Teslin Community Wildfire Protection Plan

Wildland Fire Management

Yukon

Adoption of the Teslin Community Wildfire Protection Plan

The Teslin CWPP was developed between 2020-2022 and represents a collaborative effort between the Teslin Tlingit Council, Village of Teslin, and Government of Yukon to take action to address the threat of wildland fire to the community of Teslin. As directed by this CWPP, extensive fuels reduction and fire prevention and mitigation activities will be completed on public and Settlement Lands in and around Teslin.

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

Aug 16/2022

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Executive Summary

The Teslin Community Wildfire Protection Plan (CWPP) was developed through a collaborative effort between the Teslin Tlingit Council, Village of Teslin, and the Government of Yukon Wildland Fire Management Branch. Ember Research Services Ltd and Forsite were contracted and provided significant contributions towards the technical assessments and recommendations herein, as well as the writing of the plan. The CWPP addresses the wildland urban interface (WUI) surrounding the community of Teslin. The area of interest is within the traditional territory of the Teslin Tlingit Council.

Using the best available spatial data and fire science research, this CWPP identifies the wildfire risks surrounding the community, potential consequences of a wildfire to the community, and recommends possible ways to reduce the risk.

The fuel types in the area are a mosaic of mature conifer and mixed-wood forests. Previous fire history in the area indicates primarily human-caused fires with moderate potential for lightning-caused fires. The probabilistic wildfire risk is rated as moderate based on quantitative analysis of the available forest fuels, weather, previous FireSmart fuel management efforts, and the capacity for successful fire suppression. That said, perceived wildfire risk within the community is high and support for forestry interventions to reduce that risk is broad-based.

Recommendations are summarized in the table below. The recommendations 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. FireSmart is a national initiative to educate and empower the public on what can be done to protect their families, properties, and communities from wildfire. Fuel management is recommended both within the wildland-urban interface immediately surrounding developed areas, as well as at the landscape level. Community education and awareness also play a critical role in reducing the wildfire risk. Community education focuses on FireSmart principles, understanding fire use restrictions, emergency preparedness, and regularly sharing fire safety related information with the community.

This plan makes 19 recommendations to improve the wildfire-resilience of the community and its residents. The recommendations should be further prioritized by the local, First Nations, and territorial governments depending on local strengths, opportunities, and the availability of human, financial, and physical resources. At minimum, the plan should be revisited every five years to assess the progress and relevance of previous recommendations and for the continual improvement of wildfire protection planning as more information becomes available.

Teslin Community Wildfire Protection Plan

Contents

1. Introduction

Wildfire is an essential natural occurrence 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 humans expand further into natural ecosystems, more communities and industries are at risk of wildfire impacts. Land managers, emergency managers and communities are tasked with understanding wildfire risks associated with their areas of management and to then develop strategies to increase resiliency against wildfire threat.

Drivers of a wildfire

There are three interacting elements that drive a wildfire, commonly referred to as the 'fire triangle' (Figure 1): fuel, weather and topography. These three factors determine how a wildfire behaves – how fast is spreads and how intensely it burns.

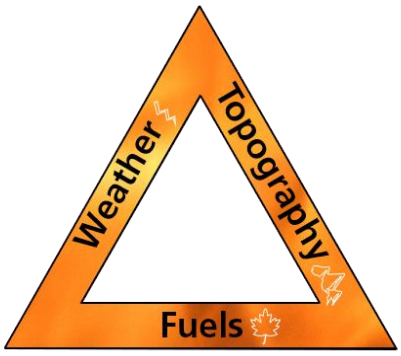

Figure 1. The fire triangle – interacting components that drive a wildfire.

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.

Weather also influences how fast a fire moves, 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[1].

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.

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.

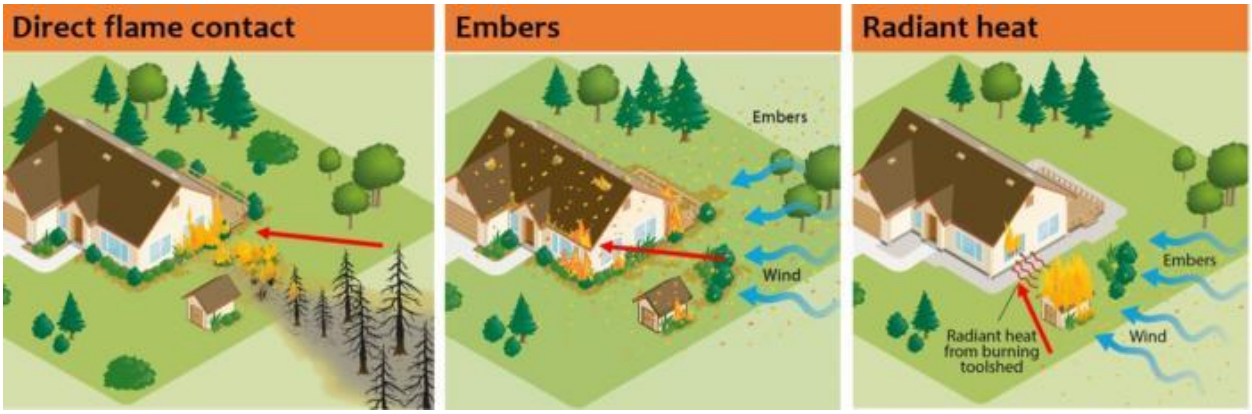

Figure 2. Example of how a wildfire can impact a home[2]

[1] Cruz MG, Alexander ME and Fernandes, P. 2022. *Evidence for lack of a fuel effect on forest and shrubland fire rates of spread under elevated fire danger conditions: implications for modelling and management*. International Journal of Wildland Fire. Doi:10.1071/WF21171

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

Figure 2 above demonstrates 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 3). 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.

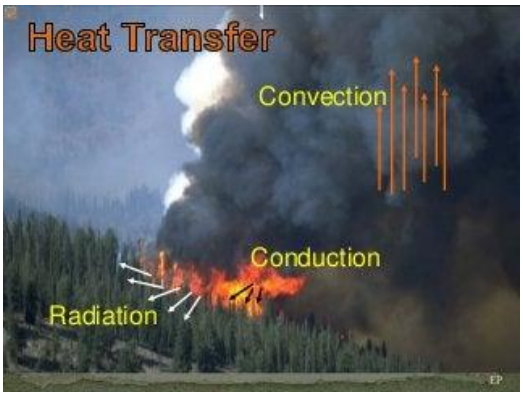

Figure 3. Example of three different types of heat and energy transfer. Convection contributes to severe fire behaviour by supplying the fire with more oxygen to burn, creating strong winds which push the fire and transport embers, and sometimes developing lightning storms which can start more fires.

What is Wildfire Risk?

Detailed wildland fire risk methods can be found in the following report, *Yukon Communities: Wildland Fire Risk Assessment Methodology Project*[3] (WFRAM Report). The WFRAM Report uses the internationally recognised risk management standard ISO 31000 "Risk Management – Principles and Guidelines" [4] and applies it for wildland fire risk management using an adaptation of research by Al Beaver[5]. 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

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

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

[5] 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.

	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 length of time that a value is vulnerable to a fire. Exposure considers the influence of seasonal and diurnal weather conditions on the likelihood and potential severity of a fire. For example, for how many days in summer is a home under threat of a fire starting and burning hot enough to destroy it?
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. This 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.

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[5]

2. Purpose

The purpose of this Community Wildfire Protection Plan (CWPP) is to provide a sustainable wildfire risk management strategy to support the village of Teslin, within the Teslin Tlingit Council Traditional Territory.

This CWPP describes the community of Teslin to contextualise the active governance, community, social and cultural aspects of the community as well as the environment in which it inhabits. It then identifies the wildfire risk potential within and surrounding the Teslin CWPP Planning Area. It describes the values at risk of wildfire impacts within the Teslin Area of Interest and develops a plan to reduce wildfire risk factors to those values.

The action plan developed in this CWPP aims to be integrated with other land and community management plans identified.

For all practical purposes, the Teslin Tlingit Council Natural Resource Manager is the primary point of contact for questions about this plan.

3. Planning Area Description

3.1 Teslin

The Village of Teslin is located on the shores of Teslin Lake, at the confluence with Nisutlin Bay Inlet, at Mile 804 (Km 1244) of the Alaska Highway (Figure 4). This location is a traditional summer camp of Tlingit people coming from coastal Alaska and the Tahltan area of B.C., who used the area for subsistence and cultural identity. During the Klondike Gold Rush of 1898 Teslin became a stopover for prospectors working their way north. Once the gold rush passed the Hudson's Bay Company established the Nisutlin Trading Post and Teslin, as is known today, was established. Construction of the Alaska Highway in 1942 finalized the permanence of the settlement and today Teslin is one of eight incorporated municipalities within Yukon Territory.

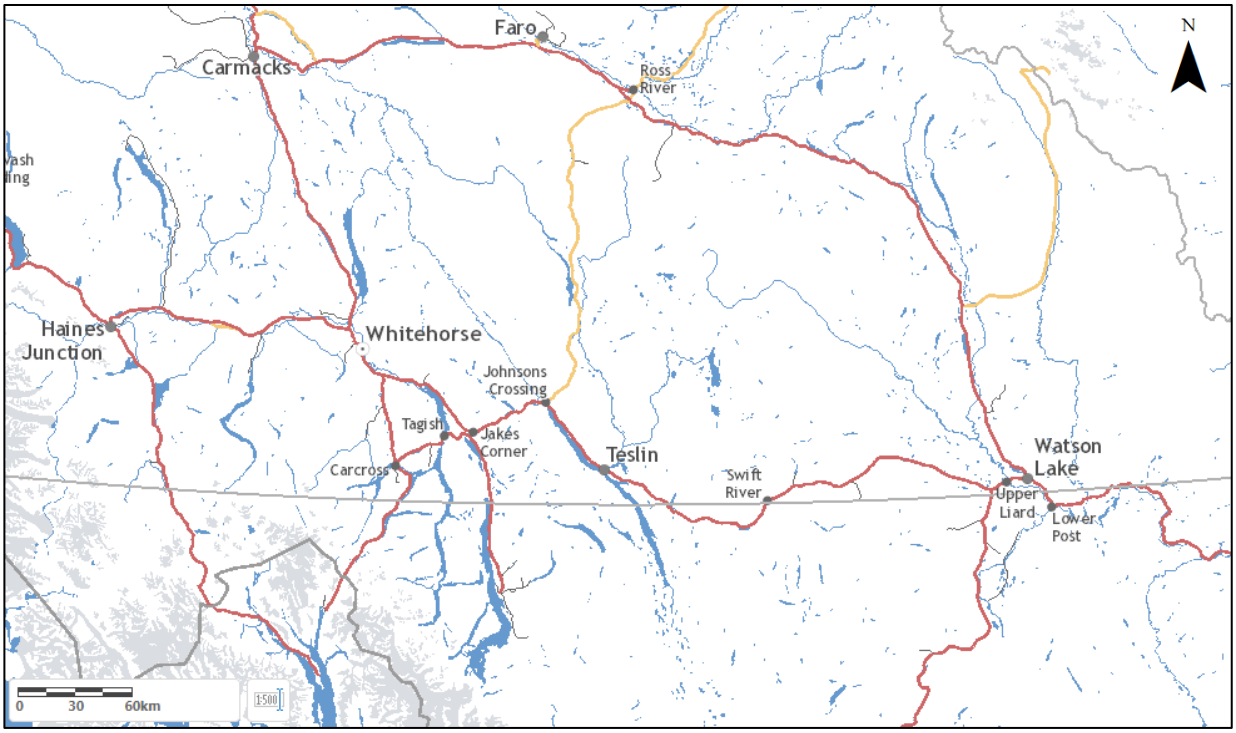

Figure 4 Teslin location

The Village and associated residential areas are spread along Teslin Lake from Morley Bay to Johnson Crossing; however, the Area of Interest (AOI) is restricted to a smaller area surrounding the municipal boundary of Teslin (Figure 5). Serving a population of around 486[6], human lives and safety are the top priority within Teslin.

Public and tourist services include motels, service stations, campgrounds and a general store. There is also an elementary school, community centre, post office, recreation complex, ball diamond, skateboard park and a Yukon College campus.

The Teslin Health Centre is the main medical facility in the area. Swift River Ambulance provides paramedic services and the RCMP provides area policing. There is a small regional airport that can accommodate a 737 sized aircraft in the event of an emergency. Yukon Electrical Co. Ltd. provides electrical service from the Whitehorse Dam, with generator backup, and the Teslin Biomass Project supports some district heat generation around 4 energy centers (more detail below).

[6] Yukon Bureau of Statistics. 2022. (table). *Population Report First Quarter, 2022*.

Area of Interest

The Area of Interest for wildfire risk and mitigation planning is the village of Teslin, outlined below (Figure 5). It is important to consider context, so information in the first three sections of this CWPP includes a broader area to enable an informed risk mitigation planning process in the AOI.

Figure 5. Area of Interest for CWPP Risk Assessment and Risk Management Planning

Community

One hundred forty-four private dwellings were recorded during the 2021 Statistics Canada Census[6] with a growing need for more housing options within the community. Many of these buildings are constructed out of wood frame or logs and rely on wood-burning heating systems. Additionally, several important heritage buildings are sprinkled throughout the community, all of which are constructed out of aged wood and are highly flammable.

Recommendations:

1. FireSmart: assessments should be undertaken for heritage buildings throughout the community, as noted in the Village of Teslin Official Community Plan (2.2.2.1).
2. Individual property owners in existing and new subdivisions should be encouraged to treat and maintain their properties to FireSmart guidelines.
3. New residential subdivisions should be designed using FireSmart principles with respect to access roads, defensible perimeters and linked fuel discontinuities (primary and secondary fuel breaks) as they are planned and developed.

The natural environment is also an important cultural value to people living in the Teslin region. Interviews conducted in 2015 with Teslin Tlingit Traditional Territory community members (First Nations and others) highlighted the significance of access to pristine wilderness for activities (such as hunting, collecting food and medicinal plants, trapping, fishing and hiking) and for physical health and connection to the land[7].

Government (First Nation and territorial) is currently the largest employer in Teslin, however tourism is another dominant sector, attracting numerous summer visitors as a stopover on the Alaska Highway tour as well as visitors to the area specifically for Teslin's many natural and cultural attractions. This includes the Northern Wildlife Museum, the Teslin Tlingit Heritage Centre and the George Johnston Museum. The Nisutlin River Delta National Wildlife Area, just upriver from Teslin, is federally protected and provides habitat for thousands of waterbirds, shorebirds, and mammals including several species listed under the Species at Risk Act. Wildlife within this area is protected but many tourists are also attracted to the Teslin area with fishing and/or hunting objectives in the surrounding unprotected areas. Depending on industry trends there could also be a number of guide outfitters and miners in the area at any given time.

Teslin has a robust recreation program with many camps, programs and events offered throughout the year. These include but are not limited to organized team sports such as baseball, pickleball, and hockey, individual skill sessions for swimming, mountain biking and cross-country skiing, and outdoor recreation activities such as canoe trips, camp-outs and mini winter Olympics.

Recommendation: Teslin's recreation program could support FireSmart programs and activities for the community.

[7] Timko J, Green S, Sharples R & Grinde A. 2015. *Using a community-driven approach to identify local forest and climate change priorities in Teslin, Yukon*. Cogent Social Sciences, 1:1, 1047564, DOI: 10.1080/23311886.2015.1047564

Governance

Teslin's local municipal governance is a progressive collaboration between the Village of Teslin Council (VOT) and the Teslin Tlingit Council (TTC). TTC is a self-governing Yukon First Nation with a Final Agreement (1993) and Self-Government Agreement (1995). TTC provides programs, services, governance, laws, and management of lands and resources within their traditional territory, and for TTC Citizens. TTC lands retained under the TTC Final Agreement which lie the AOI include two Indian Reserves (# 13 and # 15), small parcels of land for existing residential, and larger parcels for other uses, including future residential uses. TTC's corporation has also purchased some lands within the area.

Five traditional Clans play a central role in the TTC's government structure: Kùkhhittàn (Raven Child Clan), Ishkìtàn (Frog Clan), Yanyèdí (Wolf Clan), Dèshitàn (Beaver Clan), and Dakhl'awèdí (Eagle Clan). There are five councils established by the Teslin Tlingit Council's Constitution. The Elders Council is made up of all Teslin Tlingit Elders over the age of 65. General Council is comprised of five representatives appointed from each Clan for a total of 25 Council members. One member from each Clan sits on each of the Executive Council, Youth Council, and Justice Council. These Councils, along with Management Board (the Directors of the 8 departments), and support from Executive Services make up the TTC government.

Through regular joint council meetings, the TTC and VOT have formed an effective partnership and a number of plans have been created together.

> *"Both governments have similar long-term goals related to community sustainability, infrastructure, planning and development. These include land use stewardship, economic diversification, community recreation and cultural development."*[8]

The VOT Council follows the standards and legislation of all Yukon Municipal Governments as per the Yukon Municipal Act[9]. It is comprised of a mayor and four councillors who are elected on a three-year term, with the next election set to take place October 2024. Council meetings are run twice a month.

[8] Teslin Tlingit Council and Village of Teslin. 2015. *Teslin Community Development Plan 2015-2025*. Accessible: https://static1.squarespace.com/static/5a1355c8d74cff26eb78da29/t/5c193d7103ce64be5a889f57/1545158099518/REVISED+FINAL+DRAFT+TTC-VOT+Community+Development+Plan+-+March+15%2C+2015.pdf

[9] Government of Yukon. 2002. *Municipal Act: Revised Statues of the Yukon*. Accessible: https://laws.yukon.ca/cms/images/LEGISLATION/acts/municipal.pdf

Media and Communications

As with many groups, businesses and organizations, Teslin community outreach has evolved to include many online and social media platforms as the dominant forms of communications.

The *Teslin Post* is a monthly electronic newsletter, which includes a summary of the two VOT regular council meeting notes, an Administration report co-authored by the Chief Administrative Officer (CAO) and the Public Works foreman, and a robust Recreation report. The document always includes generic emergency contact information and direction as well as information on how to join the Teslin Volunteer Fire Department.

Deslin Neek – The Voice of the Teslin Tlingit Council is also an online publication that focuses on all matters relevant to the community from informal community announcements and event reporting to TTC resolutions and updates, to Territorial First Nations proceedings. It always includes a Chief's message and general community announcements and is published once every two months.

The community of Teslin also has several Facebook pages including the 'Teslin Volunteer Fire Department' and 'Teslin What's Happening'. Community members also have access to broader emergency information via Facebook pages such as 'Yukon Protective Services' and 'Yukon First Nations Wildfire'.

Public radio platforms include: CBC Radio One, CHON FM and The Rush.

Recommendation: Teslin has significant communication and social networks which can support emergency information dissemination as well as providing FireSmart information, wildfire updates and community project information.

Teslin Biomass Project

Teslin has recently undertaken an innovative solution to address the desire to reduce greenhouse gas emissions, reduce wildfire risk and create new jobs in the community: the Teslin Biomass Project[10]. It has allowed for the viability of a sawmill in the community, which was previously uneconomical due to the amount of waste produced, while reducing the reliance on diesel fuel by providing energy to the community. At present, several Teslin Tlingit Council buildings are being serviced by the biomass project and plans to expand the service are underway. The project also provides greater incentive to undertake wildfire fuel management tasks as much of the debris from these projects can also feed the wood chip boilers.

[10] Yukon Wood Products Association. 2018. *Teslin Tlingit Council Biomass Project*. Accessible: https://www.yukonwoodproducts.org/index.php/news/4-teslin-tlingit-council-biomass-project

Recommendation: The Teslin Biomass Project is significant for the community of Teslin. Specific risk mitigation should be considered for this site and the contributions of fuel management programs to supporting wood product supply need to be included in fuel management plans.

Wildfire Response

Wildfire response in Teslin is a well-coordinated effort between multiple jurisdictions including the Yukon Territorial Government (YTG), VOT and TTC. The entire AOI falls within a "Critical Zone", which means that all fires are attacked immediately and aggressively and usually worked until fully extinguished.

Teslin is part of the Southern Lakes Fire Management Region of Yukon Wildland Fire Management, Protective Services branch. Most of the regional operations are based out of Whitehorse, which includes Response Officers, Initial Attack crews and an Air Tanker base. However, the Teslin base has historically been home to two Initial Attack crews: Teslin Echo Fire Crew and Teslin Delta Fire Crew.

First Nation fire contracts were established as per the Economic and Employment Opportunities section of the Land Claims Agreement. For Teslin this means Lighting Fire Management, which is a subsidiary of the Deisleen Development Corporation (the development arm of the TTC), holds the contract to provide one Initial Attack Crew and transportation (4x4 crew cab) to the Yukon Wildland Fire Management.

While both Echo and Delta crews are based in Teslin this does not always guarantee their availability for wildfire response in or near the community. For example, when hazard is high elsewhere in the territory, country or even internationally these crews could be deployed away from Teslin. Yukon Wildfire Management Branch and the Canadian Interagency Forest Fire Centre (CIFFC) have sophisticated models and approaches for determining where crews are positioned based on ongoing hazard and risk analyses but systems are not infallible and a wildfire incident could occur in Teslin when no crews are available.

The Teslin Volunteer Fire Department is active and equipped to respond to emergencies within 16 km from the Teslin municipal boundary. A complete list of firefighting equipment is listed in the Emergency Measures Plan[11] and the procurement of an additional pumper truck is

[11]Teslin Tlingit Council. 2014. *Emergency Measures Plan: Village of Teslin*. Accessible: https://static1.squarespace.com/static/5a1355c8d74cff26eb78da29/t/5c92a7bfa4222f9d75e7d162/1553115082465/EMERGENCY+MEASURES+PLAN+Draft+2018.pdf

underway. Additionally, the construction of a new fire hall began in the fall of 2021 and is slated to be complete by October 2022.

Recommendation: Provide cross training of volunteer firefighters with wildland firefighters. This will provide volunteers with skills to better action a wildland fire within the AOI, as well as establish working relationships between firefighting resources and increase firefighter safety.

3.2 Teslin Community Management plans and Relationship to CWPP

Wildfire can affect many aspects of a community and there are several existing plans impacting the Teslin community 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 2. Key Local Plans and Relationship to CWPP

Plan Title	Description	Relationship to CWPP	Additional Information
Teslin Official Community Plan (2020)	• A road-map for community development and a reference to help VOT and TTC work together to make decisions about the use and development of land within community boundaries. Also helps others with jurisdiction over lands adjacent to village boundaries understand how their actions may affect municipality. • Applies to land within municipal boundaries including settlement land as per the Teslin Tlingit Council's Self Government Agreement for now (zoning regulations are a high priority item for the TTC and expect development of these within 5 years) but not including retained reserves. Until TTC makes its own zoning regulations it follows the Village of Teslin's	• Provides disaster prevention and preparedness policies and actions. (ie, supports and implements a FireSmart program, will develop a development policy related to reduction of fire risk in Country Residential housing, vegetation management, disaster preparation via Emergency Measures Plan, encourages all property owners to protect and mitigate damage to their own property). • Requires all new housing be built to reduce vulnerability to fire (metal roofs, fire-resistant siding, water reservoirs for fire-fighting, management of vegetation in proximity to housing). • Sets forth governance policies that will ultimately support and facilitate wildfire	• Applies to land within municipal boundary including TTC Settlement Land but not including TTC retained reserves (IR 13 and IR 15), until such time as TTC creates laws to displace VoT zoning

Table 2. Key Local Plans and Relationship to CWPP			
Plan Title	**Description**	**Relationship to CWPP**	**Additional Information**
	authorities of development approval. On retained reserves the TTC retains development approval authority. • Provides long-term vision for land use, cultural, infrastructure, economic, and environmental priorities.	hazard planning and mitigation projects.	
Teslin Community Development Plan (2015-2025)	• Collaboration between VOT and TTC. • Identifies project priorities related to infrastructure, land use planning, economic diversification, recreation and community and cultural development. • Based on Teslin community's values and goals.	• Sets forth governance policies that will ultimately support and facilitate wildfire hazard planning and mitigation projects.	• Deisleen Development Corporation (DDC) is the local, federally incorporated not-for-profit development arm of the TTC.
Emergency Measures Plan Village of Teslin (most recent amendment 2016)	• A response plan that provides contact information and agency resources (internal and external to the community) for various services and types of emergencies. • Outlines procedures for coordinated preparation for, response to, and recovery from emergencies and disasters, including wildfire events and urban interface fires.	• Forest Fire is listed at the top of the hazard list. • This CWPP and the Emergency Plan are coordinated to reduce redundancies.	• Recommends training and emergency response drills.

Table 2. Key Local Plans and Relationship to CWPP			
Plan Title	**Description**	**Relationship to CWPP**	**Additional Information**
Teslin Strategic Forest Management Plan (2007)	• Co-developed by TTC and Yukon Government to provide sustainable development strategies for forests in the Teslin Tlingit Traditional Territory. • Provides clear framework and practical guidance on what issues and concerns, values and interests must be addressed during forest operations in the area.	• Sets forth governance policies that will support and facilitate CWPP implementation. • Provides a synopsis and summary of wildfire history in the broader TTC traditional territory. • Reflects TTC's expectations for forest management on Traditional Territory.	• Encompasses a much broader area than is addressed in CWPP. •
Timber Harvest Plan for Sawmill Road and Demonstration Forest (2011)	• Provides for the implementation of three small scale harvesting units close to the Village of Teslin.	• Units should be considered and integrated with recommended fuel management as part of a broader scope to fuel management around the community.	• Proposed FireSmart project along Pipeline Right-of-Way.
Timber Harvest Plan for the Teslin North and Strawberry Creek Management Areas (2018)	• Outlines management objectives for two separate forest harvesting areas close to the Village of Teslin.	• A portion of the management areas are outside the AOI; however, these harvest units should be tied in with recommended future fuel management units to create a landscape level protection plan.	• Teslin North - prescribes more frequent and larger openings to reduce wildfire risk. • Strawberry Creek - no specific wildfire risk objective, significant distance from AOI, likely would have little impact on wildfire threat to AOI.

Table 2. Key Local Plans and Relationship to CWPP			
Plan Title	**Description**	**Relationship to CWPP**	**Additional Information**
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.	•
Teslin Regional Land Use Plan	• Chapter 11 regional land use planning was started in the late 1990's by the Yukon Land Use Planning Council (YLUPC) for the Teslin area but has not been completed.	• Regional land use planning (including the BC portion of the TTC Traditional Territory) is expected to restart in summer 2022. Future iterations of CWPP should consider Land Use Plan if complete at this time.	• Yukon Land Use Planning Council
Teslin Integrated Resource Plan	• To address the energy needs and priorities of the community for electricity, heat and transport and a cost-effective, prioritized action plan to implement these priorities through locally sourced energy, and facilitating economic development & self sufficiency	• Need to understand and protect future development and energy producing values	•
Teslin Terrain / Constraints Mapping	• This mapping is intended to inform local land use planning and increase Teslin's understanding of the local geologic setting and how the	• Need to understand and protect future development values	•

Table 2. Key Local Plans and Relationship to CWPP			
Plan Title	**Description**	**Relationship to CWPP**	**Additional Information**
	terrain characteristics affect development suitability		
Teslin Community Energy Plan	• Energy planning is a process that strategically evaluates a community's options for managing their energy use in a way that results in local benefits. Community, in the case of this plan, refers to the traditional territory of the Teslin Tlingit First Nation and the Village of Teslin. The planning actions are focused on reducing the amount of energy the community consumes (i.e. energy efficiency) and generating electricity locally (i.e. renewable energy) while supporting economic development and community self-sufficiency.	• As an important planning tool and living document, the Teslin Community Energy Plan will help the community by: 1) Ensuring a reliable, clean and secure local energy system; 2) Supporting local economic development; 3) Fostering behaviour change and a culture of energy conservation; and Identifying ways to increase the energy efficiency of buildings in Teslin.	

Table 2. Key Local Plans and Relationship to CWPP			
Plan Title	**Description**	**Relationship to CWPP**	**Additional Information**
Teslin Tlingit Council Self-Government Agreement, Teslin Tlingit Council Final Agreement (1993)	• Agreements between TTC, YTG and Government of Canada granting TCC self governance and full management jurisdiction over Settlement Lands.	• TTC is a separate jurisdictional entity and will need to be consulted upon and involved in all CWPP processes.	

Table 2. Key Local Plans and Relationship to CWPP			
Plan Title	**Description**	**Relationship to CWPP**	**Additional Information**
Teslin Tlingit Lands and Resources Act (2016 amended 2018)	• Sets out rules, principles and legislative and administrative structures for the disposition of interests and licenses in, and the use and development of, settlement land, natural resources and BC aboriginal title land, and through which the TTC will exercise authority over those lands • Deals with many aspects of Settlement Land management including administrations (how TTC makes decisions about Settlement Lands) rights in and to land and resources, planning and development, and enforcement.	• Sets forth governance policies that will support and facilitate CWPP implementation.	• Describes a fire season as being from April 1 to September 30 and sets some rules around use of fire on Settlement Lands during this time as well as authorizes power to the Director of Lands to restrict or prohibit starting of fires.
Settlement Land Tenure Regulation	• Process by which TTC (through the Director of Lands and Resources) uses to provide Citizens and non-citizens an application to obtain interests (allocations, leases, easements) and licenses of occupation on Settlement Land.	• Must be considered for all fuel management plans effecting Settlement Lands.	•
Settlement Land Development Procedures Regulation (2018)	• Applies to new development on Settlement Land and to rezoning of Settlement Land within the Village boundary.	• Must be considered for all fuel management plans, particularly if any re-zoning is required.	• Village of Teslin Zoning Bylaw applies on Settlement Land within the Village Boundary but applications for re-zoning of, and development permits in respect of retained reserves within the

Table 2. Key Local Plans and Relationship to CWPP			
Plan Title	**Description**	**Relationship to CWPP**	**Additional Information**
			Village Boundary must be submitted to and approved by TTC. A development permit is required for all development on Settlement Land (to Director of Lands).
Settlement Land Access Regulation (2018)	• Applies to persons exercising or seeking to exercise a right of access.	• Must be considered for all fuel management plans that may cross Settlement Lands.	
Natural Resources Regulation (2018)	• Regulates the taking or use of natural resources located on Settlement Land over which TTC has legislative jurisdiction.	• Must be considered for all fuel management plans effecting Settlement Lands.	
TTC Fish and Wildlife Act (1997)	• Establishes the role and appointment of members of the Teslin Tlingit Renewable Resources Council as well as the purpose and duties of said council. • Outlines rules surrounding hunting, trapping, fishing and habitat protection within TTC traditional territory.	• Sets forth governance and permitting requirements that could impede fuel management projects on Settlement Land.	• Development that may affect habitat on Settlement Land must be authorized by a habitat protection permit issued by the General Council.

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

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 environmental regulations note:

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). Some activities always require assessments under YESAA. It is important to contact the TTC Lands and Resources Department, Major Projects Yukon, or YESAB for assessment requirements.

3.3 Ecological description

Topography

The Village of Teslin is situated in south central Yukon on what is known as the Yukon Plateau. Topography in the region generally lies in a north-west direction due to the influence of underground faults oriented this way. Teslin Lake lies in a north-west orientation and provides the diving line between two sub-plateaus: the Teslin Plateau to the west and the Nisutlin Plateau to the east. The land of these sub-plateaus consists of rolling hills and broad valleys.

At an elevation of 688 m, Teslin is nestled at the confluence of Teslin Lake and the Nisutlin River. It is partially protected from wildfire by the vastness of these two water bodies, both of which are suitable to act as fire suppression water sources for on-ground personnel, rotary wing and fixed wing aircraft.

Despite its name meaning “long narrow water” in Tlingit, Teslin Lake is approximately 3 km wide; creating somewhat of a natural barrier for wildfire coming from the south-west. Directly south-east of Teslin is the Nisutlin Bay. Being only 584 m wide at the Nisutlin Bridge it does not offer the level of wildfire protection as the lake, especially considering common wind speeds coming from this direction, the fuel type and continuity of the Nisutlin Plateau above the south arm of Teslin Lake and below the Alaska Highway. If conditions were right, a volatile wildfire could easily spot across the Nisutlin Bay. A fire in the 1950s burned a large area in this region; however, the fire did not spread in the direction of the village of Teslin.

Another topographic influence in the area is the Big Salmon Mountain range, the base of which is about 5km north of the Village. This provides some protection to the Village as catastrophic wildfire is less likely to originate here and spread downhill toward the community. However, there is potential for a wildfire to originate to the east of the mountain range in the more volatile black spruce fuel type found along the Nisutlin River. Winds rarely come from this direction and there are some topographical features to impede wildfire spread from the northeast into the Village.

Figure 6. Village of Teslin, looking south along Teslin Lake towards the village[12].

Climate

Precipitation: Teslin's climate is subarctic continental and is characterized by cold dry winters and warm dry summers. Lying in the heart of the St. Elias-Coast Mountains rain shadow, the average annual precipitation is 343 mm[13]. For context, most experts agree that areas with average rainfall amounts of less than 250 mm per year are considered deserts[14]. Late winter and early spring receive the lowest amounts of precipitation with an average of 24 mm per month for February, March and April. As summer progresses rainfall amounts do increase; May, June, July and August see an average of 37.7 mm per month, which primarily falls as summer showers[15], which may be ineffective at suppressing a wildfire. Teslin usually experiences its

[12] Village of Teslin. n.d. *The Village of Teslin*. Available: https://www.teslin.ca

[13] Climate-Data.org.n.d. *Teslin Weather and Climate in October*. Accessible: https://en.climate-data.org/north-america/canada/yukon/teslin-718707/t/october-10/?amp=true

[14] NASA Earth Observatory. n.d. *Biomes: Desert*. Accessible: https://earthobservatory.nasa.gov/biome/biodesert.php

[15] Smith CAS, Meikle JC, and Roots CF. (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. Accessible: https://yukon.ca/sites/yukon.ca/files/env/env-ecoregions-yukon-territory.pdf

greatest amount of precipitation in September with an average of 65 mm. This autumn precipitation is often associated with active storm centers in the Gulf of Alaska[15].

Temperature: Average temperatures in the region vary from -15.8°C in January to +14°C in July[13]. Historical maximum temperatures for Teslin have been seen in July at around 18°C. Caution is advised when planning as this data does not accurately describe the temperature potentials seen during the record breaking 'heat dome' event that occurred during the summer of 2021. A new record was set in Teslin with a high of 30.7°C in late June. It is also important to note that Teslin Lake freezes in November or December and is commonly ice-free by mid-June. Caution is advised in respect to this historical weather data as well – milder winters could see an earlier break up of lake ice, which could in turn result in a warmer spring as the persistence of ice cover can delay spring by two weeks.

Wind: Wind is a primary weather factor influencing ability to control a wildfire. As shown in the wind rose below (Figure 7) developed from the Teslin Weather Station, wind from any direction can occur but strong prevailing winds generally come from the west to south directions.

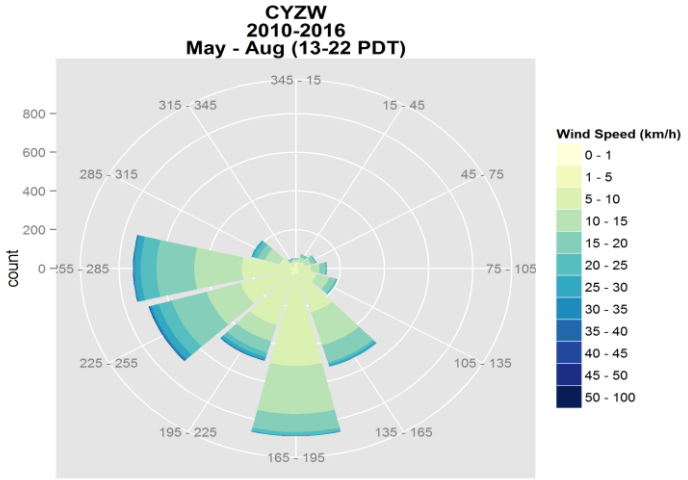

Figure 7. Wind Rose for Teslin Airport weather station.

Vegetation

As per the Yukon Ecosystem Classification Framework, the Teslin area falls within Yukon Southern Lakes ecoregion of the Boreal Cordillera ecozone[15]. Characteristic of this ecoregion, the AOI is relatively low elevation (Teslin is 688 m) and consists of open coniferous and mixed woodland forests with moderately developed understories. Vegetation on mesic upland sites is mixed white spruce (*Picea glauca*), black spruce (*Picea mariana*), paper birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). White spruce and lodgepole pine (*Pinus contorta*) stands are common on drier upland sites. Low lying, poorly drained sites, particularly along the Nisutlin River, support full black spruce ecosystems. Unlike much of the Yukon there is very little permafrost in this area.

The AOI itself is low lying and relatively flat and white spruce dominates with a couple small patches of pure or nearly pure black spruce stands. A micro topographical feature rises up to the north-west of the Village upon which lodgepole pine dominates. Trembling aspen and balsam poplar (*Populus balsamifera)* are also present in pure and mixed stands. Labrador tea (*Rhododendron groenlandicum*), feathermosses (*Hypnales* spp), willows (*Salix* spp) and alder (*Alnus)* are common species found in the understory.

3.4 Natural disturbance and forest succession

Wildfire has historically been the dominant agent of disturbance of the boreal ecosystems found in and around the AOI. These wildfire events can be characterized as relatively infrequent but high intensity and stand replacing. A large tract of land surrounding the Village of Teslin has not burned for a significant amount of time. Forest harvesting can mimic wildfire regimes and thus reduce the risk of wildfire to some degree; however, there has been very little forest harvesting in and around the Teslin area. The wildfire regime of this area is discussed in greater detail in the section below.

Interacting with wildfire on the landscape are other agents of disturbance such as pests, pathogens and windthrow. These 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, which in turn could affect wildfire resilience of an area. Forest Management Branch conducts localized surveys where a notable occurrence is observed and reported on an as-needed basis.

Yukon's Forest Management Branch conducts annual aerial surveys to monitor forest health in the territory, though through a zonation approach areas are only surveyed once every 3-7 years[16]. The Teslin area (Forest Monitoring Zone 1) was last surveyed in 2018[17] and no major outbreaks were noted. It is recommended that when the most recent surveys are complete this section be updated with any changes that could impact potential for increased wildfire risk, as there are several damaging agents that Teslin's dominant tree species are susceptible to.

Spruce bark beetle (*Dendroctonus rufipennis*)[18] is the most damaging forest pest of mature spruce in the Yukon. It is usually found in endemic populations throughout spruce stands but an outbreak can be precipitated by any number of stressors such as drought, a large cluster of tree mortalities due to windthrow or wildfire, or unsanitary timber harvest methods (i.e., damaging

[16] Government of Yukon. 2020. *Yukon Forest Health Report*. Whitehorse. Accessible: https://yukon.ca/sites/yukon.ca/files/emr-2020-yukon-forest-health-report.pdf
[17] Government of Yukon. 2018. *Yukon Forest Health Report*. Whitehorse. Accessible:https://yukon.ca/sites/yukon.ca/files/emr/emr-2018-forest-health-report_2.pdf
[18] Forest Management Branch. n.d. *Spruce Bark Beetle*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/19-spruce-bark-beetle.pdf

leave trees, not cleaning up slash). Northern spruce engraver (*Ips perturbatus)*[19] often acts as a secondary pest once trees have been weakened by spruce bark beetle, though it too can attack and kill trees affected by other stressors as well. Budworms (*Choristoneura spp.*)[20] also cause damage to spruce trees in the Yukon, though through defoliation rather than boring through the host's bark.

However, there was no evidence of endemic pest populations when the Teslin area was surveyed in 2018. However due to the prevalence of spruce in and surrounding the AOI, evidence of these pests appearing should be monitored. While it is generally agreed that a large amount of dead and dying spruce in the area could increase fire hazard for a period of time, it is uncertain by how much hazard would increase and for how long[21]. Unfortunately, the increase in wildfire hazard and the increase in risk of pest outbreaks have similar drivers: longer and warmer summers due to climate change.

Lodgepole pine is another leading tree species in the Teslin area and is susceptible to pine needle cast (*Lophodermella concolor)*[22]. Pine needle cast is a fungal disease that causes premature needle loss and can affect trees of all age classes though rarely does it cause mortality. It was not seen as a problem for the Teslin area in the 2018 survey; however, an outbreak could increase the fire hazard of pure lodgepole pine stands by increasing the amount of fine surface fuels available for ignition and combustion. Additionally, this pathogen thrives when summers are repeatedly wet. In the short term such conditions would reduce wildfire hazard but could result in increased understory growth, which is likely to increase fire hazard over the long term.

Trembling aspen is an important tree species when considering wildfire resiliency in the Teslin area. It is an early seral species, which means it is one of the first species to regenerate after a disturbance (such as a wildfire). In the Yukon, aspen generally occupy dry sites however, the species has little tolerance for drought. This makes aspen highly susceptible to drought stress[16],

[19] Forest Management Branch. n.d. *Northern Spruce Engraver Beetle*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/14-northern-spruce-engraver-beetle.pdf

[20] Forest Management Branch. n.d. *Budworm*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/6-budworm.pdf

[21] Hicke JA, Johnson MC, Hayes JL, Preisler HK, 2012. Effects of bark beetle-caused tree mortality on wildfire. For. Ecol. Manag. 271, 81–90.

[22] Forest Management Branch. n.d. *Pine Needle Cast*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/17-pine-needle-cast.pdf

which in turn leads to increased susceptibility to defoliators such as large aspen tortrix (*Choristoneura conflictana*)[23] and aspen serpentine leafminer (*Phyllocnistis populiella*)[24].

Large aspen tortrix can cause severe defoliation, branch dieback and extensive mortality to trembling aspen trees. A large infestation occurred near Teslin Lake in the early 1980's but it has not recently been considered a significant threat to trees in the area. In fact, tortrix has been on the decline in Yukon since outbreaks were recorded in the Haines Junction area in the early 2000's. This population decline coincides with an increase in aspen serpentine leafminer. This could suggest interspecies competition between tortrix and leafminer, with conditions currently less favourable for tortrix. While leafminer rarely causes mortality on healthy trees, previously stressed aspen seem to be vulnerable.

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[25]. While the Forest Management Branch did not detect any reportable concerns with the aspen stands in the Teslin area during their 2018 aerial surveys widespread aspen decline in the area 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 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 be monitored in the Teslin area and that a contingency plan be developed in the event of a large aspen dieback.

[23] Forest Management Branch. n.d. *Large Aspen Tortrix*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/11-large-aspen-tortrix.pdf

[24] Forest Management Branch. n.d. *Aspen Serpentine Leafminer*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/1-aspen-serpentine-leafminer.pdf

[25] Singer JA, Turnbull R, Foster M, Bettigole C, Frey BR, Downey MC, Covey KR, Ashton MS. 2019. Sudden Aspen Decline: A Review of Pattern and Process in a Changing Climate. *Forests*. 10(8):671. https://doi.org/10.3390/f10080671

3.5 *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. The frequency of fire in the Teslin Strategic Forest Management Plan area has been estimated at 290 years; that means it will take 290 years for the entire area to have experienced some fire[26].

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 most often result in surface and ground fires (Figure 8). Surface fires spread along the forest floor, burning fuels on the ground (leaf litter and duff layer) and woody debris. Rate of spread depends on many factors; however, intensity is usually at a manageable level for successful wildfire suppression. 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.

Figure 8. Types of wildfire

Large wildfires occur during warm and dry weather patterns that remain long enough to dry out vegetation. Under extreme fire weather conditions, the boreal forest type can sustain high intensity wildfires[27]. High intensity wildfires are fires that have extreme fire behaviour, such as crowning and long-distance spotting of embers. Crown fires are those which burn tree canopies and most often completely burn fuel at all levels in the forest, from the ground up. Long-distance spotting occurs when significant embers are produced from burning material,

[26] Teslin Tlingit Council, Teslin Renewable Resource Council & Government of Yukon. 2007. *Teslin Strategic Forest Management Plan: Strategic Forest management Plan for the Teslin Tlingit Traditional Territory*. Available: https://yukon.ca/sites/yukon.ca/files/emr/emr-forest-management-plan-teslin-tlingit-traditional-territory.pdf

[27] Boreal forest fire regimes and climate change. 2001. Stocks BJ, Wotton BM, Flannigan MD, Fosbert MA, Cahoon DR, Goldammer JG. Pages 233-246 in M. Beniston and M.M. Verstraete, editors. Remote sensing and climate modeling: synergies and limitations. Kluwer Academic, Dordrecht, The Netherlands.

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.

Figure 9 below shows recorded fire history around the village of Teslin. Significant wildfires occurred in the region in 1950 and 1958; however, most wildfires have been smaller in size. This pattern is characteristic of the boreal forest[28], producing a mosaic of small burned patches, some large burned areas and long unburned stands. Table 3 summarises wildfire history shown in Figure 9.

The fire regime fluctuates with seasons. Spring wildfire risk can be high in between the time of snow melt and when green-up occurs (deciduous trees produce leaves). 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 Teslin area is unknown - interviews with some First Nations people in the Teslin Tlingit Traditional Territory concluded that most respondents did not think forest patches were deliberately burned in the area[29].

[28] Stocks BJ, Wotton BM, Flannigan MD, Fosbert MA, Cahoon DR, & Goldammer, J.G. 2001. *Boreal forest fire regimes and climate change*. Pages 233-246 in M. Beniston and M.M. Verstraete, editors. Remote sensing and climate modeling: synergies and limitations. Kluwer Academic, Dordrecht, The Netherlands.

[29] Timko J, Green S, Sharples R & Grinde A. 2015. Using a community-driven approach to identify local forest and climate change priorities in Teslin, Yukon, Cogent Social Sciences, 1:1, 1047564, DOI: 10.1080/23311886.2015.1047564

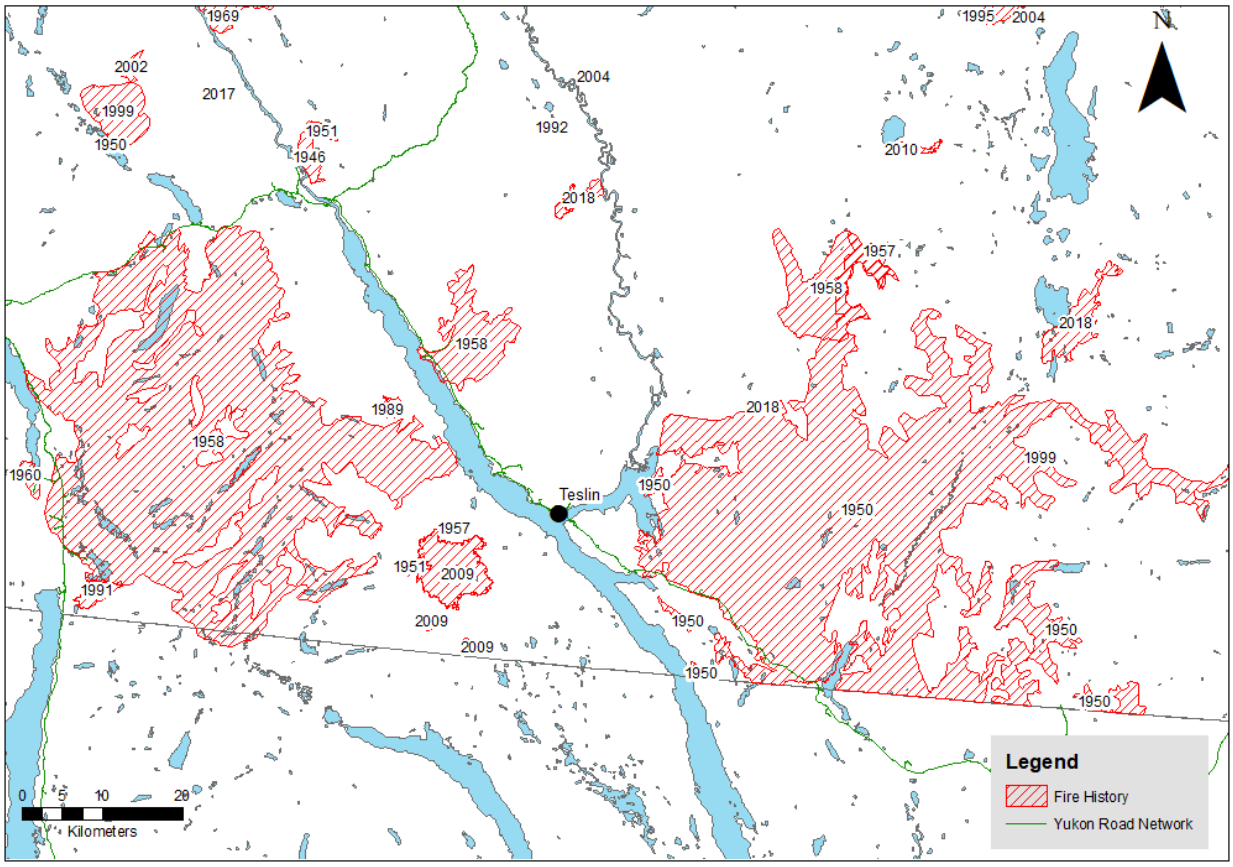

Figure 9. Fire History around the village of Teslin 1946 – 2021 (source data: GeoYukon)

Table 3.Wildfire History Summary (1946 – 2021)

Number of fires	Area burned	Median Fire Size	Maximum Fire Size
25	308,717 ha	517 ha	143,237 ha

Source: GeoYukon

Climate change

Fire regimes in boreal forests are changing. During the 1990s, 2.75million hectares of forest was burned annually across Canada. By 2004, 3.3 million hectares of forest burned. By the end of this century, the annual area burned by forest fires in Canada is predicted to increase by 74 – 118%[30].

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[31]. 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[31]:

- an increase in the number of days where crown fires are likely
- 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[32]. Results found that temperature, precipitation and humidity annual averages will all increase. Table 4 predicts changes in climate over two warming scenarios. According to this report, the potential for wildfire spread days might remain steady or even decrease around Teslin.

Table 4. Future Climate Trends for Yukon - April to October[32]

		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[31]. Warmer temperatures increase evapotranspiration, lower water tables and decrease fuel moisture and surface soil moisture content. Significant increases in precipitation would be

[30] Flannigan MD, Logan KA, Amiro BD, Skinner WR & Stocks BJ. 2005. *Future Area Burned in Canada*. Climatic Change 72: 1-16.
[31] 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.
[32] AECOM. 2021. *Modeling Future Wildfire Risk in Yukon*. Report for Yukon Government.

required to balance an increase in temperature[30]. It is far more difficult to model the impact of climate change on precipitation quantities than it is for temperature[33].

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

[33] 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.

4. Risk Assessment

The Area of Interest for which this CWPP Risk Assessment and Risk Management components is focused on the village of Teslin, as outlined in Figure 5.

4.1 Fuel Types

For fire behaviour purposes, Canadian forests and grasslands are categorised into different fuel types[34]. These fuel types have different vegetation species and structure e.g. vegetation density. Because if this, fire can behave differently in each fuel type. Table 5 outlines which fuel types are present in the Teslin AOI. These are also mapped for the AOI and the broader Teslin area in Figure 10 and Figure 11. More detailed descriptions of these fuel types can be found on the Natural Resources Canada website[34].

Please note that fuel types C4 and C7 do not indicate there is red and white pine (C4) and ponderosa pine – douglas fir (C7) around Teslin, 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[34] present within the Teslin AOI.

Fuel Type	Name	% Present in Teslin Area of Interest	Fire Behaviour Characteristics
C1	Spruce-Lichen Woodland	3% (63ha)	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	19% (375ha)	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	7% (123ha)	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.

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

C4	Red and White Pine	1% (22ha)	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	15% (296ha)	Lowest rate of spread and lowest fire intensity of the conifer fuel types.
D1/D2	Deciduous (D1 leafless aspen, D2 green aspen)	6% (106ha)	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	14% (268ha)	-
M1/M2 30	Mixedwood – 30% conifer	8% (152ha)	The rate of spread and intensity of fire 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	2% (30ha)	
M1/M2 75	Mixedwood – 75% conifer	25% (488ha)	
O1a/b	Grass	-	Fastest rate of spread, however intensity is usually low enough for suppression to be successful.

Recommendation: 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 Teslin it is recommended to review the territorial fuel type layer and confirm mapping accuracy.

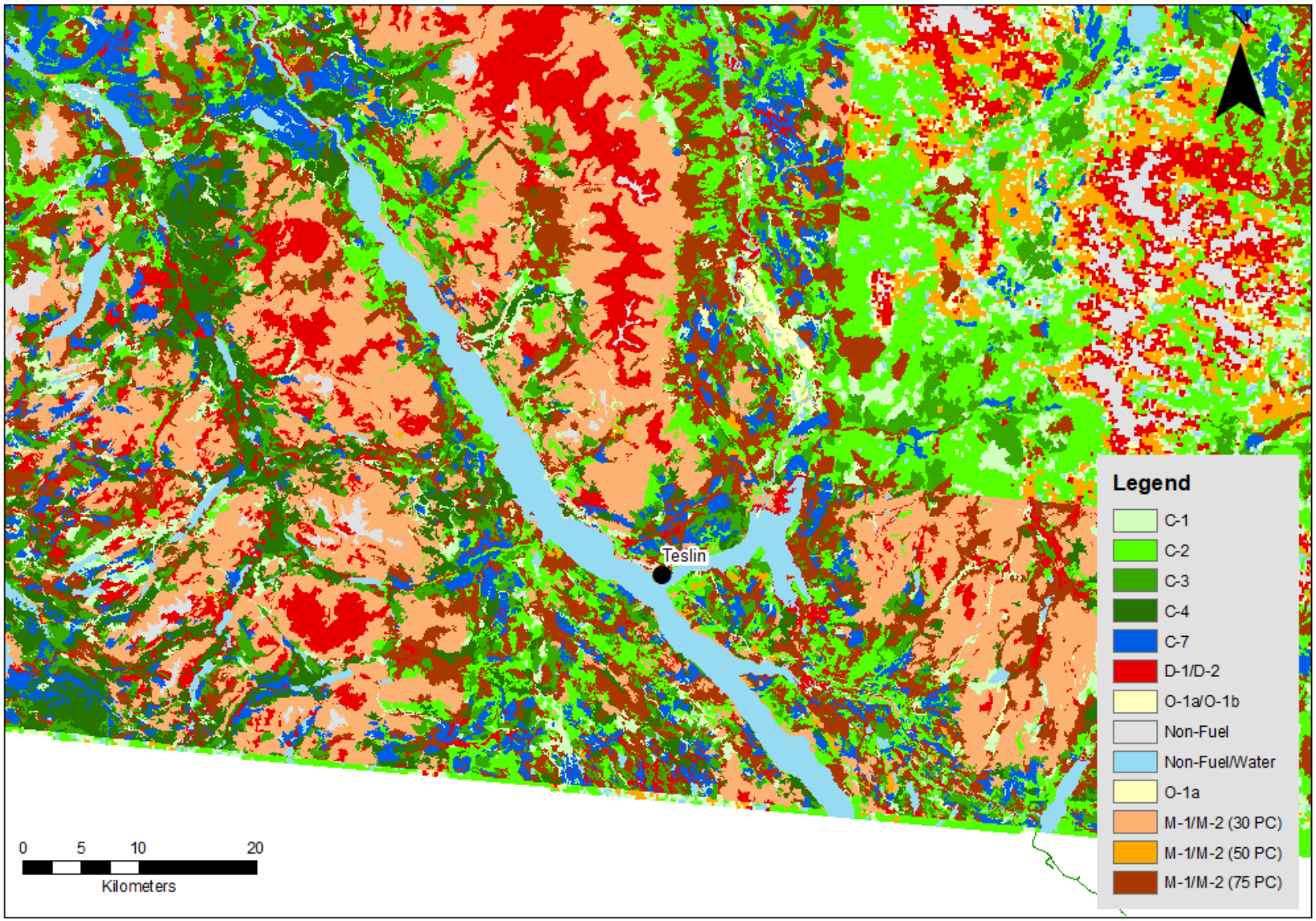

Figure 10. Fuel Types around Teslin and Teslin Lake broader area

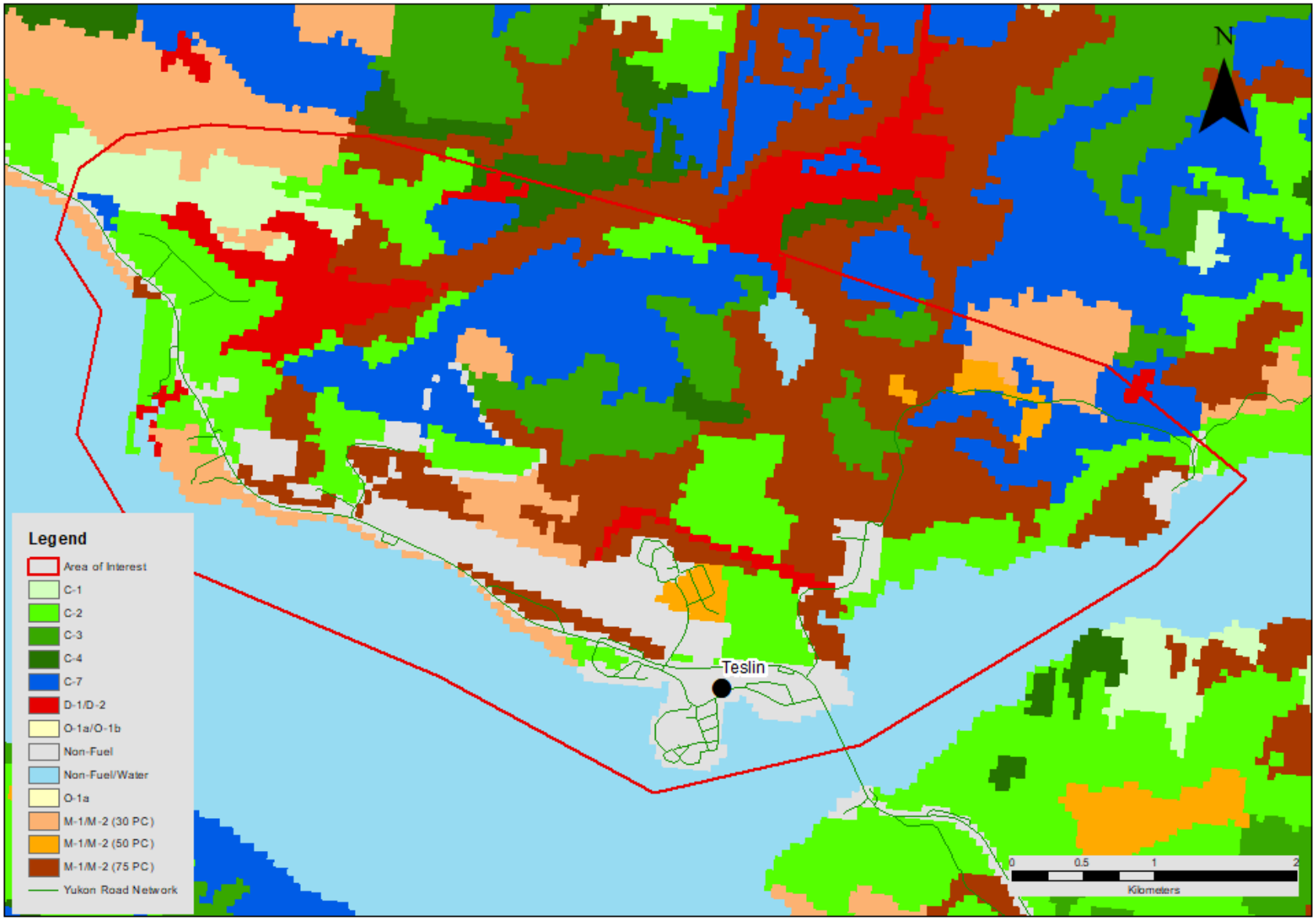

Figure 11. Fuel Types in Teslin Area of Interest

4.2 Ignition Risks

Wildfire ignitions can be divided into two main categories, human-caused and lightning-caused. Figure 12 shows historic distribution of wildfire ignitions by cause around Teslin. Human-caused ignitions include accidental and malicious causes and make up 74% of recorded ignitions, but account for just over half the total area burned (Table 6). This is because most human ignitions were either suppressed or self extinguished at a relatively small size.

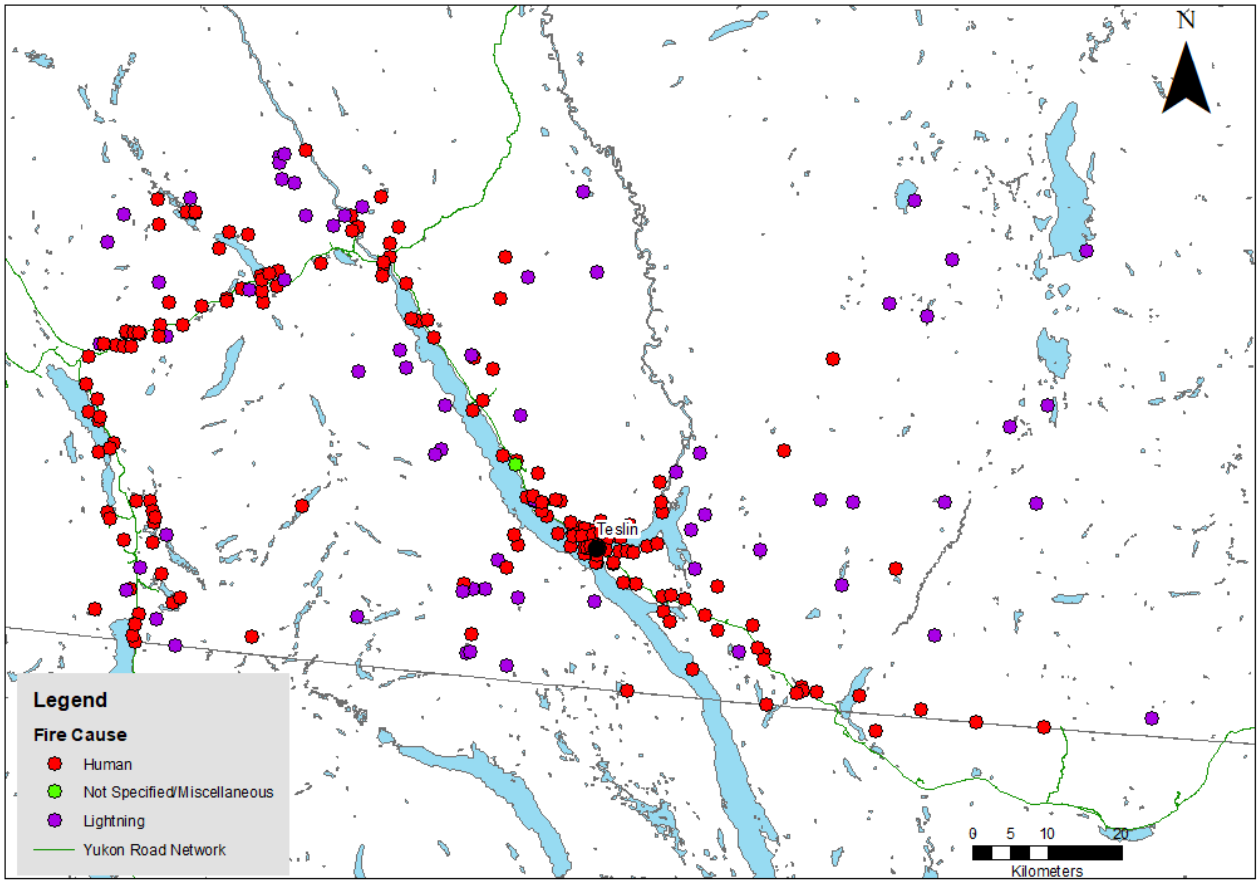

Figure 12. Wildfire ignition points around the village of Teslin, showing cause (1946 – 2021) (source: GeoYukon)

Table 6. Ignition History Summary (1946 – 2021)

Cause	Number of ignitions	Percent of total ignitions	Area burned	Percent of total area burned
Human	191	74%	164,352 ha	53%
Lightning	68	26%	145,913 ha	47%

Source: GeoYukon

In the area immediately around the village of Teslin, the recorded ignitions are all human-caused (Figure 13).

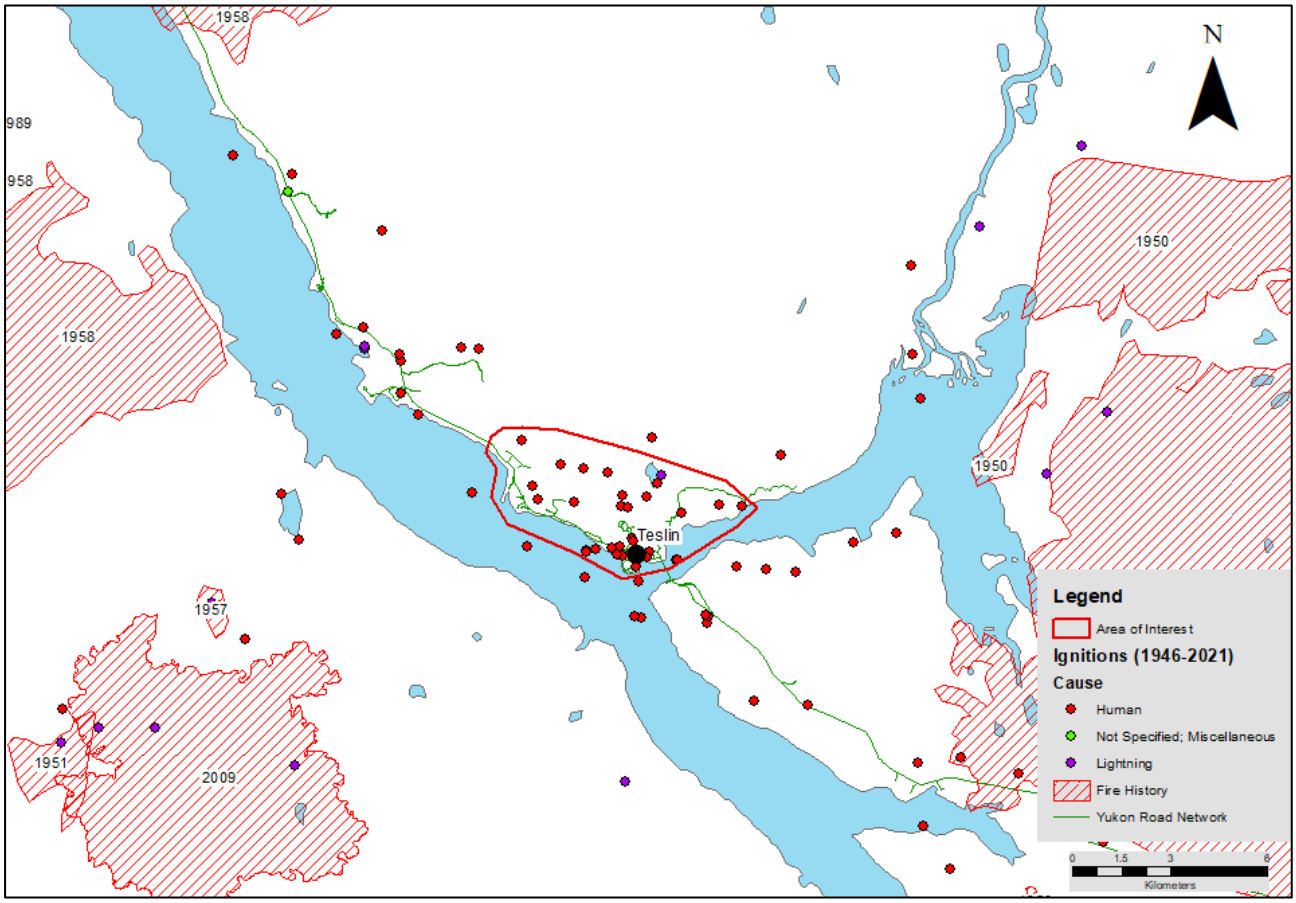

Figure 13. Wildfire ignition points and fire perimeters close to the village of Teslin, showing cause (1946 – 2021) (source: GeoYukon).

Within the Area of Interest, there are 37 recorded ignitions in the time period of 1946-2021.

Figure 14 summarises these ignitions by decade and cause. There have been no human-caused ignitions recorded in the AOI since 2010.

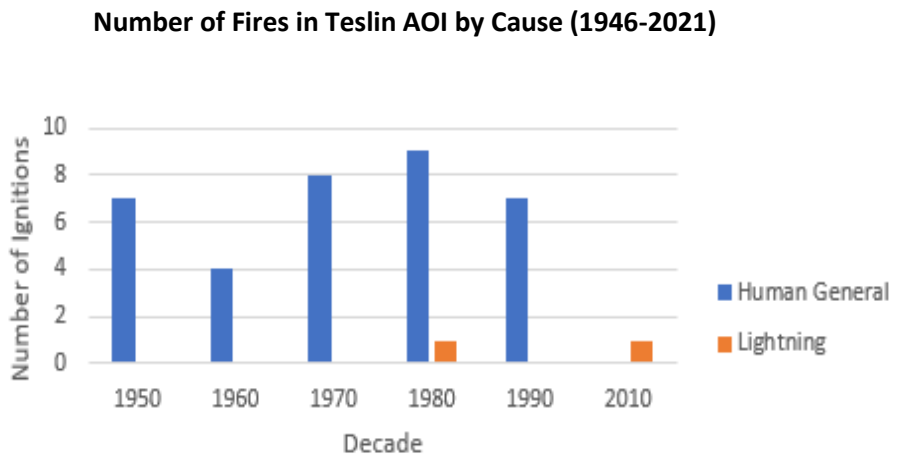

Figure 14. Summary of Wildfire Ignitions within Teslin Area of Interest by decade (1946-2021) (source: GeoYukon).

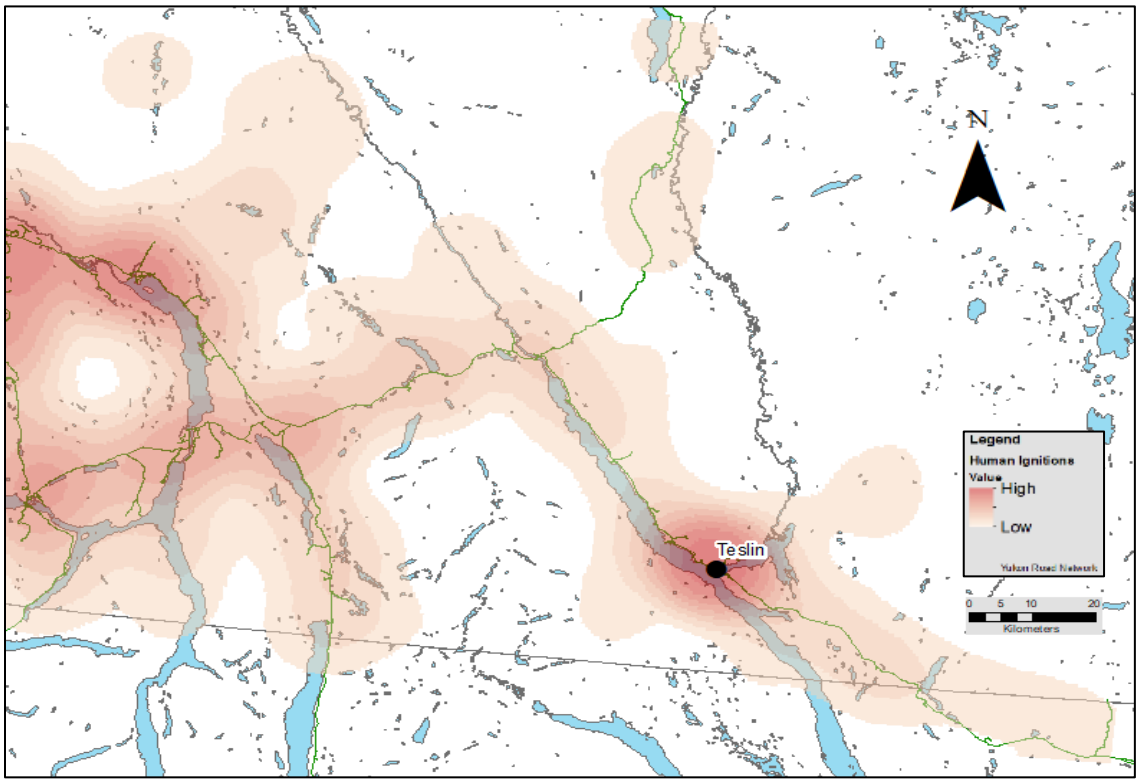

Figure 15 and Figure 16 below are ‘heat maps’ of human and lightning ignitions recorded near Teslin (1946-2021). They show areas where more ignitions have occurred in darker colours.

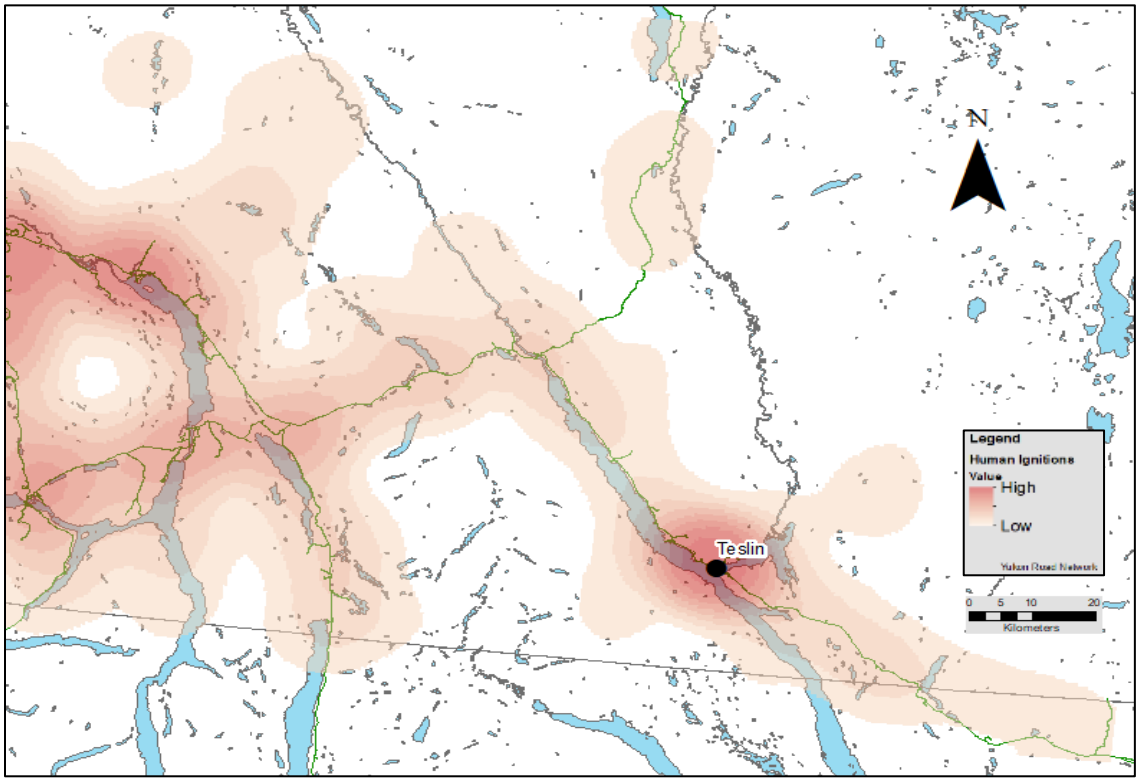

Figure 15 shows that human-caused ignitions mostly occur around towns and along roads. Teslin itself has a high occurrence of human-cased ignitions. Lightning-caused ignitions (Figure 16) are more spread out. Lightning strikes across Teslin Lake to the south-west of Teslin have historically been more numerous and developed into larger fires than those on the land adjoining the town.

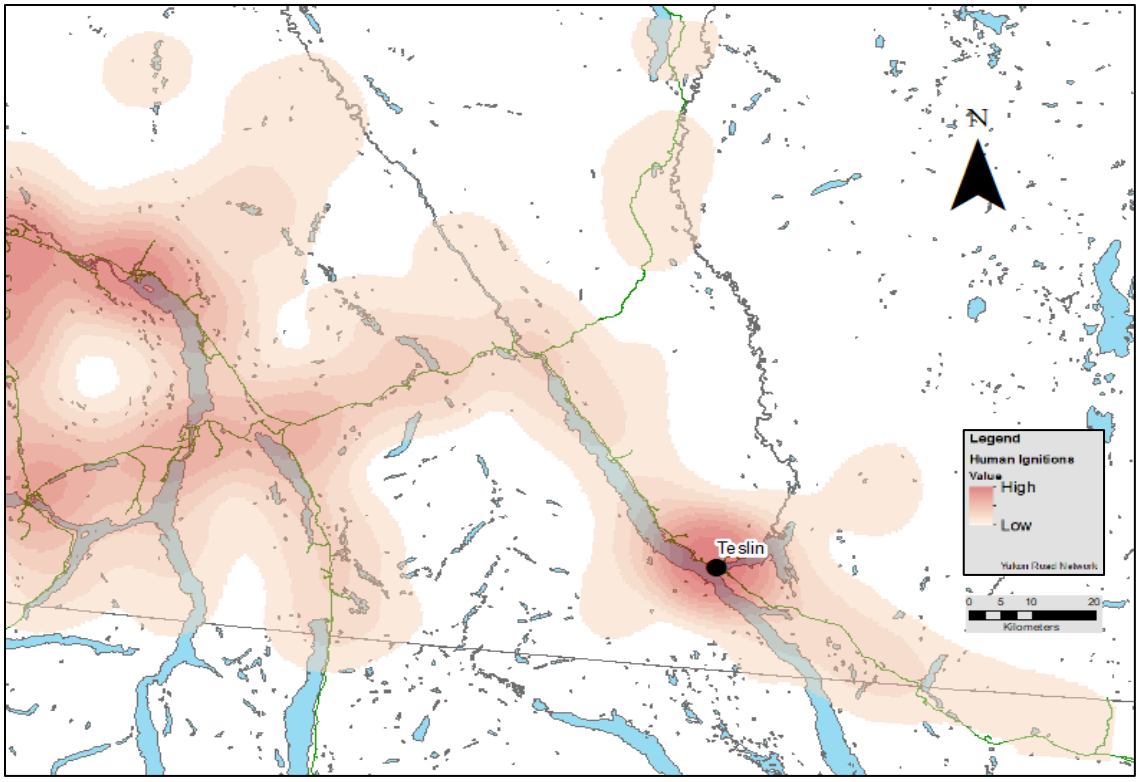

Figure 15. Heat map of all human-caused ignitions (1946-2021)

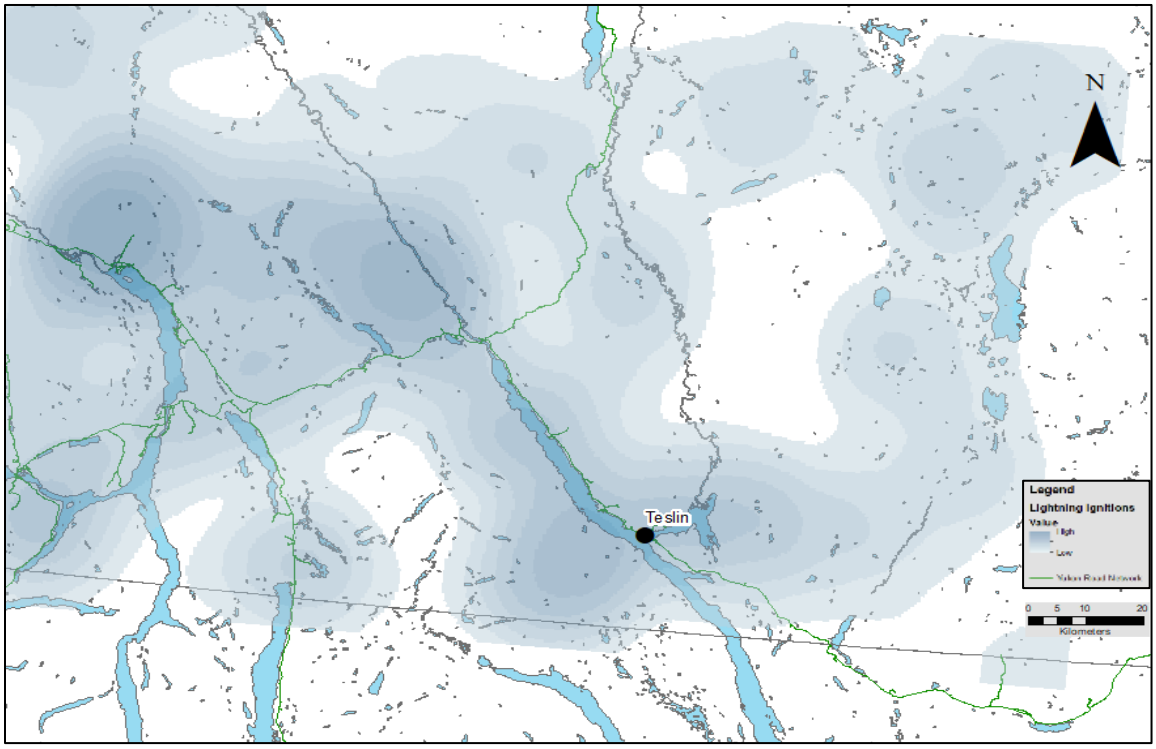

Figure 16. Heat map of all lightning-caused ignitions (1946-2021)

The potential for an ignition to develop into a large wildfire depends on several factors: the season of the ignition (influencing fuel moisture and temperature), whether first attack is successful, what fuel type the ignition occurs in, the terrain and the weather conditions following ignition.

Ignition potential research[35] in the Teslin Tlingit Traditional Territory considered the number of historic escaped fires (>3 ha in size) as well as environmental variables (elevation, topographic position, solar radiation to account for fuel dryness, distance to roads and road density). Figure 17 below maps the relationship between these factors for the entire Teslin Tlingit Traditional Territory. Results show that the village of Teslin is in a high human-caused and moderate lightning-caused ignition potential area, where ignitions could have the capacity to grow into fires >3ha in size.

However, it is important to note that there has been 1 recorded ignition >0.5ha within or adjacent to the Area of Interest. This indicates successful first attack and/or weather conditions not supporting fire growth.

[35] Hall, D, Green, S and Parisian MA. 2016. Using Burn-P3 to Model Wildfire Probability and Aid in the Management of Northern Boreal Forests in the Teslin Tlingit Traditional Territory. Poster presentation: Wildland Fire Canada Conference, Kelowna, 24-28 October 2016.

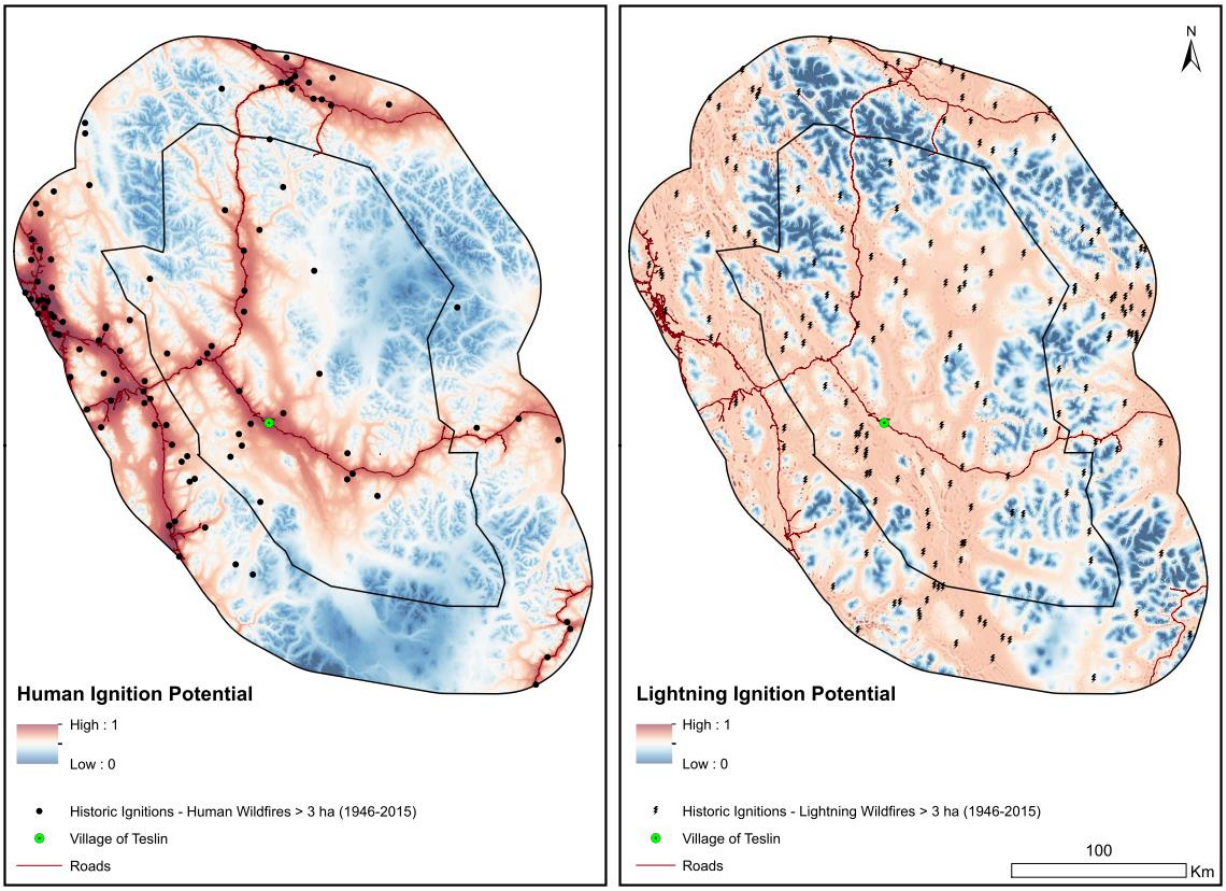

Figure 17. Ignition probability research in the Teslin Tlingit Traditional Territory[35] considering historic ignitions (1946-2015) and environmental variables (elevation, topographic position, solar radiation). The higher the ignition potential, the greater the probability of ignition.

4.3 Teslin area wildfire characteristics

The following evaluation of various Teslin community characteristics is brought forward from the Ember Research Services report entitled *Yukon Community Wildfire Risk and Reduction Assessment*[36]. This report was delivered to Government of Yukon in the year 2000. It includes detailed wildfire hazard information and provides a relative risk ranking for all major communities in the Yukon. Although this analysis was completed over 20 years ago many of the ratings are still relevant today; however, it is recommended that the following information and ratings be updated prior to any decision making that utilizes this information.

Yukon Community Fire Risk Classification: *Teslin*[36]

Table 7. Fires starting outside the community

1. Fire Climate							**Class**
Representative Weather Station	**Fire season days**		**Crown fire days**		**Total (%)**		
	Fuel Type	**%**	**Fuel Type**	**%**			
Teslin (TE)	SB	3	M-2 75C	5	8		*LOW*
2. Fuel Type Distribution (% of area within 15km radius)							
C-2	**C-3**	**C-4**	**M-2 75C**	**S-1**	**S-2**	**Total**	
5.3	12.0	0.0	49.9	0.0	0.0	67.2	*HIGH*
3. Lightning Fire Risk							*MOD.*
Potential Extreme Fire Behavior Risk							*MOD.*

Table 8. Community vulnerability to fire loss from fires starting inside the community

1. Person-caused fire occurrence density		*MOD.*
2. Suppression Capability (Qualified first responder within community)	(YES/NO)	*YES*
3. Fire Hazard Mitigation (FireSmart)		*GOOD*
Potential fire risk within community		*MOD.*

Table 9. Overall community fire risk

I. Outside Community	*MOD.*
II. Inside Community	*MOD.*

[36] Ember Research Services, Applied Ecosystem Management Ltd & TransNorthern Management Consulting. 2000. *Yukon Community Wildfire Risk and Reduction Assessment - Final Report*. Report for Government of Yukon and Indian and Northern Affairs Canada Fire Management Program, Yukon.

Table 10. FireSmart design and community awareness

Subdivision has:	YES=1	
Alternate egress route	1	
Fuelbreak/greenbelt/landscape mosaic	1	
Volunteer fire dept. or community association	1	
Firefighting access to all properties	1	
Firefighting water supply for pumpers etc.	1	
Fire Danger Information posted	1	
Regulated open burning	1	
Small lots (≤ 2 hectares)	1	
Vacant lots with crown fire prone fuels ≤50% of subdiv. Area	1	
Defensible space around most or all high risks	0	
Community suppression equipment / tool cache	1	
Total	10	
(Poor < 3 Medium 3 – 5 Good ≥ 6)		*GOOD*
Individual property owners participation in defensible space etc.		
(Poor < 20% Moderate 20 – 50% Good > 50%)		*POOR*

Burn Probability

A 2016 study[35] modelling wildfire probability in the Teslin Tlingit Traditional Territory (TTTT) incorporates ignition risk and historic weather patterns to determine areas that are more likely to be burned by a wildfire. This study used lightning and human ignitions probability (Figure 17) to simulate many fires under a variety of weather conditions within the TTTT. Simulating many different fires allows the calculation of the number of times an area is burned – meaning, given the variations in weather and fires simulated, how often could an area be impacted by a fire? In the map below (Figure 18), the result of all these different fire and weather combinations is mapped as a probability. To interpret the map, areas of red (high probability) are more likely to be burned by wildfire in any given year than green areas (low probability).

Teslin is located in a lower probability area of the TTTT, however it is surrounded by higher probability areas.

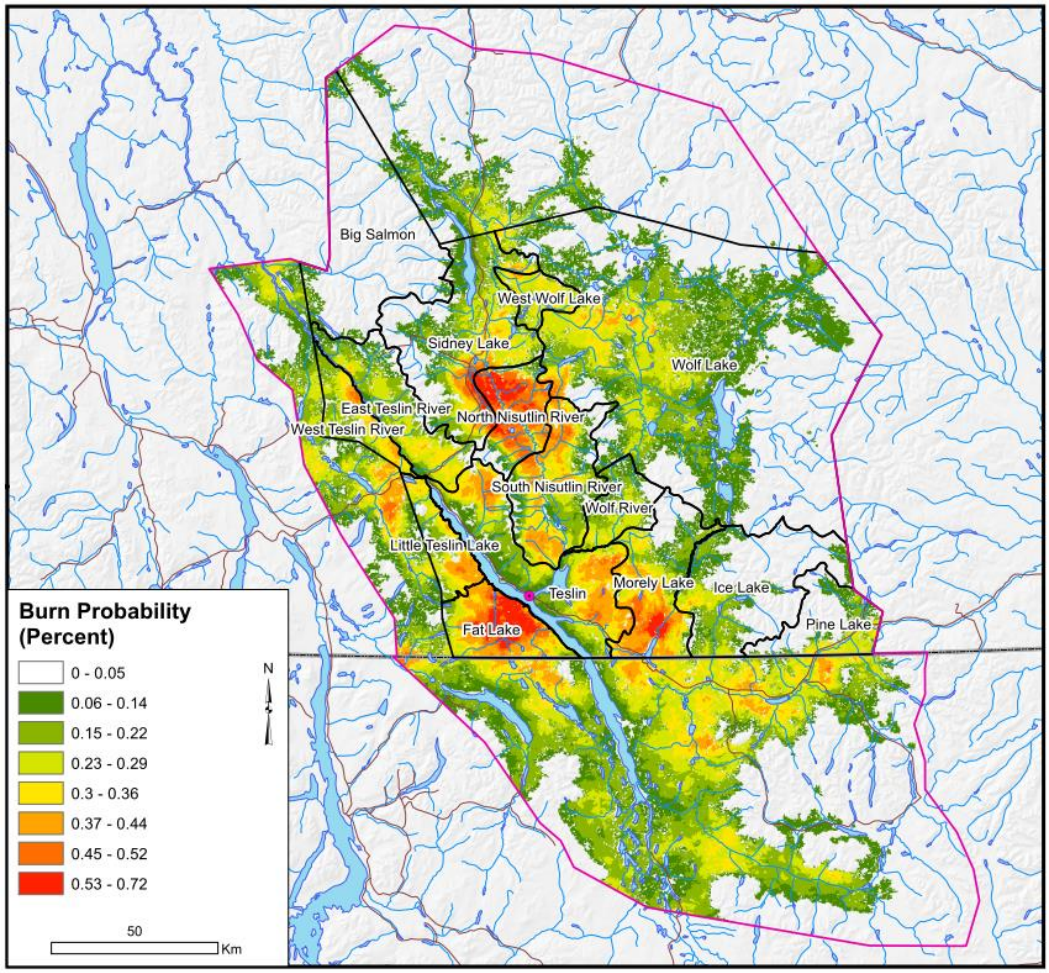

Figure 18. Burn probability in the Teslin Tlingit Traditional Territory[35]

4.4 Values at risk of wildfire impacts within the Area of Interest

Values within the Teslin community Area of Interest can be identified in the following classifications (Table 11). 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 11. Values at risk of wildfire impacts (direct or indirect) within the Area of Interest

Value	Description
Human Life (Figure 19)	Population approximately 486[6]
	144 private dwellings[6]
2Cultural (Figure 19)	Pristine wilderness immediately surrounding the village of Teslin is significant to residents for recreation, food gathering, physical health and connection to nature[7].
	Khàtìnas.àxh Community School
	Yukon University Teslin Campus
	George Johnston Museum
	Village of Teslin Office
	Royal Canadian Mounted Police
	Religious: Catholic Mission, St Phillip's Anglican Church
	Tom Dewhurst Recreation Centre
	Yukon Housing
	Teslin Tlingit Heritage Centre
	Recreational trails and trailhead infrastructure
Infrastructure (Figure 20)	Weather Station at Teslin Airport
	Teslin Health Centre
	Wind energy sources: Teslin Airport, CWRAP Site 15
	Road network: Alaska Highway and local roads
	Various Yukon Government buildings including Highways and Public Works facilities
	Nisutlin Bay Bridge
	Firebeaks: north of main town
	Airport
	General store (Nisutlin Trading Post)
	Petrol station (Yukon Motel, Nisutlin Trading Post)
	FLO electric vehicle charging station
	Liquid depot/dump
	Sewage treatment
	Teslin Biomass Project: 10 woodchip boilers in three energy centres supply heating to Teslin using harvesting by-product from the town's sawmill.
Environmental (Figure 21)	CDC Species of Conservation Concern: Woodchuck (*Marmota monax*) and Water Awlwort (*Subularia aquatica*)

	Wildfire Key Areas: Bald Eagle (*Haliaeetus leucocephalus*) and Woodland Caribou (*Rangifer tarandus caribou*)
	Water wells: environmental monitoring and public supply (31)
	Permanent Sampling Plot #30
	Fox Creek Aquatic Health Monitoring Site
Economic (Figure 20)	Tourism (activities): canoeing, fishing, hunting, hiking, museum, cultural centre
	Tourism (accommodation): Nisutlin Trading Post, Yukon Motel, Mira's B&B, Nisutlin Outfitters
	Campground
	Sawmill

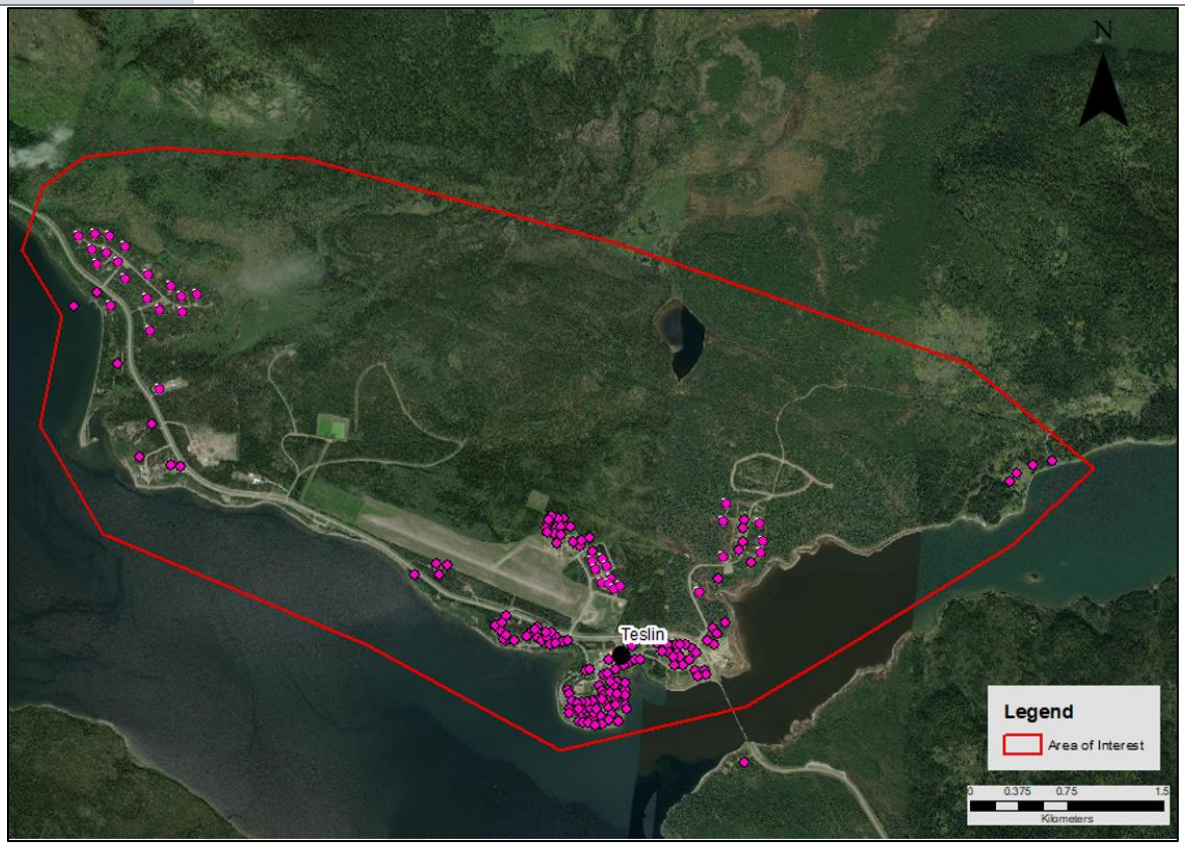

Figure 19. Human Life and Cultural Values mapped as purple dots. Data sourced from GeoYukon, Open Data Yukon and reviewing satellite imagery – not all values identified in Table 6 have been mapped on Yukon Government data sources.

Figure 20. Infrastructure and Economic Values. Data sourced from GeoYukon, Open Data Yukon - not all values identified in Table 6 have been mapped on Yukon data sources.

Figure 21. Environmental Values. Data sourced from GeoYukon, Open Data Yukon - not all values identified in Table 6 have been mapped on Yukon data sources.

4.5 Vulnerabilities

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

Table 12. Values and their vulnerabilities in Teslin Area of Interest

Value	Wildfire Hazard	Description
Homes	Direct flame contact, radiant heat and ember exposure.	Homes are constructed within the Wildland Urban Interface. Homes north of the highway in particular are surrounded by continuous forests which can support elevated fire behaviour and risk house loss (and possibly loss of life).
Evacuation routes and access routes for firefighting resources	Inability to evacuate from a wildfire.	There are two main exits from town along the Alaska Hwy, north along Teslin Lake and south across Nisutlin Bay Bridge. There is potential for evacuation difficulty along either of those options if fire or an accident were to block either route. Housing areas in the west, south and north of town have at least two roads into/out towards the highway. Areas to the north-west of town have one main road in and out.
	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.
Drinking water supply	Infiltration of fire by-products, sedimentation, changes in soil properties, runoff and firefighting chemicals infiltrating into water supply.	There are 24 public supply or private water supply wells around Teslin. Fox Point Subdivision. Fox Point subdivision, Teslin Water Reservoir/Grader Station, RCMP and Teslin Tlingit FN Well (lot 13, block 24) are all within the wildland urban interface and near continuous forest fuels.

		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 Lake Teslin, Nisutlin Bay and via wells (some private, some public)	Water sources for firefighting appliances may limit efficiency of firefighting - if wells cannot be accessed and there is no hydrant system, firefighting appliances will have to leave the fire to re-fill elsewhere, such as the lake or bay.
Health facilities	Direct fire hazard and supply chain issues from blocked roads	If the Health Centre were to be directly impacted by fire, or if Teslin were to be temporarily disconnected from supplies/staff, the community might not be able to access health care. The nearest health care facility in the Yukon to Teslin is in Carcross (2hr drive).
School facilities	Direct fire hazard and resources	If the school were to be directly impacted by fire, or if Teslin were to be temporarily disconnected from staff, the community might not be able to access school and facilities. The nearest school in the Yukon to Teslin is in Carcross (2hr drive).
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 products for the sawmill and biomass project will impact jobs within Teslin.
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	Teslin Biomass Project: 1-2 years worth of wood and debris are stored on site to dry.
Environmental Values	Loss of habitat from direct fire impacts, degradation of	Forests and river inlets within 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

	water quality from runoff	when soil properties are altered and chemicals and sediments infiltrate nearby rivers.

5. Risk Management

5.1 Risk Management Options

The following section describes some available risk management options to consider when identifying desired risk mitigation options for specific values below in Section 5.2. This list is not exclusive.

1. ***Fuel Treatment options* – below are a variety of treatment options to consider:**
    - **Prescribed fire** involves the introduction of a planned fire to an area under specific conditions to reduce fuel loading. While there is less predictability in the post-treatment stand structure following prescribed fire, it represents an efficient and cost effective way to remove fuels both on small and landscape scales. Prescribed fire can be done through aerial ignitions using a helicopter or by ground crews.

    - **Thinning** is a precise method for modifying stand structure through either hand falling/cutting or mechanical cutting. Thinning focusses on removing specific species of tree such as spruce, specific age classes of trees and pruning limbs to reduce ladder fuels. Taken together these measures aim to reduce the volatility of a forest stand as well as the probability that a surface fire can move into the forest canopy.

    - **Other treatments such as mastication and mulching** use machinery to rearrange, compact or modify fire hazard without removing fuels. These methods are not as effective at reducing fire hazard as the treatments above, however they provide an alternative for areas near to communities where more aggressive treatment options are not widely accepted.

    - **Stand conversion** involves modifying a forest stand composition to be less flammable, typically by reducing the conifer portion while encouraging the growth of deciduous vegetation. A conversion treatment may combine treatment methods, for example thinning spruce to open the canopy to provide more sunlight to aspen and planting additional deciduous trees such as aspen or birch.

    - A **fuel break** is a strip or block of land on which the vegetation has been reduced or modified to reduce the fire's ability to spread rapidly.

    - A **fire break** is an area where all vegetation and organic matter is removed down to mineral soil. The purpose of a firebreak is to deny a fire any combustible material.

2. ***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 has developed a new National Standard of Canada for Fire Resilient Planning, for Northern Communities S504:19. This standard helps guide community developments and building standards with considerations for communities living in fire prone ecosystems such as those in Yukon.

3. ***Structural Ignitability***

Reducing the ignitability of structures themselves is key to addressing wildfire hazard. Thorough guidance to improving a structure's ability to resist ignition and survive a wildfire can be found in the FireSmart Homeowner's Manual. Without attention to the structural ignitability of a building itself, forest fuel management treatments may not ensure the building's survival.

4. ***Communication and Engagement***

The CWPP will only be successful if community members are engaged in and support the fuel treatments identified in this plan, and take action to reduce wildfire hazards on private property.

There is not believed to be significant opposition to hazard reduction activities in Teslin. All local government groups are represented on the Planning Committee. However, it should be assumed that the majority of community members have a neutral attitude towards proactive work on their own properties.

This plan's communication and engagement activity can be organized into two categories:

- **Community endorsement**: Following this plan's approval, it will be presented to the community in the most appropriate venue for people to understand its contents. This event will be promoted collaboratively by the Government of Yukon, the Village of Teslin and the Teslin Tlingit Council. When complete, it will also be available for public access on Yukon.ca and on TTC's website.

- **Private property hazard reduction**: using the FireSmart principles, community members will be encouraged to support the fuel treatments outlined in this plan by reducing wildfire hazards on their properties.

- All parties to this plan will work together to provide the community with relevant FireSmart tips.
- The Planning Committee will organize a yard clean-up contest in spring/summer 2021 and continue on an annual basis that will motivate private property owners to assess and reduce their wildfire hazard. Wildland Fire Management will provide the prizes. The Village of Teslin will organize an accessible debris removal process for the duration of the contest.
- Wildland Fire Management will request permission to organize a Khàtìnas.àxh Community School visit that informs students about wildfire safety.

The Planning Committee also agrees to collaboratively develop other local engagement activities that could improve the community's support for this plan.

5. ***Tactical Exercises and Evacuation Planning***

Completing an evacuation plan and practicing evacuations ahead of time can significantly reduce the chaos and stress in an emergency, and will increase the likelihood of a positive outcome. The following are some options for tactical exercises and evacuation planning:

- Public events that explicitly address evacuation routes, challenges, and preparedness measures.
- 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,
  - Areas for residents to shelter in place in the event their evacuation route is compromised.
- Tactical exercises to practice evacuations and identify vulnerabilities:
  - "Tabletop Exercises" to address larger-scale issues and scenarios,
  - Neighbour hood-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;

Recommendation:

1. Complete an evacuation plan
2. Host public events and expand communication of evacuation considerations to residents and visitors. Tabletop exercises and live neighborhood-level mock evacuations are recommended as a component of this strategy.

6. **Teslin's Official Community Plan**

Much planning and community engagement has already taken place within Teslin. Reflected in Teslin's Official Community Plan (OCP) the community supports the goals and objectives of the CWPP through its endorsement of FireSmart programs and principles throughout its community. The following clauses within the OCP:

5.5.3.1.1.6 To minimize the risk of property damage and loss of human life from forest fires, the Village supports and implements a Fire Smart program.

5.5.3.1.3.4 In conjunction with the Teslin Tlingit Council, the Village will develop a comprehensive Fire Smart program related to Country Residential housing development that may include:

- Vegetation buffers of 10m adjacent to structures to provide a fuel free zone for fire protection;
- Further buffers of 20m (beyond the initial 10m buffer) within which vegetation will be controlled to limit the amount of potential fuel for a fire;
- Introduction of other preventative measures such as the use of fire retardant building materials or requirements for sprinkler systems; and
- Covenants on title indicating forest fire risk to potential home buyers.
- The Village may also consider revised road standards within forest fire risk areas that ensure both in and out routes, i.e. no cul-de-sacs that depend on a single access route, and a requirement for water reservoirs within subdivisions for the purposes of firefighting.

Most poignantly and directly, clause 5.5.3.1.3.5 of the OCP states '*The Village will continue to manage vegetation within municipal boundaries to create firebreaks and to reduce the amount of fuel loading on the ground surface.*'

5.2 *Identifying risk mitigation options for specific values*

As outlined in *Section 1: What is Wildfire Risk?*, wildfire risk is comprised of several risk components:

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

This CWPP section uses the values identified above and considers potential mitigation actions for wildfire risk components impacting those values. Not every risk component will have a management action identified, however it is important to note this to understand what components are driving the wildfire risk to the value.

When considering risk components for each value, the wildfire regime, ignition risk and wildfire fuel and hazard should be considered alongside the desires and capacity of the community. It is important to communicate where actions can be taken to reduce risk, but also where actions cannot reduce risk.

Fill out as much of Table 13 below as possible. Not all actions may be included in the final plan, but they can be identified for future iterations of this CWPP, included in resource bids or acted on if increased capacity is realised in the future.

When completed, it may become clear that one mitigation action might reduce wildfire risk for several values. Once actions are identified for inclusion into the final plan, they will be summarised in *Section 7* and assigned a responsible person or group.

Table 13. Mitigation methods identified to reduce wildfire risks to values within the Teslin Area of Interest. Methods identified for inclusion in this plan are in BOLD text.

			Mitigation method to address risk factor			
Value	**Wildfire Hazard**	**Description**	**Likelihood**	**Severity**	**Exposure**	**Vulnerability**
Homes	Direct flame contact, radiant heat and ember exposure.	Homes are constructed within the Wildland Urban Interface. Homes north of the highway in particular are surrounded by continuous forests which can support elevated fire behaviour and risk house loss (and possibly loss of life).				
Evacuation routes	Inability to evacuate from a wildfire.	There are two main exits from town along the Alaska Hwy, north along Teslin Lake and south across Nisutlin Bay Bridge. There is potential for evacuation difficulty along either of those options if fire or an accident were to block either route. Housing areas in the west, south and north of town have at least two				

			Mitigation method to address risk factor			
Value	**Wildfire Hazard**	**Description**	**Likelihood**	**Severity**	**Exposure**	**Vulnerability**
		roads into/out towards the highway. Areas to the north west of town have one main road in and out.				
Access for firefighting resources	Property access is challenging for firefighting resources	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.				
Drinking water supply	Infiltration of fire by-products, sedimentation, changes in soil properties, runoff and firefighting chemicals infiltrating into water supply.	There are 24 public supply or private water supply wells around Teslin. Fox Point Subdivision. Fox Point subdivision, Teslin Water Reservoir/Grader Station, RCMP and Teslin Tlingit FN Well (lot 13, block 24) are all within the wildland urban interface				

			Mitigation method to address risk factor			
Value	**Wildfire Hazard**	**Description**	**Likelihood**	**Severity**	**Exposure**	**Vulnerability**
		and near continuous forest fuels. 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 Teslin Lake, Nisutlin Bay and via wells (some private, some public)	Water sources for firefighting appliances may limit efficiency of firefighting - if wells cannot be accessed and there is no hydrant system, firefighting appliances will have to leave the fire to re-fill elsewhere, such as the lake or bay.				

			Mitigation method to address risk factor			
Value	**Wildfire Hazard**	**Description**	**Likelihood**	**Severity**	**Exposure**	**Vulnerability**
Health facilities	Direct fire hazard and supply chain issues from blocked roads	If the Health Centre were to be directly impacted by fire, or if Teslin were to be temporarily disconnected from supplies/staff, the community might not be able to access health care. The nearest health care facility in the Yukon to Teslin is in Carcross (2hr drive).				
School facilities	Direct fire hazard and resources	If the school were to be directly impacted by fire, or if Teslin were to be temporarily disconnected from staff, the community might not be able to access school and facilities. The nearest school in the Yukon to Teslin is in Carcross (2hr drive).				

			Mitigation method to address risk factor			
Value	**Wildfire Hazard**	**Description**	**Likelihood**	**Severity**	**Exposure**	**Vulnerability**
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 products for the sawmill and biomass project will impact jobs within Teslin.				
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	Teslin Biomass Project: 1-2 years worth of wood and debris are stored on site to dry.				
Environmental Values	Loss of habitat from direct fire impacts, degradation of water quality from runoff	Forests and river inlets within 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				

			Mitigation method to address risk factor			
Value	**Wildfire Hazard**	**Description**	**Likelihood**	**Severity**	**Exposure**	**Vulnerability**
		soil properties are altered and chemicals and sediments infiltrate nearby rivers.				

5.3 Prioritized Fuel Management Plan

Some identified risks highlighted in Table 13 above are to be managed through fuel modification projects as deemed appropriate for stand density and proximity to values within the community.

The three phases of the fuel management plan may overlap or occur concurrently depending on planning timelines, permitting, and resource availability.

Phase 1: Phase 1 will target areas that have previously undergone a fuel treatment to further reduce wildfire hazard including the potential for extreme fire behaviour. Enhancing the protection provided by these existing fuelbreaks will be carried out through thinning from below to increase stem spacing to 5-6m, pruning of retained stems to a minimum of 2m, removal of the majority of conifer regeneration, and removal of surface fuel accumulations.

Phase 2: Thinning and selective harvesting of spruce forests situated within the fire break and between the fire break and the community. Thinning will focus on removing specific species of tree (particularly spruce), specific age classes of trees and pruning limbs to reduce ladder fuels. All culturally modified trees will be pre-identified and retained in consultation with Teslin Tlingit Council.

Phase 3: Phase 3 will focus on stand conversion in the blocks identified within Teslin's new Timber Harvest Plan (Teslin North Strawberry Creek, 2019). Stand conversion involves modifying a forest stand composition to be less flammable, typically by reducing the conifer portion while encouraging the growth of deciduous vegetation. A conversion treatment may combine treatment methods, for example thinning spruce to open the canopy to provide more sunlight to aspen and planting additional deciduous trees such as aspen or birch. As in phase 2, all culturally modified tress will be retained within these areas.

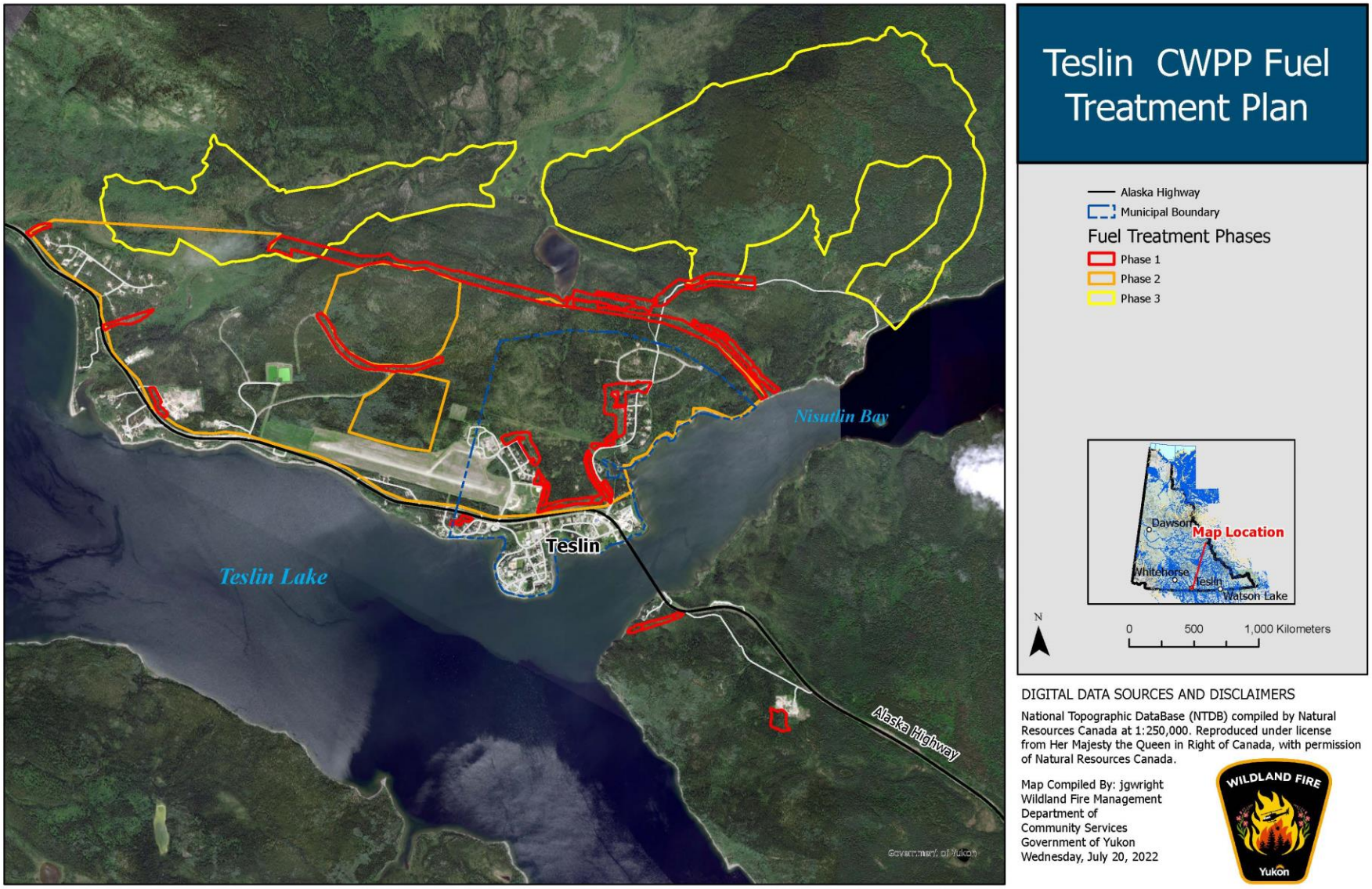

Figure 22. Prioritized Fuel Management Phases.

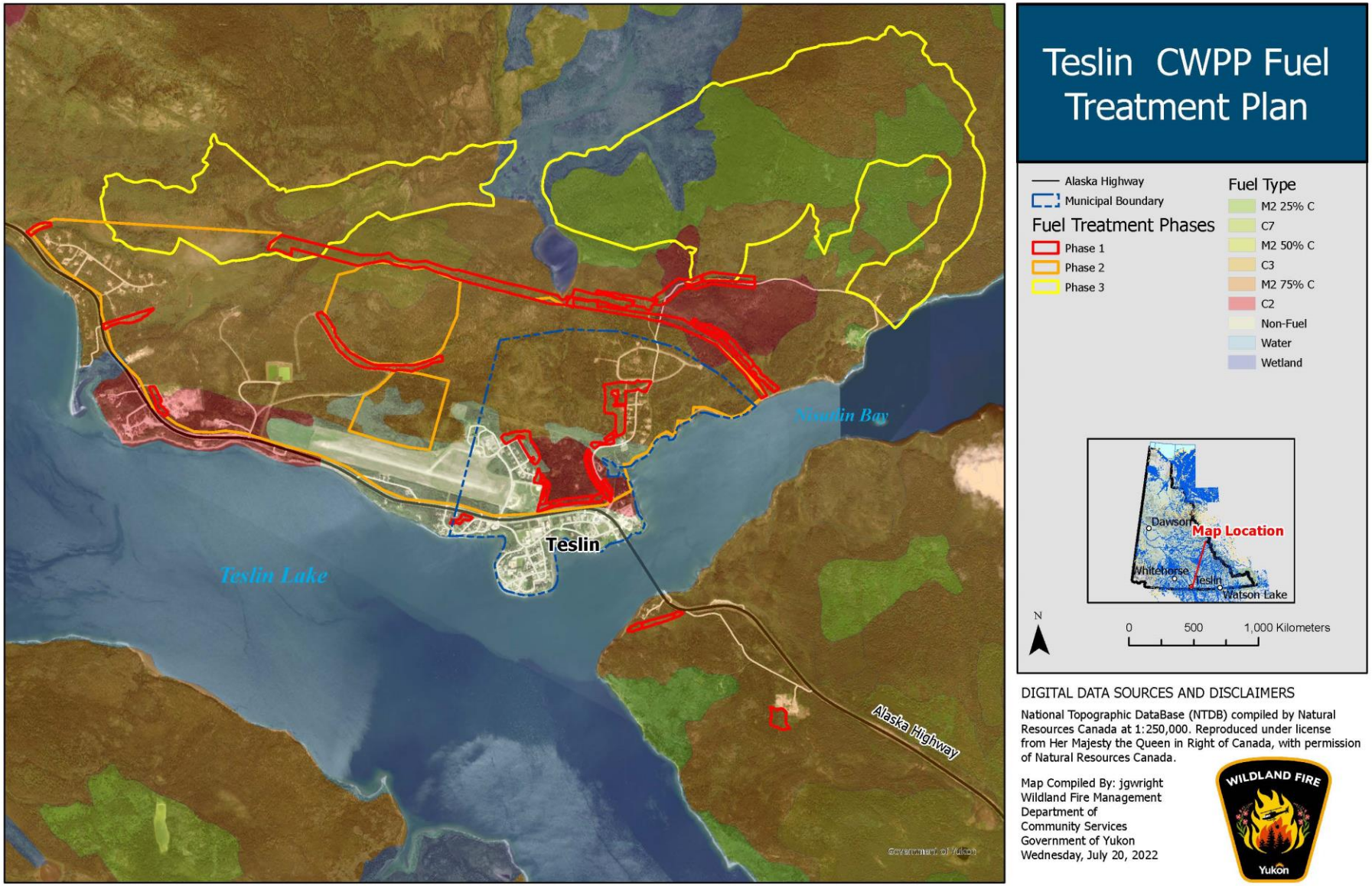

Figure 22. Map of prioritized areas with FBP fuel types

6. Monitoring and Reporting

An annual Teslin 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 Teslin's requirements for protection and risk reduction against wildfire. The CWPP will have a review cycle of 5 years.

7. Summary of Risk Mitigation Actions and Responsibilities

Table 14. Risk mitigation actions, next steps and responsibilities

Theme	Action / Recommendation	Status/Next Steps	Responsibility
1. FireSmart	a) Teslin's Official Community Plan action 5.5.3.1.1.6: To minimize the risk of property damage and loss of human life from forest fires, the Village and Teslin Tlingit Council support and implements a FireSmart program	In progress, VoT and TTC currently engages in the Government of Yukon's FireSmart Funding Program and completes fuel reduction projects annually.	VoT, TTC
	b) 5.5.3.1.3.4 In conjunction with the Teslin Tlingit Council, the Village will develop a comprehensive FireSmart program related to Country Residential housing development	Work together from the design concept phase onward to review, discuss and propose recommendations for housing development that incorporates FireSmart design principles.	VoT, TTC, LDB, WFM
	c) Individual property owners in existing and new subdivisions should be encouraged to treat and maintain their properties to FireSmart guidelines.	Provide FireSmart Canada educational materials by mail, digitally, and on-hand at VoT and TTC offices.	TTC, VoT, WFM to provide materials
	d) New residential subdivisions should be made FireSmart with respect to access roads, defensible perimeters and linked fuel discontinuities (primary and secondary fuel breaks) as they are developed.	Work together from the design concept phase onward to review, discuss and propose recommendations for housing development that incorporates FireSmart design principles.	VoT, TTC, LDB, WFM

Theme	Action / Recommendation	Status/Next Steps	Responsibility
	e) FireSmart assessment for heritage buildings throughout the community	1.Identify all heritage buildings in Teslin. 2. Complete FireSmart homeowner assessments with a local champion as a training opportunity.	1. TTC, VoT 2. WFM
	f) Teslin has a robust recreation program which could support FireSmart programs and activities		
2. Wildfire Response	a) Provide cross training of volunteer firefighters with wildland firefighters. This will provide volunteers with more skills as well as establish working relationships between firefighting resources and increase firefighter safety.	Plan and execute a tabletop exercise.	Teslin VFD, WFM
	b) Design a water access plan if pumping distance from a well or lake is considerable	TBD	TBD
	c) Complete an evacuation plan	TBD	TBD
	d) Host public events and expand communication of evacuation considerations to residents and visitors. Tabletop exercises and live neighborhood-level mock evacuations are recommended as a component of this strategy.	TBD	TBD
3. Fuel Management	a) Consider opportunity to tie in recommended fuel management units with Teslin North timber harvest plan	Continue planning for Teslin North YESAB Submission	TTC, VoT, WFM, FMB

Theme	Action / Recommendation	Status/Next Steps	Responsibility
		and subsequent stand conversion.	
	b) Begin mitigation efforts by re-treating previous firesmart areas to improve and open up thinned areas and 'bench test' the CWPP process through funding to boots on the ground (Phase 1).	In progress as of autumn 2022.	TTC, VoT, WFM
	c) The primary fuelbreak north of Teslin is an essential component of wildfire risk reduction strategy. Since work has already commenced on this new fuelbreak, its proposed location, treatments and maintenance should be examined in view of planned residential and forestry-related development, timber harvest areas and fuel type distribution, wind throw susceptibility.	Review proposed near-future development in the area and determine first treatment areas within Phase 2 of the fuel treatment plan.	TTC, VoT, WFM
	d) All stakeholder groups having an interest in wildfire risk mitigation (see above) and should be consulted on the issues related to the new primary fuelbreak and other issues of fire risk mitigation strategy, and a mitigation strategy adopted by the community.	Establish annual CWPP stakeholder group meeting to foster a learning culture and ensure that all stakeholders broadly support the next mitigation actions.	TTC, VoT, WFM
	e) The old Teslin primary fuelbreak, stretching from the airport complex in the west to Nisutlin Bay, has had recent investment in it and will be effective with further treatment. Work on the fuel break	Assess the Teslin Firebreak to determine which portions require retreatment and determine the appropriate prescription.	WFM

Theme	Action / Recommendation	Status/Next Steps	Responsibility
	should continue focusing on portions of it that can be rehabilitated at reasonable cost as fuel discontinuities supporting subdivision perimeters.		
	f) Fuel maps are produced according to a mix of provincial datasets. The result is a close representation of vegetation on the ground, however, for a small Area of Interest like Teslin, it is recommended to review the provincial fuel type layer and confirm mapping accuracy.	Groundtruth recently updated 5k FBP fuel maps to confirm accuracy.	WFM
	g) Where practical, biomass resulting from forest fuel management efforts will be incorporated into local energy production.	Monitor progress in the biomass project and adapt to provide fiber as needed.	TTC, VoT
4. Communications and Engagement	a) Media and communications: Teslin has significant communication and social networks which can support emergency information as well as providing FireSmart information, wildfire update and community project information.	Identify opportunities for locally-based communications tools to advocate for FireSmart actions and steer residents towards existing educational materials and platforms for information on fuel management projects.	TTC, VoT, WFM
	b) Following this plan's approval, it will be presented to the community in the most appropriate venue for people to understand its contents. This event will be promoted collaboratively by the Government of Yukon, the Village of	1. Plan an event to present the CWPP to interested residents. 2. Post to Yukon.ca campaign page for public access.	1. TTC, VoT, WFM 2. WFM

Theme	Action / Recommendation	Status/Next Steps	Responsibility
	Teslin and the Teslin Tlingit Council. When complete, it will also be available for public access on Yukon.ca and on TTC's website.		

8. References

The following is a summary of footnote references. Plans outlined in *Section 3.2 Teslin Community Management plans and Relationship to CWPP* (Table 2) are accessible through hyperlinks in the digital copy of this document and are not referenced again below.

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

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.

Climate-Data.org.n.d. *Teslin Weather and Climate in October*. Accessible: https://en.climate-data.org/north-america/canada/yukon/teslin-718707/t/october-10/?amp=true

Cruz MG, Alexander ME and Fernandes, P. 2022. *Evidence for lack of a fuel effect on forest and shrubland fire rates of spread under elevated fire danger conditions: implications for modelling and management*. International Journal of Wildland Fire. Doi:10.1071/WF21171

Ember Research Services, Applied Ecosystem Management Ltd & TransNorthern Management Consulting. 2000. *Yukon Community Wildfire Risk and Reduction Assessment - Final Report*. Report for Government of Yukon and Indian and Northern Affairs Canada Fire Management Program, Yukon.

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

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

Forest Management Branch. n.d. *Budworm*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/6-budworm.pdf

Forest Management Branch. n.d. *Aspen Serpentine Leafminer*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/1-aspen-serpentine-leafminer.pdf

Forest Management Branch. n.d. *Large Aspen Tortrix*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/11-large-aspen-tortrix.pdf

Forest Management Branch. n.d. *Northern Spruce Engraver Beetle*. Energy Mines and Resources, Government of Yukon. Available:

https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/14-northern-spruce-engraver-beetle.pdf

Forest Management Branch. n.d. *Pine Needle Cast*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/17-pine-needle-cast.pdf

Forest Management Branch. n.d. *Spruce Bark Beetle*. Energy Mines and Resources, Government of Yukon. Available: https://emrlibrary.gov.yk.ca/forestry/forest_health/forest-insect-and-disease-pamphlets/19-spruce-bark-beetle.pdf

Government of Yukon. 2002. *Municipal Act: Revised Statues of the Yukon*. Accessible: https://laws.yukon.ca/cms/images/LEGISLATION/acts/municipal.pdf

Government of Yukon. 2018. *Yukon Forest Health Report*. Whitehorse. Accessible:https://yukon.ca/sites/yukon.ca/files/emr/emr-2018-forest-health-report_2.pdf

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

Hall, D, Green, S and Parisian MA. 2016. *Using Burn-P3 to Model Wildfire Probability and Aid in the Management of Northern Boreal Forests in the Teslin Tlingit Traditional Territory*. Poster presentation: Wildland Fire Canada Conference, Kelowna, 24-28 October 2016.

Hicke JA, Johnson MC, Hayes JL, Preisler HK, 2012. *Effects of bark beetle-caused tree mortality on wildfire*. Forest Ecology Management. 271, 81–90.

NASA Earth Observatory. n.d. *Biomes: Desert*. Accessible: https://earthobservatory.nasa.gov/biome/biodesert.php

Perrakis DBD & Eade G. 2015 *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description*. Report for BC Wildfire Service. Victoria, British Columbia.

Stocks BJ, Wotton BM, Flannigan MD, Fosbert MA, Cahoon DR, & Goldammer, JG. 2001. *Boreal forest fire regimes and climate change*. Pages 233-246 in M. Beniston and M.M. Verstraete, editors. Remote sensing and climate modeling: synergies and limitations. Kluwer Academic, Dordrecht, The Netherlands.

Singer JA, Turnbull R, Foster M, Bettigole C, Frey BR, Downey MC, Covey KR, Ashton MS. 2019. *Sudden Aspen Decline: A Review of Pattern and Process in a Changing Climate*. Forests. 10(8):671. https://doi.org/10.3390/f10080671

Smith, CAS., Meikle, JC, and Roots, CF. (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. Accessible: https://yukon.ca/sites/yukon.ca/files/env/env-ecoregions-yukon-territory.pdf

Teslin Tlingit Council, Teslin Renewable Resources Council & Government of Yukon. 2007. *Teslin Strategic Forest Management Plan: Strategic Forest management Plan for the Teslin Tlingit Traditional Territory*. Available: https://yukon.ca/sites/yukon.ca/files/emr/emr-forest-management-plan-teslin-tlingit-traditional-territory.pdf

Teslin Tlingit Council and Village of Teslin. 2014. *Emergency Measures Plan: Village of Teslin*. Accessible: https://static1.squarespace.com/static/5a1355c8d74cff26eb78da29/t/5c92a7bfa4222f9d75e7d162/1553115082465/EMERGENCY+MEASURES+PLAN+Draft+2018.pdf

Teslin Tlingit Council and Village of Teslin. 2015. *Teslin Community Development Plan 2015-2025*. Accessible: https://static1.squarespace.com/static/5a1355c8d74cff26eb78da29/t/5c193d7103ce64be5a889f57/1545158099518/REVISED+FINAL+DRAFT+TTC-VOT+Community+Development+Plan+-+March+15%2C+2015.pdf

Timko J, Green S, Sharples R & Grinde A. 2015. *Using a community-driven approach to identify local forest and climate change priorities in Teslin, Yukon.* Cogent Social Sciences, 1:1, 1047564, DOI: 10.1080/23311886.2015.1047564

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

Village of Teslin. n.d. *The Village of Teslin*. Available: https://www.teslin.ca/

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.

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.

Yukon Bureau of Statistics. 2022. (table). *Population Report First Quarter, 2022*.https://yukon.ca/sites/yukon.ca/files/ybs/fin-population-report-q1-2022.pdf

Yukon Wood Products Association. 2018. *Teslin Tlingit Council Biomass Project*. Accessible: https://www.yukonwoodproducts.org/index.php/news/4-teslin-tlingit-council-biomass-project