-caused ignitions include accidental and malicious causes and make up 79% of recorded ignitions (Table 4).

Table 4. Ignition History Summary (1946 – 2023) – Mayo Area of Interest only

Cause	Number of ignitions	Percent of total ignitions	Area burned	Percent of total area burned
Human	37	79%	14ha	94%
Lightning	1	2%	<1ha	3%
Miscellaneous	9	19%	<1ha	3%

Source: GeoYukon

4.1.4 Fuel Types

For fire behaviour prediction purposes, Canadian forests and grasslands are categorised into different Fire Behaviour Prediction (FBP) System fuel types.[14] These fuel types have different vegetation species and structure e.g. vegetation density. Because if this, fire will behave differently in each fuel type. Table 5 outlines which fuel types are present in the Mayo AOI. These are also mapped for the AOI in **Error! R eference source not found.**. More detailed descriptions of these fuel types can be found on the Natural Resources Canada website.[14]

Fuel types are named to reflect fire behaviour in different vegetation groups. However, since fuel types are used to describe an expected fire behaviour, they may not actually reflect the tree species that are on the ground. For example, the C1 (Boreal Spruce) fuel type does not indicate there is black spruce mixed with jack pine and white birch around Mayo; rather these fuel types correlate the forest fuel complex and how the fire behaviour that could be expected in that fuel complex. Fuel types should be regarded as a 'best fit' rather than strictly based on tree species.

Table 5. Canadian Fire Behaviour Prediction (FBP) System Fuel Types[14] present within the Mayo AOI.

Fuel Type	Name	Percentage within Mayo AOI	Fire Behaviour Characteristics
C1	Spruce-Lichen Woodland	1% (24 ha)	Has some 'build up' time and will eventually reach a rate of spread similar to C2/C4. Moderately intensity for conifer fuel types.
C2	Boreal Spruce	1% (45ha)	A very volatile fuel type - C2 produce high intensity and fast moving fires more easily than other fuel types. Fires can easily become crown fires.
C3	Mature Jack or Lodgepole Pine	0% (0 ha)	Fastest rate of spread overall, however requires high wind speeds and low fuel moistures to reach this faster rate of spread than other fuel types.
C4	Red and White Pine	0% (0 ha)	Spread rate and fire intensity values predicted in C4 fuels are nearly identical to those of the very volatile boreal spruce C2.
C7	Ponderosa Pine – Douglas Fir	0% (0 ha)	Lowest rate of spread and lowest fire intensity of the conifer fuel types.
D1/D2	Deciduous (D1 leafless aspen, D2 green aspen)	1% (48 ha)	Lower rates of spread, lower ember production and lower fire intensity (than conifer) when trees have leaves. Often used in urban interface areas to reduce fire behaviour around values.
Non-Fuel	Non-fuel	2% (73 ha)	This category includes 'non-fuel', water and 'urban'.
M1/M2 25	Mixedwood – 25%	62% (2,114 ha)	The rate of spread and intensity of fire

[14] FBP Fuel Type Descriptions, Natural Resources Canada: https://cwfis.cfs.nrcan.gc.ca/background/fueltypes/d1

Fuel Type	Name	Percentage within Mayo AOI	Fire Behaviour Characteristics
	conifer		depends on the conifer/deciduous mix. Higher conifer mix will have faster rates of spread, higher fire intensity and more embers produced.
M1/M2 50	Mixedwood – 50% conifer	9% (296 ha)	
M1/M2 75	Mixedwood – 75% conifer	22% (752 ha)	
O1a/b	Grass	1% (32 ha)	Fastest rate of spread, however intensity is usually low enough for suppression to be successful.

Village of Mayo, ca.2000. Souce: Ember Research Services Ltd. *Yukon Community Wildfire Risk and Reduction Assessment* 2000.

4.1.5 Climate Change

Fire regimes in boreal forests are changing. During the 1990s, 2.75 million hectares of forest was burned annually across Canada. By 2004, 3.3 million hectares of forest are burned annually. Canada's 2023 wildfire season was the most destructive season ever recorded, with over 16.5 million hectares of land burned by September. By the end of this century, the annual area burned by forest fires in Canada is predicted to increase by 74 – 118%.[15]

Research into changing weather patterns observed in recent history generally agrees that boreal forests will become more fire prone as climate change impacts become more prevalent.[16] This is due to decreased fuel moisture and an increase in extreme fire weather occurrence. While most studies do not look at whether we can expect an increase in lightning caused ignitions, human ignitions sources can increase with growing populations and transportation networks. A recent study examining potential changes in fire intensity and type in Canada's boreal forests concluded that by the end of the century we can expect[16]:

- an increase in the number of days where crown fires are likely, and
- an increase in the number of days when fire intensity is greater than suppression capabilities.

Climate change impact of fire weather was also modelled for the Yukon specifically.[17] Results found that temperature, precipitation and humidity annual averages will all increase. Table 6 predicts changes in climate over two warming scenarios. According to this report, the potential for wildfire spread days might decrease around Mayo.

Table 6. Future Climate Trends for Yukon - April to October[17]

		Temperature (°C)	Precipitation (mm)	Relative humidity (%)	Wind (km/h)
Mid-Century Analysis #1	**RCP4.5**	+1.14	+20.31	+4.07	-0.21
2019-2048	**RCP8.5**	+1.31	+20.18	+3.91	-0.07
Mid-Century Analysis #2	**RCP4.5**	+2.35	+38.68	+4.33	-0.30
2049-2078	**RCP8.5**	+3.04	+83.57	+5.75	-0.14

An increase in precipitation has also been predicted in other research; however, there was not a similar prediction in a reduction of spread event days. One study proposes that the precipitation increase is not substantial enough to reduce the impact of warmer temperatures on drying fuels.[16] Warmer temperatures increase evapotranspiration, lower water tables and decrease fuel moisture and surface soil moisture content. Significant increases in precipitation would be required to balance an increase in temperature.[15] It is far more difficult to model the impact of climate change on precipitation quantities than it is for temperature.[18]

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[15] Flannigan MD, Logan KA, Amiro BD, Skinner WR & Stocks BJ. 2005. *Future Area Burned in Canada*. Climatic Change 72: 1-16.

[16] Wotton, M, Flannigan, M & Marshall, G. 2017. Potential climate change impacts on fire intensity and key wildfire suppression thresholds in Canada. Environmental Research Letters. 12. 095003. 10.1088/1748-9326/aa7e6e.

[17] AECOM. 2021. *Modeling Future Wildfire Risk in Yukon*. Report for Yukon Government.

[18] Wotton M, Flannigan M & Nock CA. 2010. *Forest fire occurrence and climate change in Canada*. International Journal of Wildland Fire. 19. 253-271. 10.1071/WF09002.

Both studies agree that the Yukon should expect warmer temperatures and an increase in fire season length as the impacts of climate change progress.

4.2 Socio-Economic Factors

4.2.1 Wildfire Response

The Village of Mayo has a Protective Services Department which includes Fire Protection. The municipality has a Fire Hall, 2 fire trucks, 1 emergency vehicle, and a fire hydrant system throughout the community. The Mayo Volunteer Fire Department has a Volunteer Fire Chief, Deputy Fire Chief, Fire Training Officer and turnout gear for up to 12 Volunteer Fire Department Members.

The Village of Mayo has an Emergency Measures Plan that addresses emergencies within Municipal boundaries. A joint agreement exists with FNNND for fire protection services on FNNND buildings located outside the Village of Mayo boundaries.

For wildland fire response the Yukon Territorial Government (through Yukon Wildland Fire Management, Protective Services Branch) staffs the Mayo Fire Centre. This is a regional operations centre and a number of staff are located here including Response Officers, three Initial Attack crews and Air Tankers when required.

Interagency Forest Fire Centre (CIFFC) have sophisticated models and approaches for determining where crews are positioned based on ongoing hazard and risk analyses. A number of wildland fire resources are based at the Mayo Fire Centre but, when hazard in Mayo is low and elsewhere in the territory, country or even internationally is high, these crews could be deployed away from Mayo.

4.2.2 Values at Risk

Values within the Mayo AOI can be identified in the following classifications (Table 7). Assets can be directly impacted by wildfire (e.g. radiant heat/embers) or indirectly (e.g. loss of tourism, exposure to smoke, ash, fire fighting chemicals and run off).

Table 7. Values at risk of wildfire impacts (direct or indirect) within the Area of Interest

Value	Description
Human Life	Mayo population: ~460[2]
Cultural	Pristine wilderness surrounding Mayo is significant to residents for recreation, food gathering, physical health and connection to nature.
	Mayo Legion Hall
	Five Mile Lake Campground
	McIntyre Park Campground
	Mabel McIntyre House Historic Site / Former Mining Recorders Office
	Binet House Museum
	Christ the King Mission
	St Mark's with St Mary's Anglican Church
Infrastructure	Alcan Air -Floatplane base on Stewart River

	Na-Cho Nyäk Dun First Nation Government House
	Mayo Water Treatment Plant, Lift Station and Valve Chamber
	Mayo Community Centre / Village Office and Swimming Pool
	Mayo Nursing Station
	Yukon University Mayo Campus
	J.V. Clark School
	Mayo Fire Hall and EMS Station
	Mayo Public Library
	Northern Tutchone Regional Duty Office
	Canada Post
	Mayo Royal Canadian Mounted Police
	AFD Gas Station and Mayo Petroleum Gas Station
	Communications tower
	Hydro Sub Stations
	Airport
	Firefighting Airtanker Base and Initial Attack Base
	Mayo Recycling Centre
	Water wells: 64 wells in the area for environmental monitoring, private domestic supply, public supply and some test sites.
Environmental	CDC Species of Conservation Concern: Rusty Blackbird (*Euphagus carolinus*)
	Wildlife Key Areas: Wareham Lake, Stewart River, Big Island.
	Watersheds: Upper Stewart - Yukon River Drainage Area
Economic	Tourism (activities): canoeing, fishing, hunting, camping, hiking, flight seeing, off-road access
	Wilderness tourism and tourism accommodation
	Campgrounds
	Forestry Cutting Permits

Na-Cho Nyäk Dun First Nation Government House. Source: Yukon News

4.2.3 Key Vulnerabilities

Identifying key vulnerabilities for values identified within the Mayo AOI assists in preparing mitigation and preparedness strategies. Below are the values identified in the AOI that, if impacted, can cause a significant impact on people living in or near Mayo (Table 8).

Table 8. Values and their vulnerabilities in Mayo Area of Interest

Value	Wildfire Hazard	Description
Homes	Direct flame contact, radiant heat and ember exposure. Increased risk of flooding after fire event.	Homes are constructed within the Wildland Urban Interface. Homes are near continuous forests, which can support elevated fire behaviour and risk house loss (and possibly loss of life). Significant loss of forest cover upstream due to fire can impact surface water flow and increase likelihood of high flood levels.
Evacuation routes and access routes for firefighting resources	Inability to evacuate from a wildfire.	Mayo has limited access/egress routes. Highway 11 (The Silver Trail) is the only major road south, then Highway 2 (Klondike Highway) can either lead to Dawson or Whitehorse.
	Difficulty accessing a property during a wildfire	It is important to know any specific access challenges before a fire and report to property owners, for example: long driveways and small turn around points that are difficult for a fire engine. Most properties in the Mayo AOI look like they have good access. C-6 subdivision currently has a single access egress route but plans are underway to upgrade a rough trail that would function as a secondary escape route.
Drinking water supply	Infiltration of fire by-products, sedimentation, changes in soil properties, runoff and firefighting chemicals infiltrating into water supply.	There are 4 public supply and 21 private water supply wells around Mayo. Water supply wells can be impacted by wildfire through several processes. First, contamination from particles after a wildfire seeping into wells (as a result of the fire or from fire retardant). Secondly, well infrastructure can be impacted, depending on well design.
Firefighting water supply	Access to water is from Mayo or Stewart Rivers, wetlands and private wells	Water sources for firefighting appliances may limit efficiency of firefighting - if wells cannot be accessed and there is no nearby hydrant system, firefighting appliances will have to leave the fire to re-fill elsewhere.
Community Health and Health Facilities	Direct fire hazard and supply chain issues from blocked roads	If the Nursing Station were to be directly impacted by fire, or if Mayo were to be temporarily disconnected from supplies/staff, the community might not be able to access health care.

Value	Wildfire Hazard	Description
		The nearest health care facilities to Mayo are in Pelly Crossing or Dawson.
	Smoke	Smoke particulates cause significant physical and mental health impacts for both short and long-term exposures.
School facilities	Direct fire hazard and resources	If the school were to be directly impacted by fire, or if Mayo would to be temporarily disconnected from staff, the community might not be able to access school and facilities. The nearest school facilities to Mayo are in Pelly Crossing or Dawson.
Economic: tourism, forest products	Direct fire impact and smoke	Loss of environment assets and increased smoke in the area can reduce tourism. Loss of forest harvest opportunities could impact jobs within Mayo. Loss of historic buildings will also impact tourism.
Infrastructure	Loss of soil integrity as a product of fire	Chemical changes such as increased acidity from fire product run off can impact biological treatment of sewage
	Ember attack and radiant heat threats	Historic wooden structures and unsealed structures in Mayo are particularly vulnerable.
Environmental Values	Loss of habitat from direct fire impacts, degradation of water quality from runoff	Forests, rivers and wetlands around the AOI provide regional biodiversity values and support provincially listed species at risk. Loss of habitat can occur not only when forests are burned at too a high severity or too frequently, but also when soil properties are altered and chemicals and sediments infiltrate nearby rivers. Large wildfires can also impact permafrost -due to the variable depths of permafrost in and around the Mayo area, it is particularly at risk of melting and impacting the species that have evolved with this feature. There are severe Aspen Leaf Miner (Phyllocristis populiella) impacts to aspen forests in valleys surrounding the AOI. Wildfire behaviour in these areas can significantly increase.

4.3 FireSmart

FireSmart™ Canada is a national program that helps Canadians increase neighborhood resilience to wildfire and minimize its negative impacts. It was founded over 20 years ago to address common concerns about wildfire in the wildland urban interface.

Research investigating recent Wildland Urban Interface (WUI) disasters presents the case that catastrophic loss of homes due to wildfires is often due to structure ignition from ember showers which can ignite fuels surrounding, or in contact with, the structure.[19,20] Once a home or other infrastructure is ignited, the fire can spread through the built environment and quickly overwhelm suppression resources.

The findings from the 2021 Lytton disaster (British Columbia) cannot be understated. The wildfire passed over the community in less than one hour. After which, the fire was perpetuated throughout the Village and Indian Reserves along four different spread paths from structure to structure. Most structures destroyed in the Lytton fire were ignited by other structures and urban fuels, not from the influence of the wildfire pictured below.[19]

Image of Lytton, BC, after the 2021 wildfire showing unburned vegetation surrounding destroyed homes and structures. Source: CBC.

Disastrous fires in the WUI can overwhelm fire suppression efforts due to large numbers of near simultaneous structural ignitions - this is called the 'WUI fire disaster sequence'.[21,22] We cannot rely on

[19] Cohen JD, Westhaver A. 2022. An Examination of the Lytton, British Columbia wildland-urban fire destruction. Summary Report to the British Columbia FireSmart Committee. Available: https://firesmartbc.ca/wp-content/uploads/2022/05/An-examination-of-the-Lytton-BC-wildland-urban-fire-destruction.pdf

[20] Knapp, E.E., Valachovic, Y.S., Quarles, S.L. et al. 2021. Housing arrangement and vegetation factors associated with single-family home survival in the 2018 Camp Fire, California. fire ecol 17, 25. Available: https://doi.org/10.1186/s42408-021-00117-0

[21] Cohen, J.D. (2010). The wildland/urban interface problem. Fremontia. 38:2/38:3. 8p.

suppression efforts to reduce large scale structure loss, instead creating ignition-resistant structures and properties is the most likely means of preventing WUI disasters.

Figure 12. FireSmart Home Ignition Zones. Source: FireSmart.ca.

The best strategy to prevent loss of values is to mitigate the hazard on the property. The Home Ignition Zone (HIZ) is the area within 30 of your home and structures. Figure 12 illustrates the Immediate Zone, Intermediate Zone and Extended Zone.

Homeowners can minimise home and property vulnerability to wildfire by addressing threats in each of these zones. Start with the most vulnerable zone, the Immediate Zone, and work outwards away from the value at risk.

For information on each Home Ignition Zone, training, tips and checklists on how to protect your home and further resources such as project funding opportunities, see FireSmart Canada and FireSmart Yukon websites.[23]

Aside from encouraging residents to follow FireSmart Homeowner practices there are other factors that can be planned for and regulated. Some factors that influence the susceptibility of WUI structures, effectiveness of response, and level of public safety during a wildfire include:

- Location of development, including hazardous or vulnerable land uses, in relation to the higher hazard forested vegetation types, steep slopes, and other geographical features that contribute to extreme fire behavior,
- Access to and within the community and circulation/travel patterns,
- Availability and adequacy of water supply,
- Design guidelines and architectural standards,
- Residential addressing and street signage,
- Type of construction materials used to build structures and attachments,
- Lot size and structure density,
- Landscaping, screening, and buffering.

[22] Calkin, D.E, Cohen, J.D., Finney, M.A. and Thompson, M.P. (2014). How risk management can prevent future wildfire disasters in the wildland-urban interface. Proc. Natl. Acad. of Science. U.S.A. 111: 746–751.
[23] FireSmart Canada website: https://firesmartcanada.ca/ and FireSmart Yukon website: https://yukon.ca/en/emergencies-and-safety/wildfires/keep-your-property-safe-wildfires

5. Plan Implementation

The CWPP is designed to comprehensively plan for all aspects of community wildfire planning by structuring strategies based on the seven FireSmart disciplines:

- Education,
- Emergency Planning
- Vegetation Management
- Legislation
- Development.
- Interagency Cooperation
- Cross Training

Each FireSmart discipline and their role in resiliency planning for the Mayo community within the AOI is outlined below.[24]

A summary of all actions is available in *Appendix 3: Summary of Risk Mitigation Actions and Responsibilities*, along with assigned responsibilities and information on resources required.

Additional resources and information sources are in *Appendix 4: Additional Resources and Information*.

5.1 Education

Public education and outreach efforts help community members learn about wildfire and its potential impacts to their communities. In addition, these efforts should be designed to help individuals understand their role in taking action to reduce risk. Education and outreach activities are designed for all groups to benefit, including elected officials, community planners, residents, visitors, businesses, land managers, first responders, and more.

Goal: The Community Wildfire Protection Plan is only successful if community members and stakeholders are engaged in taking action to reduce wildfire risk. This CWPP aims to establish effective communication and develop educational activities to that each member of the community understands interface fire in Mayo and can play their role to reduce the risk.

Context: Many Mayo residents have endured the stress of wildfire during the summer of 2022 when the Crystal Creek Wildfire forced the closure of the Klondike Highway, and the entire community of Mayo was put on evacuation alert. Having lived through the experience, many residents understand the threat of wildfire and are supportive of increasing their community's resiliency.

Actions:

- Community Endorsement: During the draft stages the CWPP is presented to and available to the public to understand, comment and ask questions. Approval of the management tools presented in the plan is crucial to its success.

[24] For more information on the national FireSmart program, visit: https://firesmartcanada.ca

- Ongoing awareness: Conduct an annual community meeting (or incorporate into an existing meeting) in support of the CWPP and community preparedness.
- Promoting FireSmart Principles:
    - Relevant parties will work with community associations and other local groups to coordinate FireSmart projects. Additionally, Wildland Fire Management in collaboration with other stakeholders will seek to educate the community on FireSmart principles, such as organizing community school visits to inform students about fire resiliency and FireSmart practices.
    - Identify trusted locals as community FireSmart champions who will be available to assist with FireSmart activities as required.
    - Participate in an annual FireSmart Community Preparedness Day.[25] Increase advertising to attract higher attendance each year.
- Private Property Hazard Reduction Strategies: In addition to supporting FireSmart and fuel abatement activities on public land, implementation of the CWPP includes educating community members on reducing wildfire hazards on their own properties.
    - Undertake a community survey to find out the greatest barriers to FireSmart (education, physical means, financial means, etc).
    - If physical barriers (equipment, time, labour) are a key barrier for not undertaking FireSmart measures around the community, assemble and train a youth crew to conduct works such as hauling away flammable debris, keeping grass mowed, etc.
    - Disseminate information about the free FireSmart Begins at Home mobile app.[26] This is a free Apple or Android app that "guides homeowners through a series of questions about their property to help residents identify specific actions they can take on their property to reduce wildfire risks."

5.2 Emergency Planning

Community preparations for a wildfire emergency requires a multi-pronged approach. Individuals and agencies need to be ready to react by developing plans, mutual-aid agreements, resource inventories, training and emergency communication systems. All of these make it possible for a community to respond effectively to the threat of wildfires as a whole.

Goal: The goal of emergency planning is to prepare the community to respond safely and effectively, in partnership with local first response agencies and local and regional authorities to wildfire events. This CWPP aims to increase the number of community members who:

1. Understand the risk associated with wildfire in their community,
2. Know what to do to be safe and mitigate damage,

[25] See https://firesmartcanada.ca/programs/wildfire-community-preparedness-day/ for more information.
[26] Available through App store and Google Play

3. Take action to increase individual preparedness, and
4. Participate in community resilience planning.

Context: The Village of Mayo has its own Protective Services Department, which includes Fire Protection undertaken by a Volunteer Fire Department. Wildland Fire Crews, which are stationed at the Mayo Airport base, could be available (when not training or deployed on an incident) to help with emergency planning works around the community.

Actions:

- Completing an evacuation plan and practicing evacuations ahead of time can significantly improve efficiency during an emergency and increase the likelihood of a positive outcome.
- Increased communication of existing and future evacuation planning efforts to the public, including identification of:
    - A range of possible scenarios and how evacuation might proceed in each,
    - Primary routes, their quality, and strategies for improvement (if necessary),
    - Areas for residents to shelter in place in the event their evacuation route is compromised.
- Host annual tactical exercises to practice evacuations and identify vulnerabilities, such as:
    - 'Tabletop Exercises' to address larger-scale issues and scenarios,
    - Neighbourhood level mock evacuations to address local considerations,
    - Neighbourhoods identified as being most exposed would represent the best pilots and priorities for these exercises and provide opportunities for local feedback.

5.3 Vegetation Management

The general goal of vegetation management is to reduce the potential wildfire intensity and ember exposure to people, infrastructure, structures and other values through manipulation of both the natural and cultivated vegetation that is within or adjacent to a community. A well-planned vegetation management strategy that is coordinated with development, planning, legislation and emergency response wildfire risk reduction objectives can greatly increase fire suppression effectiveness and reduce damage and losses to structure and infrastructure

Goal: Proactively manage vegetation at multiple scales to reduce the potential wildfire intensity and ember exposure to people, infrastructure, and other values.

Context: The community of Mayo is relatively well protected from wildfire due to both natural (rivers, wetlands and deciduous vegetation) and constructed fuel breaks. However, there are several concerns with relying on these features as they presently exist.

First, wetlands provide ample water for fire suppression activities and can act as a fuel break when in healthy, moist conditions. If wetlands are not protected from disturbance they can dry out and become a

highly hazardous fuel source that is difficult to fully supress, sometimes smouldering throughout the winter to reemerge the following spring.[27]

Second, the human constructed fuel breaks are in need of re-evaluation and maintenance work in order to function as they were intended.

Third, these breaks do not protect the community infrastructure from wildfires started as a result of ember transfer from afar, or from wildfires originating within the community. Therefore vegetation management within the community must be considered.

Wildland Fire Management has been working in partnership with the Village of Mayo on thinning and pruning treatments around the community, as well as the development of a Fuel Management Plan.

Actions:

- Complete a Fuel Management Plan for the Mayo CWPP Area of Interest.
- Continue to reduce the fuel hazard in close proximity to structures in the community. Consider training and employing a youth crew[28] to assist Wildland Fire Management crews with this work.
- Prioritize the protection of wetlands surrounding the community of Mayo from disturbance.[29]
- Explore the local capacity for cultural burning with Elders, Community Knowledge Keepers and interested community members.
    - See additional resources for cultural burning in *Appendix 4: Additional Resources and Information*.
- Organize community clean-up days for properties. Prioritize properties based upon FireSmart Home Assessments done and proximity to forest fuels.
- Develop plans to reduce wildfire risk to sacred sites.
- Fuel maps are produced according to a mix of territorial datasets. The result is a close representation of vegetation on the ground; however, for a small Area of Interest like Mayo, it is recommended to review the territorial fuel type layer and confirm mapping accuracy.

Additional information:

- See *Appendix 5: Types of Fuel Management* for more information on the different types of vegetation treatments.

[27] Granath, G., Moore, P., Lukenbach, M. et al. Mitigating wildfire carbon loss in managed northern peatlands through restoration. Sci Rep 6, 28498 (2016). Available at: https://www.nature.com/articles/srep28498

[28] One of the key strategic goals of the FNNND Council 2020-2023 Stragetic Plan is to "*access education, training and employment opportunities*".

[29] This aligns with objectives set out in the Mayo Region Climate Change Adaptation Plan (2012) as well as the strategic goals of the FNNND Council 2020-2023 Stragetic Plan. See Appendix 1 for more details.

5.4 Legislation

Legislation and Regulation can be a very effective tool for reducing wildfire risk on provincial crown lands and within the administrative boundaries of a local government or First Nation communities. Provincial acts and regulations provide the means for local governments and First Nation communities to implement wildfire risk reduction actions through by-laws.

Goal: To facilitate an understanding of how local, provincial and federal legislation can either support or restrict the ability to implement local policies and bylaws, and other wildfire risk reduction activities.

Actions:

- Adopt FireSmart building and landscaping requirements to be addressed in the development and leasing approvals process.
- Assess and determine how future planning and development activities can support post fire recovery, such as preparing information and permits for debris removal and rebuilding that will be ready in the event of structure losses during a wildfire.

Additional Information:

Territory Policy: The Yukon and Canadian governments both have Acts, Regulations and guidance documents are relevant to wildfire protection planning in the Mayo area – see *Appendix 2: Relevant Acts and Regulations*.

Bylaws and zoning: Communities can have a significant impact on reducing fire risk by considering a suite of options available through regulations such as zoning and/or bylaws. New infrastructure, such as future subdivisions should consider fire hazards prior to development. Established infrastructure should consider fire risk whenever upgrades are required. The Canadian Standards Association (CSA) has developed a *National Standard CSA S504:19 Fire Resilient Planning for Northern Communities*.[30] This standard helps guide community developments and building standards with considerations for communities living in fire prone ecosystems such as those in Yukon.

Wildfire risk reduction is currently not specifically addressed in any bylaws, zoning, the Official Community Plan for the Village of Mayo or the First Nation of Na-cho Nyäk Dun Council Strategic Plan .

Management plans: *Appendix 1* identifies key local management plans for the planning area. These existing plans include information that guides the contents of the community wildfire protection plan and may include policies and recommendations that touch on reducing risk of oncoming wildfire for the community. Additionally, future management plans or amendments to existing plans should consider the contents of the community wildfire protection plan and incorporate the content to consider increasing fire resiliency.

[30] For more information, see ChangingClimate.ca: https://changingclimate.ca/case-study/csa-s50419-fire-resilient-planning-for-northern-communities/

5.5 Development

Development decisions, such as land use types, structure density, road patterns, and other considerations, shape the built and natural environments. These decisions can bring lasting impacts to the WUI and wildfire risk by affecting public and first responder safety and survivability of homes, critical infrastructure, and other community features. Considering these factors early in the development process can reduce wildfire risk to life safety and property.

Goal: To implement a strategy for decreasing the chance of structural losses within the AOI due to wildfire, by utilizing regulatory and administrative tools to reduce wildfire hazard and increase the number of homes and other infrastructure compliant with FireSmart guidelines (with low ignition potential).

Context: Currently neither the Village of Mayo nor the FNNND have specific wildfire risk restrictions within the framework of their development permitting process. At present there is minimal planned development in the Mayo area, with the exception of the new Wareham subdivision.

Actions:

- Complete FireSmart Canada's Advanced Home Assessment program in order to support future FireSmart projects for homes and critical infrastructure.
- Once assessments are complete create a database for keeping track of community needs. Assign priority ranking, associated cost and support needs (financial or physical) for each structure assessed.

5.6 Interagency Cooperation

It takes the collaborative efforts of multiple stakeholders working together to achieve a fire resilient community. These people include the local fire departments, local government staff, elected officials, First Nations representatives, industry representatives and territorial government residents in your area. Individually they are responsible to their own organizations, but all of the stakeholder organizations are dependent upon each other to develop an effective Community Wildfire Resiliency Plan and undertake a successful wildfire response.

Goal: To encourage and establish collaborative relationships among the First Nation of Na-cho Nyäk Dun, Mayo Volunteer Fire Department, Village of Mayo City Council, Yukon Wildfire Management Branch, and other stakeholder groups to achieve a wildfire resilient community.

Context: In regards to wildfire and emergency planning, the leadership groups in the Mayo area have good working relationships. The community is small and maintains an inclusive, neighborly spirit where everyone takes care of everyone.

Actions:

- Continue to coordinate relationship building opportunities with staff from identified stakeholder groups. This could include organizing tabletop exercises, organize a neighborhood walk day with Wildland Fire and Protective Services staff providing a demonstration with a fire truck while assessing firefighting challenges at different residences in the area, and/or participating in cross-training activities.

5.7 Cross Training

Wildland-Urban Interface resiliency planning and incident response draw on many different professions who do not typically work in wildfire environment. Cross-training of fire fighters, public works staff, utility workers, local government and First Nations administration, planning and logistics staff, and other key positions will help support the development of comprehensive and effective wildfire risk reduction planning and activities.

Goal: Develop a diverse skill set within community members, Fire Departments and Yukon Wildland Fire Management and facilitate understanding across participants engaged in risk reduction activities and wildfire planning/response. This will allow for skilled workers to support the development of comprehensive and effective CWPP activities, including a safe and effective wildfire response.

Context: When hazard is high in other parts of Yukon or Canada, the Mayo based Wildland Fire crews may be deployed elsewhere and it could be valuable for Volunteer Fire Department personnel to have basic training in wildland fire suppression tactics for vegetation fires within the municipal boundary.

It can also be useful for policy making staff to have a broader understanding of wildfire and FireSmart principles in order to help facilitate incorporation of FireSmart goals into many aspects of community planning.

Actions:

- Prioritize and coordinate training opportunities. These can vary, but the following training is recommended for interested community members:
    - Basic Wildland Fire Suppression and Safety,
    - Incident Command System (Emergency Operations Center and Training Program),[31]
    - FireSmart 101[32],
    - Local FireSmart Representative,
    - FireSmart Community Champion,
    - FireSmart Home Partners Wildfire Mitigation Specialist,
    - Post wildfire reclamation and recovery,

[31] Available: https://www.icscanada.ca/en/home.html. Yukon contact: emo.yukon@gov.yk.ca
[32] Available: https://firesmartcanada.ca/programs/firesmart-101/

    - Post wildfire structure damage assessment.
- Offer cross training opportunities to members of the FNNND, Mayo Volunteer Fire Department, and Yukon Wildland Fire Management.

This could include practice wildfire scenarios or burning off dry grass in the spring. These experiences should always include any FNNND Community Knowledge Keepers who are able to participate.

6. Monitoring and Reporting

An annual Mayo CWPP meeting will be established with stakeholders to update progress from the previous year and on current and future projects. This meeting will allow consultation and input into these projects.

The CWPP is a living document that is developed using the best understanding of fire hazards and behaviour and wildfire community protection that is known at the time of writing. The knowledge base is anticipated to evolve as will the community of Mayo's requirements for protection and risk reduction against wildfire. The CWPP will have a review cycle of 5 years.

Source: www.explorenorth.com

Appendix 1: Key Local Management Plans

Wildfire can affect many aspects of a community and there are several existing planning documents that relate to this CWPP. While this CWPP will inform subsequent community planning, existing community plans will inform the development of this CWPP by providing helpful information that guides overall plan development. The tables below outline existing plans and their relationship to this CWPP. In the digital version of this CWPP, plan titles are hyperlinks to access documents.

Table 9. Key Local Plans and Relationship to CWPP

Plan Title	Description	Relationship to CWPP	Additional Information
First Nation of Na-cho Nyäk Dun Council 2020-2023 Strategic Plan	• Describes the FNNND's priorities and identifies the actions required to implement these priorities over the designated time frame. • Provides guidance for FNNND administration on the implementation of Council's mandate and fundamental principles set out in the FNNND Constitution.	Provides 10 principles that the CWPP will align with (when applicable to wildfire preparedness and emergency management).	Plan provides 7 Strategic Goals, 4 of which directly overlap with recommendations in this CWPP: 3: health, wellness, food security and safety, 4: traditional way of life, 6: quality housing and infrastructure, 7: access to education, training and employment opportunities.
Village of Mayo Official Community Plan (2022-2023)	• The main policy document for the Village. • Outlines goals and policies that are used to guide decision making on planning and land use management.	• Sets forth governance policies that will ultimately support and facilitate wildfire hazard planning and mitigation projects.	CWPP AOI goes beyond Municipal boundary
Mayo Region Climate Change Adaptation Plan (2012)	• An analysis of the projected impacts of climate change to the Mayo area. • Provides five main priority actions to assist in the adaptation of the area to the changing	• Provides valuable insight into the cross linkages between climate change and wildfire occurrence and severity, and how this could impact the community .	

Plan Title	Description	Relationship to CWPP	Additional Information
	climate.	• First priority recommendation is to "integrate climate change into all land and resource planning" –CWPP will align with this.	
McQuesten Timber Harvest Plan (2014)	• Outlines management objectives for a 712 357 hectare area (total area where public are allowed to apply for cutting permits) in and surrounding the Mayo CWPP AOI.	Describes some of the values that will need to be considered if doing fuel management activities.	The McQuesten THP has been prepared to meet the needs of the local woodcutters supplying a local economy. The local demand is comprised mostly of fuelwood for the purpose of residential heating but also includes building logs for cabins, fence posts, and small amounts of sawlogs
Summary of Land Management Authorities within Yukon Municipalities (2012)	• Identifies the four jurisdictions (Government of Canada, YTG, First Nation Governments and municipal governments) that plan, manage and authorize activities on land in Yukon. • Outlines the roles and responsibilities that fall to the above jurisdictions.	• Provides direction to the development of policy and law governing forest resources.	
A Policy for the Stewardship of Yukon's Wetlands (2022)	• A high level principle based document intended to support the Government of Yukon's decision-making process to ensure the benefits of Yukon's wetlands are sustained. • Contains three main goals: improving knowledge and understand of wetlands, manage human impacts on wetlands,	• CWPP AOI (and closely surrounding area) contains wetlands that may meet criteria of "Wetlands of Special Importance" – subsequent CWPP's may need to account for these areas. • Contains three Guiding Principles that were	Only applies to wetlands where the Government of Yukon has decision-making authority. Peatlands are being recognized as an important carbon store -protecting them from wildfire could become a growing priority globally.

Plan Title	Description	Relationship to CWPP	Additional Information
	identify and protect "Wetlands of Special Importance". • Commits the Government of Yukon to developing territory-wide inventory over the next five years.	consistently brought forth by Indigenous governments and groups that should also be considered when doing fuel management treatments: 1. Holistic approach that considers wetlands as an integral part of an interconnected system 2. Importance of respecting the land 3. Concept of reciprocity -must give back to the land when we take from the land.	
Community-Based Fish and Wildlife Work Plan for the Nac-Cho Nyäk Dun Traditional Territory (2014-2019)	• Five year work plan made in collaboration between First Nation of Na-cho Nyäk Dun, Government of Yukon, and Mayo District Renewable Resources Council that identified the following four priorities to address: habitat, moose, fisheries, and monitoring and stewardship.	• This version is expired but an updated version is currently being undertaken – will need to ensure any fuel management works being completed comply with the updated Work Plan.	Emelie Fredriksson, Märtha Wallgren & Therese Löfroth. (2023). Wildfire and prescribed burning impact moose forage availability and browsing levels in the northern boreal forest, Scandinavian Journal of Forest Research, 38:1-2, 58-69, DOI: 10.1080/02827581.2023.2184489

Appendix 2: Relevant Acts and Regulations

The following high-level Acts, Regulations and guidance documents are also relevant to wildfire protection planning in the Mayo area:

Local

- Na-Cho Nyäk Dun Final Agreement (1993)
- Na-Cho Nyäk Dun Self Governing Agreement (1993)

Territorial

- Forest Protection Act (2002)
- Yukon Historic Resources Act (2002)
- Yukon Wildlife Act (2002)
- Territorial Lands (Yukon) Act (2003)
- Waters Act (2003)
- Yukon Environmental and Socio-economic Assessment Act (2003)
- Forest Resources Act (2008)
- Forest Resources Regulation (2010)
- Forest Resources Act: Standards and Guidelines (2015)

Federal

- Forestry Act (1985)
- Migratory Birds Convention Act (1994)
- Canadian Environmental Protection Act (1999)
- Species At Risk Act (2002)
- Fisheries Act (2019)

It is important to note that while every attempt must be made to work within the confines of the above legislation and best management guidelines, at times the qualified professional may need to decide to pursue a course of action that prioritizes wildfire risk mitigation over other values. It is important in this scenario to communicate and consult with all effected stakeholders and government authorities.

Additional regulations notes:

- Environmental assessments may be required for fuel management projects if they exceed any of the thresholds established under the Yukon Environmental and Socio-economic Assessment Act 2017 (YESAA). It is important to contact the Na-Cho Nyäk Dun Land and Resources Department, Major Projects Yukon, or YESAB for assessment requirements.
- All operations must follow the Forest Management Branch's Historic and Archaeological Resources Standards and Guidelines.

Appendix 3: Summary of Risk Mitigation Actions and Responsibilities

Table 10. Risk mitigation actions and responsibilities

Action	Lead/Collaborators	Priority	Resources Required	Metric for Success	Notes / Priority
Education					
1. Community Endorsement: During the draft stages the CWPP is presented to and available to the public to understand, comment and ask questions. Approval of the management tools presented in the plan is crucial to its success.					
2. Ongoing awareness: Conduct an annual community meeting (or incorporate into an existing meeting) in support of the CWPP and community preparedness.					
3. Relevant parties will work with community associations and other local groups to coordinate FireSmart projects.					
4. Identify trusted locals as community FireSmart champions who will be available to assist with FireSmart activities as required.					
5. Participate in an annual FireSmart Community Preparedness Day.					

Action	Lead/Collaborators	Priority	Resources Required	Metric for Success	Notes / Priority
6. Private Property Hazard Reduction Strategies.					
Emergency Planning					
7. Completing an evacuation plan and practicing evacuations ahead of time.					
8. Increased communication of existing and future evacuation planning efforts to the public.					
9. Host annual tactical exercises to practice evacuations and identify vulnerabilities.					
Vegetation Management					
10. Complete Mayo Fuel Management Plan					
11. Continue to reduce the fuel hazard in close proximity to structures in the community. Consider training and employing a youth crew to assist Wildland Fire Management crews with this work.					
12. Prioritize the protection of wetlands surrounding the community of Mayo from disturbance.					
13. Explore the local capacity for cultural burning with Elders, Knowledge Keepers and interested community members.					
14. Organize community clean-up					

Action	Lead/Collaborators	Priority	Resources Required	Metric for Success	Notes / Priority
days for properties. Prioritize properties based upon FireSmart Home Assessments done and proximity to forest fuels.					
15. Develop plans to reduce wildfire risk to sacred sites.					
16. Review the territorial fuel type layer and confirm mapping accuracy.					
Legislation					
17. Adopt FireSmart building and landscaping requirements to be addressed in the development and leasing approvals process.					
18. Assess and determine how future planning and development activities can support post fire recovery.					
Development					
19. Complete FireSmart Canada's Advanced Home Assessment program in order to support future FireSmart projects for homes and critical infrastructure.					
20. Once above assessments are complete create a database for keeping track of community needs. Assign priority ranking.					
Interagency Cooperation					
21. Continue to coordinate relationship building					

Action	Lead/Collaborators	Priority	Resources Required	Metric for Success	Notes / Priority
opportunities with staff from identified stakeholder groups.					
Cross Training					
22. Prioritize and coordinate training opportunities.					
23. Offer cross training opportunities to members of the First Nation of Na-Cho Nyak Dun, Mayo Fire Department and Yukon Wildland Fire Management.					

Appendix 4: Additional Resources and Information

The following list of resources and information has been compiled according to the seven FireSmart Disciplines to aid in the implementation of CWPP actions in Mayo.

FireSmart Discipline	Resource
Education	• FireSmart Canada programs • Yukon Wildfire Management • Canadian Mental Health Association - Coping with Natural Disaster Stress • Educational Messaging Advisory Committee – Desk Reference • Red Cross – Coping with Crisis
Emergency Planning	• National guide for wildland-urban-interface fires - provides guidance to Canadian local governments and First Nations on WUI land use planning and regulation implementation, as well as guidance on wildfire response preparedness planning. • Evacuation Operational Guide for First Nations and Local Authorities in British Columbia • 2022 Wildfire Resources – Before, During and After a Wildfire – a list gathered by FNESS containing links for resources to support communities through all stages of a wildfire. • National Indigenous Fire Safety Council Project and the Aboriginal Firefighters Association of Canada -provides programs and research through an Indigenous led framework designed to support Indigenous communities in the development of their internal capacity to improve community safety and resiliency.
Vegetation Management	• Funding resources for fuel management treatments can vary from year to year. Information on Yukon Government funding opportunities can be found here. • FireSmart has a Cultural Burning & Prescribed Fire page with information on burn planning, current and past Cultural Burning initiatives, and funding supports. • Prescribedfire.ca also has information and resources including how to plan a burn. • Review a video case study of Shackan Indian Band (British Columbia) cultural burning planning and operational process. • Review research paper "Centering Indigenous Voices: The Role of Fire in the Boreal Forest of North America"[33]

[33] Christianson, A.C., Sutherland, C.R., Moola, F. *et al.* 2002. Centering Indigenous Voices: The Role of Fire in the Boreal Forest of North America. *Curr Forestry Rep* **8**, 257–276. https://doi.org/10.1007/s40725-022-00168-9

	• The We Are Fire Toolkit is an online knowledge product that invites you to learn about and explore uses of fire on the land. It is based in Saskatchewan however it is an excellent resource for how to develop Indigenous-led Fire Prescriptions. • Canadian Council of Forest Ministers – Canadian Wildland Fire Prevention and Mitigation Strategy
Legislation	*See Appendix 2: Relevant Acts and Regulations*
Development	• Additional guidance on land use planning tools and strategies for the Wildland-Urban Interface include the American Planning Association's PAS Report 594 Planning the Wildland-Urban Interface (2019), which available at no charge through the association's website. • The National Research Council (NRC) Wildland-Urban Interface Technical Committee has also published National Guide for Wildland-Urban Interface (WUI) Fires (2021); this guide provides guidance to Canadian local governments and First Nations on WUI land use planning and regulation implementation.

Interagency Cooperation and Cross Training	Agencies that may play a role in interagency cooperation include:
	• Yukon Wildfire Management
	• First Nation of Na-cho Nyäk Dun
	• Village of Mayo Council
	• Mayo Volunteer Fire Department
	• Indigenous Services Canada
	  ○ Emergency Management Assistance Program (EMAP), which supports communities in accessing emergency assistance services. Will provide funding for communities to build resiliency, and prepare and respond to natural hazards
	• First Nation Health Authority
	  ○ Emergency Management Branch – ensures FN communities are effectively incorporated into emergency preparedness, prevention, response and recovery initiatives.

Appendix 5: Types of Fuel Management

Types of Vegetation Management

Fuel Abatement

Fuel abatement is a term to describe larger-scale landscape level forest fuels treatments that extend past the wildland urban interface zone and into the landscape zone. Fuel abatement projects tend to be larger in size than FireSmart projects with a greater amount of removal of forest fuels.

Larger fuel treatments have the ability to slow or completely stop oncoming wildfire by removing and/or reducing surface, ladder and crown fuels will achieve goals to reduce the rate of spread, fire intensity and reduce the likelihood of a transition from a manageable surface fire to an aggressive crown fire.

Larger fuel treatments also provide strategic vantage points for firefighting operations. The treated areas enable safer access and egress (i.e. escape) for firefighters to suppress a wildfire. They also enable a strategic location for attack strategies such as back burning.

The following describes the fuel abatement tools proposed under this plan:
A **fire guard** is an area where all vegetation and organic matter is removed down to mineral soil. The purpose to remove combustible materials on the surface, create an access for firefighters to suppress wildfire and provide an egress route for firefighters and members of the public in the event of advancing wildfire.

A **fuel break** is a strip of land on which the forest fuels and ground vegetation has been reduced or modified to reduce the fire's ability to spread rapidly. A fuel break may include:

- **Thinning** the forest through hand falling and/or mechanical cutting. A shelterwood thinning treatment includes an increased spacing (5-8 metres) between stems of trees in order to reduce the potential for sustained crown fire and reduce the spread rate of fires that travel through the forest canopy.

- **Variable retention** includes clearing to create a landscape-scale fragmentation in forest fuels through removal of all coniferous stems and retention of healthy deciduous stems.

- **Mastication and mulching** using machinery to remove and/or reduce surface fuels to reduce the potential for fire to reach critical surface intensity as well as spread to a crown fire.

Proposed areas are positioned to take advantage of existing terrain features and infrastructure as well as linear breaks in the fuels and access such as trails and roads. The areas were also selected based on the most likely direction of an encroaching wildfire based on weather, winds, forest fuels, fire history and ignitions and ability to protect the areas of interest and values at risk.

Prescribed Fire

Prescribed fire involves the introduction of a planned and controlled fire to an area under ideal (i.e. safe) conditions. Prescribed fire offers an efficient and cost-effective method following fuel abatement to reduce slash loading and thick duff layers (i.e. surface fuels). It may also be used as a removal treatment

in a mixed wood to eliminate more flammable conifers and stimulate deciduous growth (i.e. forest fuels). Individual prescribed fire prescriptions will be developed based on site requirements and include an operational plan that considers safety and fire weather conditions.

Prescribed fire is also a strong tool to enrich and prepare the ground for stand conversion.

Cultural Burning

"*Cultural Burning is the controlled application of fire on the landscape to achieve specific cultural objectives. These burns are typically implemented at a low intensity, with guidance from an Elder or Fire Knowledge Keeper, often in collaboration with inter-ministry partners.*"[34]

Since time immemorial many Indigenous groups in Canada have cared for the land by putting low intensity fire on the landscape. This was a sacred practice that had many practical outcomes such as increased forage for ungulates, increased berry crop production and reduced wildfire hazards. Colonial government's ban of the Cultural Burn in the late 1800's and subsequent forest "protection" legislation implemented federally and across provinces and territories has had many ramifications on Indigenous people and the forests around them. However, there is a burgeoning interest from academics, government officials, general public, and most importantly First Nations in renewing Cultural Burn programs.

The Cultural Burning process can achieve many objectives:

- reduces overall wildfire hazard,
- empower First Nations to take back their culture and continue to increase their role as stewards of the land,
- builds interagency coordination and cooperation as multiple jurisdictions work together,
- builds on existing knowledge base of wildfire and suppression techniques,
- builds fire management capacity within the Nation and external agencies (Wildland Fire Management and other Fire Departments), and
- supports ecosystem biodiversity and habitat heterogeneity.[35]

Cultural Burning programs are gaining momentum. There are national programs available to provide hands-on guidance to build a cultural burn program with the Nation – starting with existing capacity and building upon that at the Nation's pace. Review *Appendix 4: Additional Resources and Information*.

[34] Excerpt from "What is Cultural Burning" on Prescribed Fire website. Available at: https://prescribedfire.ca/cultural-burning/

[35] UBC News. 2021. 'Cultural burning' important for biodiversity: UBC expert'. Available: https://news.ubc.ca/2021/08/03/cultural-burning-important-for-biodiversity-ubc-expert/#:~:text=Cultural%20burning%20is%20used%20for,to%20each%20community%20and%20culture

Stand Conversion

Stand conversion has also been supported by research as a strategy to reduce the risk of a catastrophic wildfire. Stand conversion is defined as the removal of flammable species (e.g. coniferous) and replacing with less flammable species (e.g. deciduous), whether through tree planting or allowing deciduous to regenerate naturally.

Native deciduous trees (aspen or birch) may be damaged from fire but seldom contribute as a fuel to the wildfire unless under extreme fire weather conditions. This is due to their inner moisture content (trunks and thick branches) as well as the green leaves retain much more moisture than pine/spruce needles. Additionally, naturally there is very rarely any 'ladder fuels' (i.e. branches/leaves) on the lower two thirds of a mature native deciduous species. Ladder fuels contribute to fire severity by allowing a fire on the surface to travel to the crown of the tree. A fire in the crown of the trees spreads at a much more accelerated rate and higher intensity and is therefore more difficult to suppress.

Therefore, stand conversion from spruce/pine to native deciduous species has the benefits of:

- Having the potential to slow or completely stop a wildfire in certain conditions,
- Buying wildland firefighters more time to conduct a response to an approaching wildfire,
- Increasing safety for the wildland firefighters initiating a response by reducing the intensity of approaching wildfire.

Wildland Fire Management may assist in stand conversion strategies through planting native fire resilient deciduous species.

Appendix 6: References

The following is a summary of footnote references. Plans outlined in *Appendix 2: Relevant Acts and Regulations* are accessible through hyperlinks in the digital copy of this document and are not referenced again below.

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Appendix 7: Mayo Fuel Management Plan

Mayo
Fuel Management Plan 2024

Wildland Fire Management

Mayo Fuel Management Plan

Contents

7. Plan Implementation

The following section highlights actionable tools proposed for wildfire risk management in Mayo, including forest fuel treatments and other risk management activities, and is derived from the Mayo Community Wildfire Protection Plan (CWPP). It also describes the risk factors and key vulnerabilities for each area of interest (i.e. geographic areas) and proposed methods to reduce those risks.

7.1 Proposed Forest Fuel Treatments

The proposed areas in this report were identified using existing terrain features, infrastructure, and linear breaks in fuel continuity, such as preexisting trails or access roads. It is important to note that the proposed fuel treatments were determined through desktop analysis without field verification. The goal was to identify large general risk areas within the area of interest (AOI). Further assessment of the identified polygons by a wildland fire professional will be completed in summer as soon as is practicable. Treatment polygons have been identified through high-level desktop planning and has not accounted for factors such as riparian areas or wetland protection areas. Therefore, the final areas may be subject to adjustments following on-site visits by wildland fire professionals.

When planning and prioritizing fuel management units, three parameters were considered:

1. Prevailing wind and fire history patterns.
2. Proximity to and density of Values at Risk.
3. Fuel type and forest stand structure.

In addition to the finalized areas for treatment determined by wildland fire professionals, recommendations will be made to utilize one of the following methods to reduce wildfire hazard: FireSmart, Fuel Abatement, Prescribed Fire, and Stand Conversion.

Figure 1: Area of Interest (AOI) for the Mayo Community Wildfire Protection Plan and accompanying Fuels Management Plan

7.1.1 FireSmart

FireSmart is a national program that helps Canadians increase neighborhood resilience to wildfire and minimize its negative impacts. It was founded over 20 years ago to address common concerns about wildfire in the wildland urban interface. The FireSmart program introduces several principles from assessments of materials used to build homes, how a property owner can make their property more fire resilient, to forest fuel treatments on public land.

Treatment of forest fuels in volatile fuel types can reduce the risk of wildfire by reducing the potential intensity, severity and rate of spread. FireSmart projects are commonly implemented as 2-5 metres spacing of conifer species, retention of less flammable deciduous species, pruning limbs of remaining timber to a minimum height of 2 metres and pile and burning debris. It is also important that surface fuels are removed from the forest floor, as they can carry fire spread especially in areas with heavy litter or downed trees. These programs are generally targeting the wildland urban interface zone where human development meets or intermingles with the natural environment.

FireSmart projects have been completed throughout the planning area and will continue to be implemented in strategic areas within the wildland urban interface, or intertwined with larger, landscape

level fuel abatement work. FireSmart education and events will be incorporated into the CWPP as part of the broader risk mitigation actions and responsibilities to provide opportunities for community members to reduce the risk to their personal properties.

Figure 2: FireSmart Project in Mayo

7.1.2 Fuel Abatement

Fuel abatement is a term to describe large-scale landscape level forest fuels treatments that extend past the wildland urban interface zone and into the landscape zone. Fuel abatement projects tend to be larger in size than FireSmart projects with a greater amount of removal of forest fuels.

Larger fuel treatments removes and/or reduces surface, ladder and crown fuels to reduce the rate of spread, fire intensity and reduce the likelihood of a transition from a manageable surface fire to an aggressive crown fire.

Larger fuel treatments provide strategic vantage points for firefighting operations such as direct attack or backburning. The treated areas also create defensible space which enables safer access and egress (i.e. escape) for firefighters to suppress a wildfire.

The following describes the fuel abatement tools proposed under this plan:

A ***Fire Guard*** is a linear feature where all vegetation and organic matter is removed down to mineral soil. Linear fire guards can provide some fire behaviour reduction benefits; however they mostly provide strategic, operational outcomes. These linear units enable safer access and egress (i.e. escape) for firefighters and necessary equipment into fuel treatment areas or into high-risk areas to attack a wildfire. They also serve as control lines to enable planned ignition strategies such as burning out and back burning to remove fuels adjacent the fire guard.

Fire guards are typically always linear, straight lines due to the ease for wildland firefighters to travel and conduct back burns.

Fire guards can be constructed using a bulldozer or other relevant heavy equipment to remove vegetation and bring the ground down to mineral soil. They are generally the width of a bulldozer blade (5-8 metres) and can be wider in some instances. Mineral soil is not considered flammable and thus could stop or slow an oncoming low intensity surface fire as well as create access and space for wildland fire fighters to safely suppress fire.

Fire guards are popular for recreational pursuits by community members including carrying out traditional practices, walking, snowmobiling, and use by motorized off-road vehicles. Care and consideration should be exercised when planning and implementing permanent fire guards, as they may become water saturated over time in areas with an existing high-water table. Additionally, long, linear clearings that are permanently established may result in changes to large predator/prey interactions. Monitoring and maintenance of the fire guards long term is essential.

During the 2023 wildfire season, several fire guards were constructed, utilizing bulldozers, surrounding the Mayo AOI in response to the approaching MA033 wildfire from the south. These fire guards were strategically placed at a distance from the Village of Mayo to serve as practical points of defensibility and areas for wildfire crews to implement backburning operations.

Fire guards are relevant to the Fuel Management Plan as they are retained on the landscape to support future fire suppression activities. To be useful, fire guards should provide continued vehicle access, while being managed for erosion and controlled for invasive species ingress. Fire guard restoration is an opportunity for the Government of Yukon and the Mayo community to collaborate to support restoring native plants used for traditional or medicinal purposes, while maintaining fire protection for the community.

A ***Fuel Break*** is a larger parcel of land on which the forest fuels and ground vegetation has been reduced or modified to reduce the fire's ability to spread rapidly. A fuel break may include:

- **Shelterwood thinning** the forest through hand falling and/or mechanical cutting. A shelterwood thinning treatment includes an increased spacing (5-8 metres) between stems of trees to reduce the potential for sustained crown fire and reduce the spread rate of fires that travel through the forest canopy.
- **Variable retention** includes clearing to create a landscape-scale fragmentation in forest fuels through removal of all coniferous stems and retention of healthy deciduous stems.
- **Mastication and mulching** using machinery to remove and/or reduce fuels on the surface to reduce the potential for fire to reach critical surface intensity as well as spread to a crown fire.

It is worth noting that both fire guards and fuel breaks provide tactical tools to assist with both direct and indirect attack on an approaching wildfire; however, it is understood that these will not in themselves stop an approaching wildfire without the addition of suppression tactics. Even with suppression, there is potential for wildfires to jump the guards; however, direct and indirect attack utilizing these guards reduces this potential.

The most common distance for ember travel (i.e. cause of spot fires) is 100-500m ahead of the fire front, where embers can travel up to nine kilometers ahead of the fire under extreme conditions and start new spot fires. For this reason, a fuel break alone is unlikely to stop a running crown fire, unless the fuel break is used to support ignition strategies.

Figure 3: Example of a fire guard constructed during a wildfire response to MA011 near the Victoria Gold Mine Site. Preventative fire guards have the benefit of time to construct in a clean, tidy manner and considering community values versus fire guards constructed in haste in an emergency.

Figure 4. Example of variable retention treatment in Haines Junction on the left, mulching completed in the Mary Lake Shaded Fuelbreak in Whitehorse on the right.

7.1.3 Stand Conversion

Stand conversion has also been supported by research as a strategy to reduce the risk of a catastrophic wildfire. Stand conversion is defined as the removal of flammable species (e.g. coniferous) and replacing with less flammable species (e.g. deciduous), whether through tree planting or allowing deciduous to regenerate naturally.

Native deciduous trees (trembling aspen or white birch) may be damaged from fire but seldom contribute as a fuel to the wildfire unless under extreme fire conditions. This is due to their inner moisture content (trunks and thick branches) as well as the green leaves retain much more moisture than pine/spruce needles. Additionally, naturally there are very rarely any 'ladder fuels' (i.e. branches/leaves) on the lower two thirds of a mature native deciduous species. 'Ladder fuels' contribute to fire severity by allowing a fire on the surface to travel to the crown of the tree. A fire in the crown of the trees spreads at a much more accelerated rate and higher intensity and is therefore more difficult to suppress.

Therefore, stand conversion from spruce to native deciduous species has the benefits of:

- Having the potential to slow or completely stop a wildfire in certain conditions.
- Buying wildland firefighters more time to conduct a response to an approaching wildfire.
- Increasing safety for the wildland firefighters initiating a response by reducing the intensity of wildfire.
- Reduce frequency of maintenance in a fuelbreak.

Wildland Fire Management may assist in stand conversion strategies through planting native fire resilient deciduous species. An important characteristic of deciduous as a fuel break is whether the stand has leafed-out or not. Prior to green-up, deciduous stands can carry fire through cured grass (if present). Once the vegetation has greened-up in the spring, ignition probability and spread potential often reduces considerably.

Figure 5: Photo depicting a wildfire where conifer trees (lodgepole pine) were completely charred from bottom of the tree to crown; whereas fire resilient aspen only burned approximately one quarter of the stem and leaves remaining intact.

7.1.4 Prescribed Fire

Prescribed fire involves the introduction of a planned and controlled fire to an area under specific conditions. Prescribed fire offers an efficient and cost-effective method following fuel abatement to reduce slash loading and thick duff layers (i.e. surface fuels). It may also be used as a removal treatment in a mixed-wood to eliminate more flammable conifers and stimulate deciduous growth (i.e. forest fuels). Individual prescribed fire prescriptions will be developed based on location, site requirements and include an operational plan that considers safety and weather. Prescribed fire makes it difficult for a natural fire to ignite as fuels are already burnt and it is also used as a strong tool to enrich and prepare the ground for stand conversion.

Figure 6: Prescribed burn in the Duke River Meadows

7.2 Areas of Interest for Fuel Treatment

1.2.1 Area A – 5 Mile Lake

The Five Mile Lake area, situated northwest of Mayo, encompasses a Territorial Campground and the Wareham Lake Dam—an integral part of the Mayo Generating Facility supplying power to Mayo and Dawson City residents (Figure 7). High Fire Weather Index Values (FWI) for the Mayo area, particularly associated with north winds during spring and summer (as referenced in the *Mayo Community Wildfire Protection Plan*), increase the likelihood of fires starting north of Mayo and being driven towards the community.

Considering this, the Five Mile Lake Territorial Campground faces an elevated risk of fire starts during fire seasons, often triggered by recreational activities like unattended campfires (see TU-2). To address this risk, a proposed fuel treatment area has been delineated around the Territorial Campground, focusing on **FireSmart** treatments. This approach aims to preserve the park's aesthetics while reducing the threat of new fires rapidly surpassing early suppression capabilities.

Given the significance of the Wareham Lake Dam as critical infrastructure, fuel treatment polygons have been delineated in the northern forested areas surrounding this infrastructure (TU-1). These proposed treatments, well-suited for **FireSmart** fuel mitigation methods, aim to enhance the protection of this

critical facility against potential wildfires driven by predominant north winds.

Figure 7: Treatment units proposed in Area A of the AOI.

1.2.2 Area B – C6 Subdivision

Along with its subdivision of homes, the C6 Subdivision is surrounded by a mixed-wood forest characterized by a high deciduous component (Figure 8). A high deciduous component generally indicates a lower fire risk.

Existing **FireSmart** treatments are in place along the egress road from the community. **FireSmart** treatments along egress routes serve dual purposes: acting as enforced fire breaks and creating a corridor for residents in the event of a prompt evacuation. Monitoring and retreating these existing treatments at an appropriate time is essential to ensure continued effectiveness.

Satellite imagery identified a potential secondary egress route along the northern portion of TU-3 from the Na-Cho Nyak Dun Government House to the Silver Trail Highway. This area has been selected for additional **FireSmart** treatments along the egress route.

Along the western portion of TU-3, a fuel treatment area was identified behind the subdivision, consisting of a mixed-wood forest with a high deciduous component. Recommended treatments include the installation of low-intensity fuel breaks, such as hiking or quad trails. These trails would not only provide easy accessibility for firefighters but also help break up continuous fuels, reducing the risk of fire spreading toward the subdivision.

The existing historic fuelbreak (FB1) on the western edge of Area B is currently about 50m wide and would benefit from maintenance or restoration with traditional and medicinal plants as heavy spruce regeneration is present. The historic fuelbreak (FB2) to the north near the dump does not require re-treatment currently as it is mostly aspen.

Treatment Unit TU-4 encompasses part of a 2023 dozer guard. To ensure their continued effectiveness, the dozer guard should be regularly maintained and kept accessible for vehicles, which are necessary for practical use by fire crews. For the proposed Treatment Units, it is recommended to consider implementing a **stand conversion** fuel treatment on the town-facing side of the dozer guard, transitioning to a deciduous species such as aspen or traditional and medicinal plants. This **stand conversion**, coupled with the dozer guard, would act as a fire guard lowering fire intensity. On the opposite side of the dozer guard, facing away from the AOI, it is recommended to implement **fuel abatement** treatments. This approach would lower fire risk while allowing firefighters to implement backburn operations effectively.

There is also a section of 2023 dozer guard directly east of the C6 subdivision which does not require reinforcement as there are FireSmart treatments adjacent to the guard.

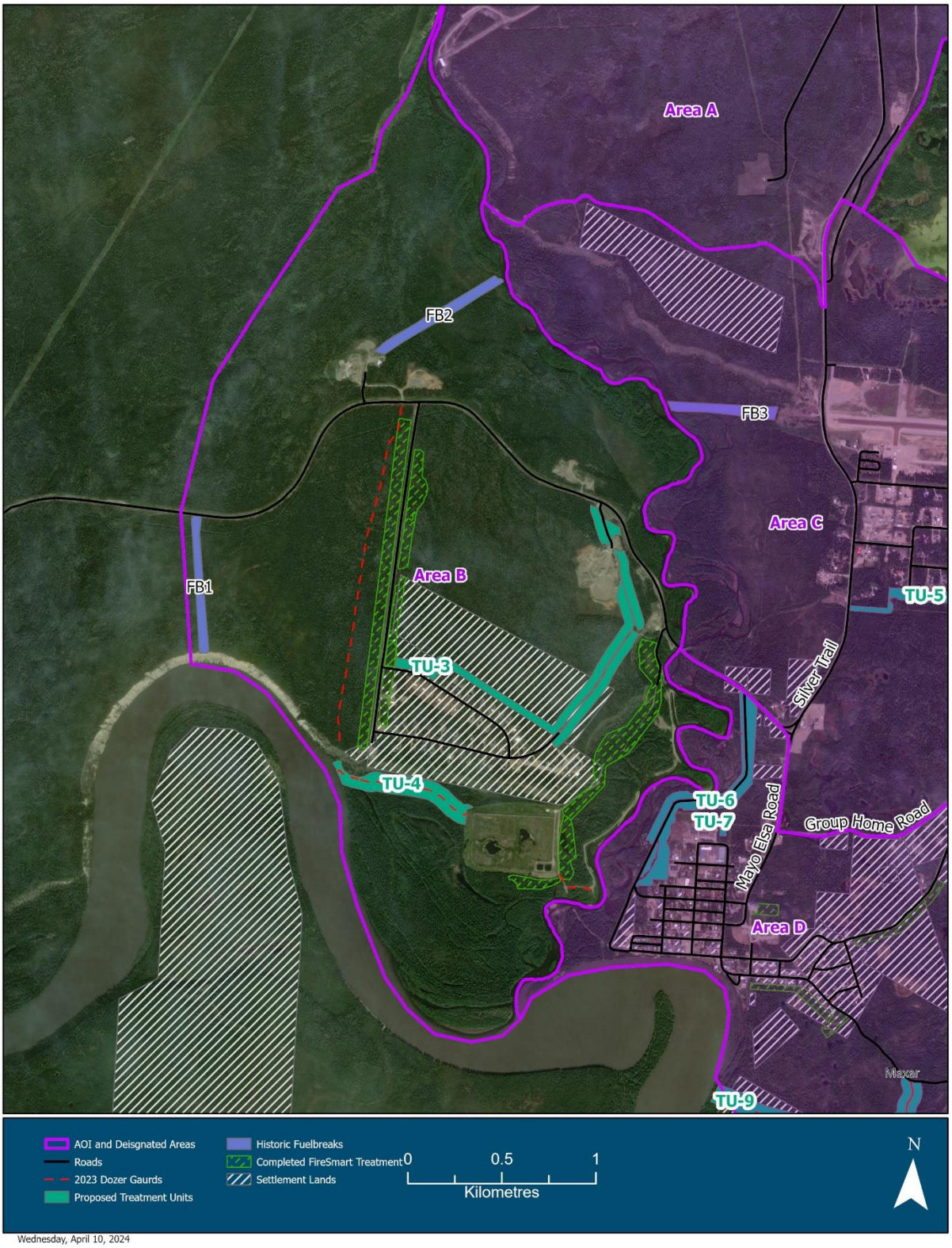

Figure 8: Treatment units proposed in Area B of the AOI.

1.2.3 Area C – Mayo Airport

The area surrounding the Mayo airport supports a mixture of forests and values. To the north of the airport is mixed-wood forest with a high coniferous component and variety of lakes and wetlands (Figure 9). To the south of the airport is a residential area surrounded by a mixed-wood forests with a medium conifer component.

A cause for concern in the Mayo area is strong winds from the north during periods of high fire risk (as referenced in the *Mayo Community Wildfire Protection Plan*). The Mayo Airport runs linearly east-west acting as a large fuel break. It is recommended that the community consider maintaining the existing historic fuel break (FB-3) to the west of the airport from the 1970's adjacent to the airport. Maintenance of this fuel break and/or restoration with traditional or medicinal plants would provide a large linear break in fuels connecting from the Mayo River to the eastern edge of the airport. Considering that this treatment ties into a riparian area, exploring a **Stand Conversion** treatment is recommended. This approach would lower fire intensity and minimize potential damage to the riparian area.

The area south of the airport has existing **FireSmart** treatments in place. Monitoring and retreating these existing treatments at an appropriate time is essential to ensure continued effectiveness.

New **FireSmart** fuel treatment areas are proposed south of Galena Road to tie into the existing **FireSmart** treatments and the Silver Trail Rd (TU-5). Once completed, these treatments south of Galena Rd would provide a linear fuel treatment that would be utilized to protect the residential area from fires approaching from the southeast.

The historic fuelbreak (FB4) to the east, requires field verification and likely re-treatment or restoration to minimize any conifer regeneration.

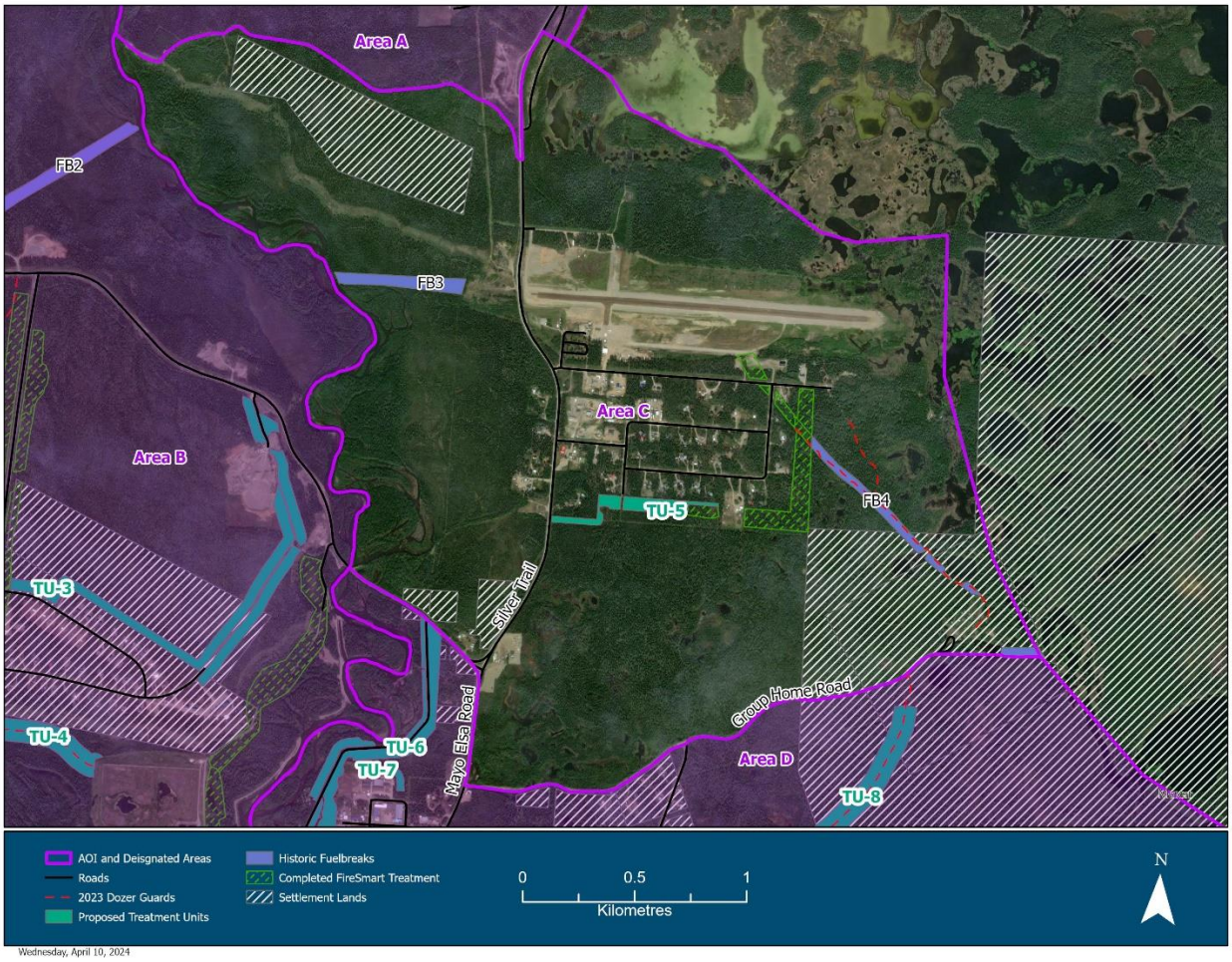

Figure 9: Treatment units proposed in Area C of the AOI.

1.2.4 Area D – Mayo Central

The Mayo central area, housing the Village of Mayo, is bordered to the south by the Stewart River and to the west by the Mayo River. This region is surrounded by mixed-wood forests with varying conifer content, ranging from low to high. Two primary egress routes, Dyke Road on the western side of town and Mayo Elsa Road connect to the Silver Trail Highway.

Existing **FireSmart** treatments are already in place in the Mayo area, and it is crucial to monitor and retreat these treatments at appropriate intervals to ensure continued effectiveness (Figure 10).

Fuel treatments were delineated along Dyke Road, a key egress route from town that would be utilized in the event of a fire (TU-6). This area takes precedence over Mayo Elsa Road fuel treatment area due to overgrown vegetation encroaching on Dyke Road, rendering it unsafe in its current state during a wildfire event as an egress route. Treatment recommendations include clearing vegetation along Dyke Road and to create a 5-30 meter treatment strip along either side of the road.

The area surrounding the Yukon College Mayo Campus and the Mayo Community Center, identified as high-value assets to the community, also received recommendations for **FireSmart** treatments to enhance their protection (TU-7).

Treatment Units TU-8 and TU-9 encompass 2023 dozer guards. To ensure their continued effectiveness, the dozer guards should be regularly maintained and kept accessible by vehicles, which are necessary for practical use by fire crews. For the proposed Treatment Units, it is recommended to consider implementing a **stand conversion** fuel treatment on the town-facing side of the fire guard, transitioning to a deciduous species such as aspen, traditional or medicinal plants. This **stand conversion**, coupled with the fire guard, would act as a fuel break lowering fire intensity.

On the opposite side of the fire guard, facing away from the AOI, it is recommended to implement **fuel abatement** treatments. This approach would lower fire risk while allowing firefighters to implement backburn operations effectively.

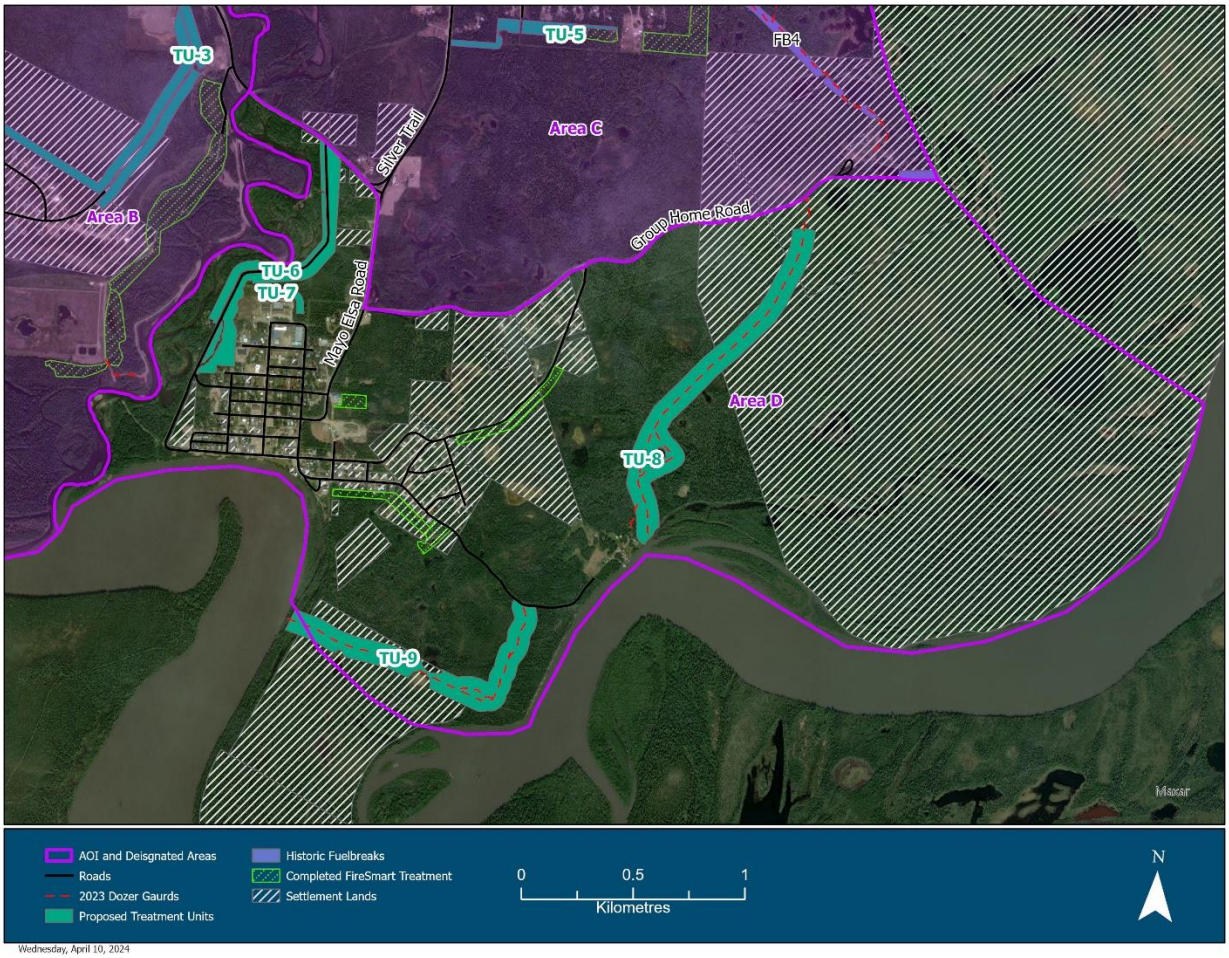

Figure 10: Treatment units proposed in Area D of the AOI.

7.3 Summary of Treatments

Below is a table summary and a map (Figure 11) of all of the proposed treatments in each treatment area. Next steps would be to potentially prioritize the treatments for scheduling.

Table 1: Treatment proposed in the AOI

Treatment Area A – 5 Mile Lake		Area (ha)	Priority
- TU 1	FireSmart treatment.	3.3	
- TU 2	FireSmart treatment.	5.8	
Treatment Area B – C6 Subdivision			
- TU-3	FireSmart treatment and fuelbreak 10-20m wide to north.	14.8	
- TU-4	Maintain dozer guard, fuel treatment and stand conversion on town side of guard. Fuel treatment on opposite side of dozer guard.	7.0	
- 2023 Dozer Guards	Requires long term maintenance to serve as access or egress for emergency personnel. In the event of additional development in this area, new fuel breaks should be established including a fire guard down to mineral soil.	-	
- Existing fuelbreaks FB1 and FB2 west and north	FB1 requires maintenance removal of conifer, FB2 fuelbreak is mostly aspen.	3.2 & 4.0	
Treatment Area C – Mayo Airport			
- Existing historic fuelbreaks FB 3 and FB4 west and east of airport	Maintenance removal of conifer, consider stand conversion.	3.0 & 4.0	
- Existing FireSmart treatments	Plan for re-treatment	11.6	
- TU-5	FireSmart treatment to tie into existing FireSmart treatments south of Galena Road.	3.1	
Treatment Area D – Mayo Central			
- Existing FireSmart treatments	Plan for re-treatment.	5.6	
- TU-6	Fuelbreak 5-30m on either side of the Dyke Road.	9.5	
- TU-7	FireSmart treatment.	0.7	
- TU-8 and TU-9	Maintain 2023 dozer guard, fuel treatment and stand conversion on town side of guard. Fuel treatment on opposite side of dozer guard.	18.3 & 14.0	

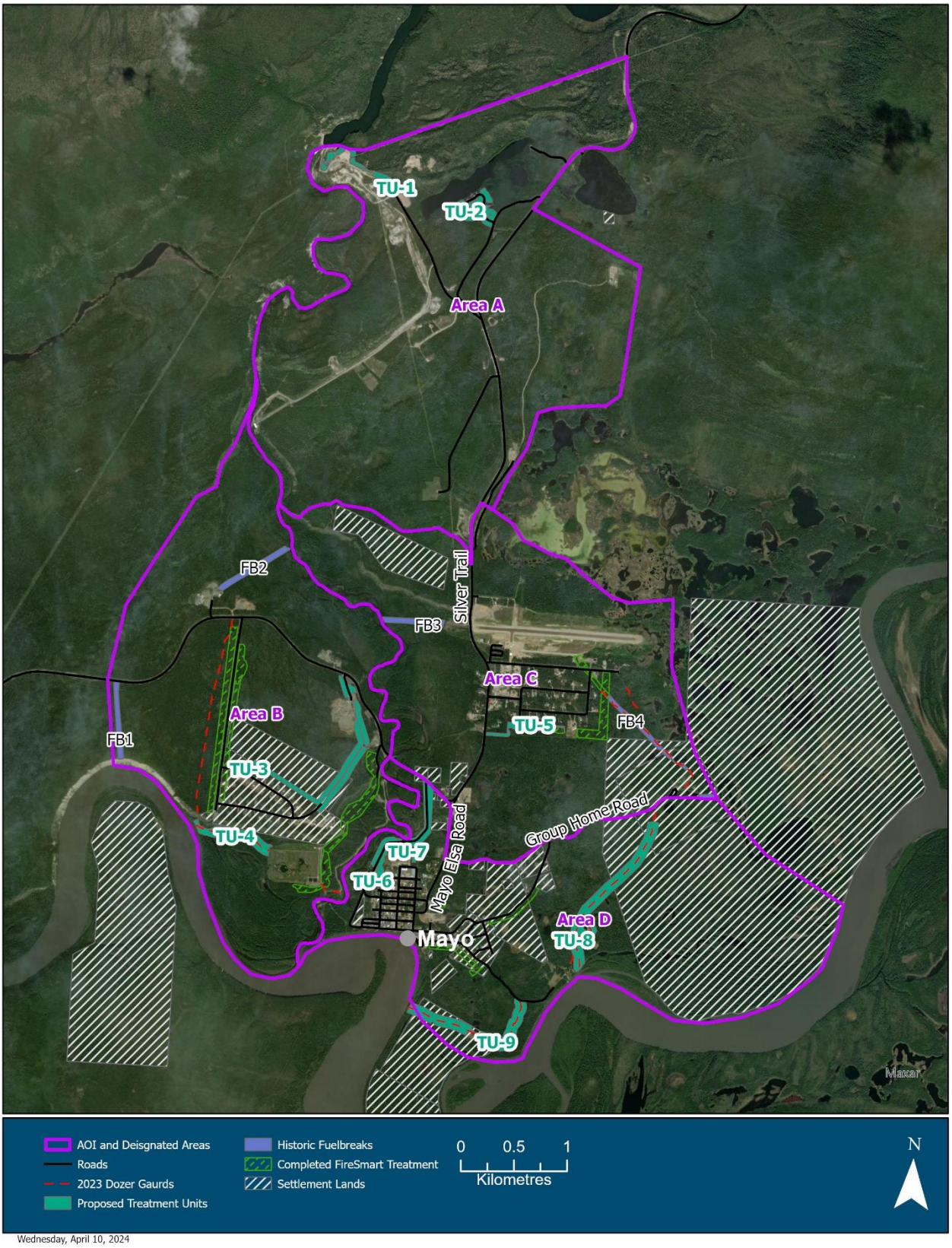

Figure 11: Overview of all treatment units proposed in around Mayo within the AOI.