

2023

UNIVERSITY OF
WATERLOO



Fire Research Group
Department of Mechanical and Mechatronics Engineering
University of Waterloo
Waterloo, ON Canada N2L 3G1

E. Weckman, K. Senez, B. Southern and A. Winter

WUI Fire Risk in Canadian Indigenous Communities

June, 2023

A research report prepared for
National Indigenous Fire Safety Council
under funding Project 40-R-3 (RFP 2022 – 05)

Executive Summary

Preamble

This report draws on a limited sample of case studies that are currently available for First Nations Populations on Reserve. There is a goal in moving beyond this current state and, wherever possible, implementing new forms of data collection, drawing upon different data sources, and framing research questions that include Inuit and Métis communities as well as First Nations residents on, and off, reserve.

Analytical Approach

The research reported here includes a review of current literature, case studies, reports, government wildfire documentation, wildfire guides and other sources relating to wildfire preparation and management for fire safety strategies for communities at the Wildland Urban Interface, referred to herein as WUI. To this end, case studies specific to Canadian First Nations communities are analyzed in a detailed fashion to provide the appropriate context to understand limitations in the current practices based on past events. Connections are drawn to identify a series of recommended best practices that are applicable to the unique requirements of Canadian First Nations communities. Additionally, a guide for the practical implementation of strategies for increased fire-resilience across these communities can be derived from the current research.

Recommendations

Based on the present analysis, a series of six high level recommendations are proposed, as follows:

- Work directly with community leaders and knowledge keepers to understand specific wildfire fire threats and management challenges in their communities.
- As more experience with planning for, and the management of, wildfires in First Nations communities is gained, modify the existing roles and responsibilities or create new roles and responsibilities, adjusting databases and tools accordingly.
- Develop a strategy for familiarization and education around outreach package and resources from this research.
- As more experience with the outreach package and web application is gained, ensure the tools are updated to continually improve their design, accessibility and functionality.
- Modify the outreach package and web application to reflect the individuality of each community with language, art, and community-specific roles and responsibilities.
- Develop a long-term strategy for on-going maintenance, and improvement to the resource databases to ensure relevant stakeholders have a clear and accurate picture challenges faced by First Nations (and other Indigenous communities) at the WUI.

Acknowledgements and Caveats

The National Indigenous Fire Safety Council (NIFSC) is the result of a new Indigenous developed framework designed to support Indigenous communities in the development of their internal capacity to support community safety and resiliency. The NIFSC is Indigenous inspired, designed and led in collaboration with regional and national Indigenous communities, organizations, and leaders.

This report has been developed in response to funding under Research Area #6 (RFP #2022-06 from the 2022-23 NIFSC research agenda) to contribute Research Toward Wildland Urban Interface (WUI) Fire Safety in Canadian Indigenous Communities. The broad goals of the work included a review existing knowledge, resources, guidelines, practice and management approaches to understand specific threats of fire. From this basis, a preliminary WUI fire safety and response framework was developed and a series of ‘best practices’ and associated implementation strategies proposed to create more resilient, community-wide WUI fire safety guidelines.

The authors would like to acknowledge the National Indigenous Fire Safety Council (NIFSC) for requesting this work and being committed to evidence-based decision-making in such critical areas of community health. In particular, the authors express thanks to the Board of Directors, Nathan Wright, Executive Director, Blaine Wiggins, Senior Director Indigenous Fire Marshals Service, Mandy Desautels, Director of Strategic Initiatives, and Len Garis, Director of Research for their vision and guidance as the project unfolded.

Special thanks are due to Anishinaabe Onyota’a:aka artist, Tsista Kennedy, for their invaluable contribution of incredible woodland style icons and artwork to this Project. We are deeply grateful for their artistic vision and dedication to the artwork included in the educational materials.

The presentation of data within this report cannot be considered as either endorsed by the NIFSC or an expression of their policies or views. Any errors of omission or commission are not the responsibility of the NIFSC.

Contents

Executive Summary	ii
Acknowledgements and Caveats	iii
List of Tables	v
1 Introduction	1
2 Background and Context	2
2.1 The Stages of A Wildfire Event	2
2.2 Case Studies and Lived Experiences from First Nations Communities	3
2.2.1 Sandy Lake, 2011	3
2.2.2 Dene Tha', 2016	4
2.2.3 Whitefish Lake, 2011	5
2.2.4 Mishkeegogamang Ojibway Nation, 2011	5
2.3 General Shortcomings	6
2.3.1 Available documentation	6
2.3.2 Wildfire Detection	6
2.3.3 Community Wildfire Planning	7
2.3.4 Resilient Infrastructure	8
3 Community Roles	9
3.1 Before the Fire	13
3.1.1 Emergency Planning	13
3.1.2 Emergency Preparedness	15
3.1.3 Outreach	17
3.2 During the Fire	18
3.2.1 Incident Identification and Decision to Evacuate	18
3.2.2 Communications	19
3.2.3 Evacuation Preparation	20
3.2.4 Evacuation	21
3.2.5 Host Communities	23
3.2.6 Emergency Response and Maintaining Community During the Fire	24
3.3 After the Fire	27
3.3.1 Emergency Response and Maintaining Community After the fire	27
3.3.2 Resources and Financial Supports	29
3.3.3 Rebuild and Recover	30
4 Resources	31
4.1 Informational and Outreach Material	31
5 Information Dissemination	33
6 Conclusions	35

List of Tables

1	Emergency Responders	9
2	Internal community roles	10
3	Roles external to the community	10
4	Indexing Table for all other Tables	12
5	Host Community Plan Responsibilities	13
6	Communication Plan Responsibilities	13
7	Evacuation Plan Responsibilities	14
8	Financial Plan Responsibilities	15
9	Creation of Checklists and Handouts	15
10	Emergency Responder Preparation Responsibilities	16
11	Community Preparation Responsibilities	16
12	Evacuation Centre Responsibilities	17
13	Outreach Responsibilities	17
14	Incident Identification Responsibilities	18
15	Evacuation Decision Responsibilities	18
16	Information Accuracy Responsibilities	19
17	Internal Communication Responsibilities	19
18	External Communications Responsibilities	20
19	Preparing Homes Responsibilities	20
20	Emergency Services Preparation Responsibilities	21
21	Pre-Evacuation Responsibilities	21
22	Evacuation Responsibilities	22
23	Resource and Financial Responsibilities	22
24	Special Considerations	23
25	Pre-Reception Responsibilities	23
26	Reception Responsibilities	23
27	Hosting Responsibilities	24
28	Emergency Operations Centre Responsibilities	25
29	Emergency Responders Responsibilities	26
30	Advisor and Volunteer Responsibilities	26
31	External Organizations Responsibilities	27
32	Pre-return Responsibilities	28
33	Repatriation Responsibilities	28
34	Celebrate and Acknowledge Efforts	29
35	Resources and Financial Supports	29
36	Rebuild and Recover	30
37	Most Utilized Informational Materials	32
38	Labeling of Columns in Sortable Roles and Responsibilities Spreadsheet	34
39	App Dependencies	40

1 Introduction

Increased severity and frequency of wildland fires are posing an ever-growing threat to the health, safety and well-being of Canadian communities situated at the wildland urban interface (WUI) [1–5]. This is an extremely important issue since over 12.3% of Canadians live in the WUI [6] and nearly 80% of Indigenous communities [7], comprising one third of on-reserve First Nations members, are situated in WUI settings [6]. It has been noted that over 17% of on-reserve populations live in areas with Fire Return Intervals of less than 250 years, in comparison to only 4.7% of other WUI residents [6].

The location of these remote communities brings many unique challenges in wildfire preparation and management. Previous studies of wildfire events experienced by communities at the WUI indicate that emergency response planning must be thorough and specific to the region for which it is developed. Insufficient planning leads to unforeseen challenges during plan deployment. Despite the need, there are few comprehensive sources which integrate the experiences of fire-prone communities with the spectrum of resources available from the government and other organizations to aid in community planning [8].

As such, the objectives of the present research were as follows:

- To undertake a review of research, case studies, knowledge, practice and implementation of fire safety strategies for communities at the WUI,
- To identify a series of best practices related to unique requirements of Canadian Indigenous communities of varying size and resources, and
- To recommend practical implementation strategies for advanced WUI fire safety and resilience across Canadian Indigenous communities.

To this end, the research reported here focused on a scan of current literature, case studies, reports, government wildfire documentation, wildfire guides and other sources relating to wildfire preparation and management. Available documentation ranges from published case studies on the experiences of First Nations in Canada during wildfire events [7–10] to guidelines and resources for creating wildfire protection plans from agencies within Canada [11], as well as the Federal Emergency Management Association (FEMA) in the United States [12]. An initial review of current documents and industry practices in wildfire management, in combination with Canadian and US government wildfire materials (planning guides, posters, etc.), provided insight into common approaches, analysis steps and guides used for planning in North America.

The Dene Tha' [9], Sandy Lake [7] and Whitefish Lake [10] case studies were then reviewed to draw interconnections between events, roles necessary to manage those events, and overall impacts of planning and management of WUI fires. Mind maps were made to visualize and understand the events from each case study. Key fire and evacuation events were then contrasted with conceptual planning and management guides to identify commonalities and gaps between the guides and real events. An important correlation amongst case studies is the similarity of location, namely, all participating communities are remote communities.

Therefore, the stories from their experiences emphasize a higher complexity in the problems faced when preparing and planning for wildfire events, and potentially highlight the difficulties of reduced managerial capacity in these remote regions when compared to regions with higher levels of development.

In general, resilience of fire-prone WUI communities requires thorough wildfire preparedness with robust measures for how the community will undertake wildfire assessment, mitigation, and potential evacuation. This research provides a summary of experiences and current best practices for wildfire preparation and management. Understanding the commonalities, differences, and gaps in documented approaches to wildfire preparation and management reveal several key focus-points and associated elements needed to increase the preparedness of Canadian WUI communities for wildfires. These are integrated into the new 'Roles and Responsibilities' wildfire management framework presented, with associated dissemination materials, in this report.

2 Background and Context

This section covers important background material related to planning for, and managing of, wildfire events. It begins with an introduction into the overall progression of a wildfire event as it pertains to planning. Following this is a summary of lessons learned about wildfire planning through examination of pertinent case studies of wildfire evacuations from remote Canadian Indigenous communities. The section closes with a discussion of the current shortcomings as revealed by the case studies, in combination with review of existing resources for planning and implementation of wildfire evacuation in vulnerable communities.

2.1 The Stages of A Wildfire Event

A wildfire event can be separated into three main phases which should be considered in the planning process.

'Before the Fire' is the preparation stage. This includes activities undertaken before a wildfire event, largely aimed toward mitigation of damage and impact should an event occur. At this stage, a community must analyze its specific landscape, identify critical infrastructure and cultural sites, and develop a plan to protect these assets from fire damage. General wildfire preparation, protection and maintenance activities can be completed and an overall evacuation plan can be formed. As part of this effort, key events or signals to start both voluntary and mandatory evacuation would be identified. After the plan is created, it should be regularly reviewed and updated.

The start of the 'During the Fire' stage is signified by the presence of a wildfire in close proximity to the community. This can occur when excessive smoke and fire gases impact air quality in a community or alternately when the fire threatens to enter the community in a destructive capacity. During this stage, any planning completed before the fire will be enacted, using pre-established indicators to signal next steps in a response or an evacuation.

The ‘After the Fire’ stage begins with the call to return to the community. This stage includes returning to homes, mitigating immediate health risks such as remnant ash, arranging for repair of downed or damaged infrastructure, distributing financial aid and general community recovery.

2.2 Case Studies and Lived Experiences from First Nations Communities

Studies on the evacuation of several First Nation communities were used to highlight some of the difficulties they faced when a wildfire occurred [7–10]. Taken together, the studies point to many challenges and opportunities for improvement. Among other things, difficulties arose with respect to emergency response preparedness and implementation [5, 9], communication during the event [13], and recovery in the aftermath of the event [8]. With respect to planning in the ‘Before the Fire’ stage, community-specific plans may not always exist and more generic emergency response plans can be found to be insufficient for managing a wildfire event and thus may not provide a beneficial alternative [9]. ‘During the Fire’, even with sufficient time to call for an evacuation, there may limited means of communication to ensure all community members are aware of the need to evacuate [13]. Very justifiably, then, First Nations leadership has expressed concerns over the vulnerability of their communities to wildfires, as their communities often lack the capacity to prepare for and manage such a dangerous event [7]. As background to the present research, several important case studies are discussed in more detail in the following sections.

2.2.1 Sandy Lake, 2011

The first case study involves the 2011 fire experienced by the Sandy Lake First Nation community [7]. Sandy Lake is a community in Northern Ontario which, in 2011, had a population of about 2800. During most of the year, the community is only accessible by plane, and in winter it can briefly be accessed by ice road. In July 2011, lightning storms started wildfires in the vicinity of the community. The community did not have the equipment, personnel, or budget to handle a wildfire emergency. As the wildfires approached (‘Before the Fire’), there was confusion and delay in declaring a state of emergency due to unfamiliarity amongst community leaders regarding wildfire emergency declaration procedures. The lag in the declaration of a state of emergency resulted in a delay in the time needed to organize an air evacuation, which is the only option for a plane-access community. Once evacuation began (‘During the Fire’), families were separated and the rejoining of those families during the evacuation was extremely difficult. Many individuals requiring medication or specific assistive devices were evacuated without their needed medical supplies and there was no clear communication of their requirements in the flight passenger manifests. Furthermore, when they landed in the unfamiliar host community, their host caretaker had not been informed of their medical needs and was unable to access the necessary medication and devices [8]. The familial separation, and lack of communication of medical and other special needs, coupled with the disorganization surrounding the initial call for evacuation, led to significant stress felt by both leaders and community members during the subsequent evacuations. This case

study indicates that much of the stress experienced both before and during the fire arose due to lack of a comprehensive wildfire evacuation plan.

2.2.2 Dene Tha', 2016

A second case study involves the Dene Tha' First Nation of Alberta, located in Taché, who experienced a wildfire in 2016 [9]. Since this Nation did not have air monitoring equipment, members of Taché had to visually monitor progression of the smoke and fire in the 'Before the Fire' phase. This led to uncertainty and delay in recognizing the growing severity of the event. The Nation did have an emergency plan that was provided by the provincial government; however, the plan was generic and was not written to specifically address the needs of the community or its ability to respond to a wildfire event. For example, there were no instructions included as to the roles and responsibilities of various community members during an emergency. As a result, there was no pre-planned method for relaying evacuation orders through the community, so these orders were largely communicated by word of mouth. This, coupled with uncertainty in assessment of the gravity of the wildfire situation, meant that 'During the Fire' the evacuation warning orders were delivered with little time for preparation (in some cases as little as 15 minutes) or for action [9]. Due to the sudden departure, evacuated community members raised concerns about their homes and pets, so the volunteer fire chief and a band employee stayed behind to act as security and tend to the animals. This certainly helped with communication and well-being, since they could share conditions with evacuees; however, these individuals put themselves in a high-risk situation that could have been avoided.

As in the case of Sandy Lake, other issues arose 'During the Fire' due to the incomplete evacuation planning. Because of the number of inhabitants and size of surrounding communities, Taché was evacuated to two communities, High Level and Bushe River, both roughly 75 km away. To alleviate issues with how people should be evacuated and because not all community members had their own means of transportation, the band organized a charter bus. With the short evacuation time frame, however, the community of High Level was not organized for an influx of evacuees so residents were unsure of where to report. Like Sandy Lake, some did not remember their medication and had to go to the hospital to get new medication. Once the few motels in High Level were filled, youth were given tents and sent back to Bushe River. Further confusion arose when residents were accidentally dropped off at High Level and had to be transported back to the Bushe River reception center where they were intended to be. Luckily, potential language barriers were overcome in this case because the band complexes in the host towns were used as reception centers allowing everyone to communicate in their own language [9]. Continuing challenges were also faced by community members as they returned home 'After the Fire'. Many were not made aware of the small benefits they could claim, while others experienced long delays in getting funding even though they had filed the necessary paperwork for reimbursement.

2.2.3 Whitefish Lake, 2011

Issues of poor communication leading to very short time to prepare for evacuation was also documented in the ‘During the Fire’ stage of the 2011 evacuation of Whitefish Lake [10]. Again, evacuation orders were often obtained by word of mouth, although some community members were only informed when the Royal Canadian Mounted Police (RCMP) knocked on their door telling them to leave immediately. Lack of transportation pre-planning ‘Before the Fire’ was again an issue because many band members did not have their own vehicle and ‘During the Fire’ were instead forced to travel with friends or on the school bus issued by the band. Similar to Dene Tha’, questions around what was happening at home and well-being of friends and family became consistent concerns amongst the evacuees [10].

2.2.4 Mishkeegogamang Ojibway Nation, 2011

The Mishkeegogamang Ojibway Nation in northwestern Ontario was evacuated due to wildfire in 2011 as well [13]. Unlike the other communities, ‘Before the Fire’ the Mishkeegogamang Ojibway Nation had developed both communication and transportation plans for a wildfire event. They used radio to communicate messages about events leading up to and during evacuation. ‘During the Fire’ bus evacuation took place over 3 days with the elders, pregnant mothers, babies and those very susceptible on Day 1, families with older children on Day 2 and the remainder of community members willing to evacuate on Day 3. All were transported to Geraldton and Sioux Lookout [13]. Space was still a concern, however, as some of the evacuation centers were overcrowded.

The case studies summarized above clearly reveal that ‘Before the Fire’ wildfire planning and ‘During the Fire’ evacuation management are key in mitigating the challenges and stress experienced by a First Nation community during a wildfire response. Important operational gaps, and thus points of focus, were evident as follows:

‘Before the Fire’:

- there was confusion on when and how to properly determine a state of emergency and thus precipitate the call and request resources for evacuation,
- there was general confusion about what needed to be done and when it should be done, and
- there was confusion about the roles of different individuals and their responsibilities in order to manage specific tasks.

‘During the Fire’:

- there were weaknesses in the methods and channels for communication of important information to community members,
- there were challenges for community members in accessing necessary medical and other special needs,
- there were issues with separation of family members,

- there were issues with transportation from communities to evacuation centers, particularly for communities with limited access, and
- there were issues with comfort, supplies and services at designated community evacuation centres.

‘After the Fire’:

- there were often issues with accessing and justifying resources needed to reimburse individuals and rebuild communities after a wildfire event.

In addition to the above operational concerns, some general shortcomings in existing wildfire documentation, detection technologies, community planning and overall resilience of infrastructure were also identified. These are discussed in turn in the next section.

2.3 General Shortcomings

2.3.1 Available documentation

There are a range of documents, guidelines and tools available to aid in numerous aspects of preparation and planning for potential wildland fire events. From the US, resources to guide and develop wildfire planning include Creating a Community Wildfire Protection Plan [12], Tribal Mitigation Planning Handbook [14], Hazard Mitigation Planning for Tribal Governments [15] and Review Guide [16], among others. From Canada, FireSmart: Protecting Your Community from Wildfire [17] is an in-depth guide to create a more comprehensive plan. Several government entities, such as the Northwest Territories, also host wildfire planning online for their local communities [18]. Very recently, a comprehensive guide for communities and external agencies has been written based on lessons learned from an expanded series of case studies as well [8]. While all of these resources exist, there are few that clearly delineate all of the tasks that need to be done during each of the three stages of a wildfire event. Even fewer connect the tasks with suggestions for how they should be done or, in many cases, even who should be involved and responsible for a given task within a community [19].

2.3.2 Wildfire Detection

Air quality monitoring is of great value in establishing objective criteria and thresholds by which to assess the severity of an evolving wildfire incident at any stage[20]. Distant fires that can become a substantial danger to a community generally result in appreciable increases in the background concentrations of carbon dioxide due to their emissions. In conjunction with this, they can lead to sharply increased amounts of particulate matter both indoors and outdoors [20]. On the other hand, fires in the immediate vicinity of a community, which pose a greater and more immediate threat, will lead to increased atmospheric concentrations of carbon dioxide, carbon monoxide, nitrous oxide and volatile organic compounds, as well as higher levels of particulate matter [21, 22]. When taken together, the trends, along with any sharp increases in the observed peaks of these types of emissions, can be used in all stages of a wildfire event as indicators of the size, proximity, and potential danger that a

fire poses [22]. Unfortunately, many First Nations communities do not have air monitoring equipment. Instead, they rely on visually gauging a fire to assess the threat which in some instances can lead to delay in recognizing and warning of impending danger and/or calling for an evacuation. As a wildfire event unfolds, the time taken for identification of the severity of an event is critical, since once a significant threat is confirmed, there is a process required in calling a state of emergency and acquiring resources to support an evacuation which can lead to even further delays, which impacts community health and safety [8].

2.3.3 Community Wildfire Planning

Community wildfire protection plans (CWPP) are one vehicle by which a community can begin to prepare for a wildfire emergency ‘Before the Fire’. The government of the Northwest Territories, for example, hosts a website for wildfire planning where they provide guidance and resources for development of CWPPs and host CWPP documentation for over 25 communities [18]. In creating a CWPP, key local stakeholders are identified and together they develop a wildfire plan. Based on an analysis of the landscape specific to their community, they develop a list of actions and strategies aimed to mitigate the impacts of wildfire on the structures, infrastructure, cultural sites, and other valued assets in their region. At their basis, CWPPs are intended to present a holistic approach to planning for a wildfire disaster, where continual reviews, revisions and modifications are performed across the community to reduce potential fuel sources, develop structural and infrastructure resiliency, and plan/list actions to implement, all with the overall purpose to protect against a wildfire. At the Canadian level, one of the CWPP development guides is FireSmart: Protecting Your Community from Wildfire by the Canadian Forest Service and Parks Canada [17]. A similar resource is also published as the National Guide for Wildland-Urban Interface Fires [5].

While there are many tools freely available for the development of community wildfire plans, in reality many communities have not developed community specific wildfire protection plans [23]. Some communities may have a generic plan in place, but if not sufficiently specific to that community, they may be of little use in an actual wildfire event [8, 9]. Amongst Canadian Indigenous communities, a 2013 report from the Auditor General of Canada [24] indicated that 506 Indigenous communities had emergency plans, of which 396 were on file¹, and 67 communities did not. Further examination of the plans, however, determined that emergency management plans were often missing coordination with provincial governments. In addition, only 9 of the plans documented full hazards assessments of the community and only 2 contained up-to-date contact information. A recent follow-up report [19] found that much of the allocated emergency management funding² was targeted toward the 600 emergencies and 200 evacuations faced by these same communities over the period 2018-2022. This left little funding or other support with which to develop the plans and preparations necessary to effectively manage emergencies [19]. These factors, coupled with the steady

¹Indigenous communities were not mandated to provide their plans to Aboriginal Affairs and Northern Development Canada (AANDC) at that time

²\$828 million was provided to the First Nation communities by Indigenous Services Canada (ISC) over fiscal years 2018-2021

increase in emergencies and evacuations that are taking place in Indigenous communities [19], underscores even further the dire need for planning for wildfire events.

2.3.4 Resilient Infrastructure

An important consideration in planning and preparation for a wildfire event ‘Before the Fire’ is to consider, and take measures to minimize, the impact of wildfires on community infrastructure ‘During the Fire’. Fire damage can occur due to radiation, direct flame encroachment or flying embers from the wildfire or from burning adjacent infrastructure. Fire spread will also vary depending on the topography of the area, wind conditions and detailed nature of an event. Many considerations are therefore involved in making a community, and the infrastructure within, more resilient to a wildfire event. These may include removal of fuel, design of robust infrastructure, protection of combustible building materials and preservation of supply chains to provide resources and services needed to support emergency response and recovery.

In Canada, the National Research Council of Canada estimated that building structures that satisfy their WUI construction guide would result in a 30:1 benefit-cost ratio (BCR) saving for new homes, 14:1 for retrofitting homes and communities and an overall BCR of 4:1 nationally [25]. This is consistent with the United States, wherein the National Institute of Building Sciences (NIBS) estimates that for every \$1 dollar spent to increase the wildfire fitness of a building design beyond code requirements, an estimated \$4 dollars are returned [26]. While these estimates do not directly transpose to savings on investment for a remote community in Canada, it is possible that for such communities there would be an even greater BCR. This arises due to the methodology used in deriving the original estimates, as well as the high costs of transporting building materials to remote communities, especially those with access by plane only. As such, remote communities could be greatly advantaged by the use of more fire-resistant measures that might also reduce the quantity of restorative material necessary to remediate damage after a wildfire has taken place. Knowledge held by Indigenous peoples related to their own wildland areas should form an essential part of designing and building more fire-resilient communities. In all cases, it is certain that undertaking planning and preparation to improve the resilience of a community to wildfire does translate into significant cost savings in the event of a wildfire. National implementation of such measures could also mitigate against the 17,000 non-fatal injuries that occur and over 2300 lives that are presently lost in wildfires [25].

In summary, the review of current literature, case studies, reports, government wildfire documentation, wildfire guides and other sources, identified some key limitations and gaps that should be addressed in planning and developing effective wildfire management strategies for remote communities. In general, plans are formed in the ‘Before the Fire’ stage to address critical elements in all stages of an event. Further, it is clear that when effective actions are planned for, and implemented ‘Before the Fire’ and in the early stages ‘During the Fire’, this will directly correlate to more positive experiences for community members both ‘During the fire’ and ‘After the fire’ as well.

3 Community Roles

There is a common thread through the case studies discussed in Section 2 that, during a wildfire event, there is often confusion relating to the required actions, the timeline to complete them, and who should take on those actions. This is magnified by gaps in existing informational wildfire materials, which not only lack specificity for a given community but also the definitions of the ‘who’, ‘what’ and ‘when’, for the essential tasks during the wildfire response. Depending on community size and location, the number of people needed and the effort necessary to execute a plan will vary. Regardless, people must still be identified and trained in the ‘who’, ‘what’ and ‘when’ of wildfire preparedness. As a result, it is exceedingly important that a community wildfire plan be developed in advance of an event. To guide the decision-making and management of an event, the plan should include clear definitions of the necessary roles and responsibilities required for its execution. To facilitate this process, a new ‘Roles and Responsibilities’ wildfire management framework, with associated dissemination tools, was designed as a major outcome of this research. As outlined in this section, the framework includes a comprehensive listing of key roles and their respective responsibilities (tasks) sorted according to the three stages (before, during and after) of a wildfire event. The use of the new framework in wildfire planning should aid in the identification of key stakeholders to advise in the development and implementation of a plan within the community, and more crucially, the structure could also be instrumental in preparing a community to prevent, or at least mitigate, the potential for missed actions and their associated consequences, during the wildfire event.

As the basis for the framework, 28 important roles were defined and relevant information and resources were associated with each. Important collaborative efforts between roles were also identified. Following these preliminary steps, the roles were separated into three groups: 4 roles related to emergency responders which might come from either within or outside the community, and then 12 roles that would be fulfilled from internal to the community and 12 from external to the community. The roles and role descriptions within each of these categories are summarized in Tables 1 through 3.

Table 1: Emergency Responders

Role	Description
Local Fire Department	Fire Department in region
Wildland Firefighters	Wildland Firefighters in region
Ambulance	Ambulance service in region
Police	Police service in region
External Emergency Responders	Externally Based Emergency Responders

Table 2: Internal community roles

Role	Description
Residents	All residents in the community
Local Leader	Leader of the community
Environmental Advisor	Caretaker of environmental needs and challenges
Health Advisor	Caretaker of health and well-being of the residents
Agriculture Advisor	Caretaker of Agricultural needs and challenges
Transportation Advisor	Caretaker of Transportation needs and challenges
Internal Emergency Responders	Community-based emergency responders
Emergency Coordinator	Responsible for preparation, upkeep, and use of the emergency plan Coordinates evacuation, and manages response efforts
Emergency Communications	Prepares and facilitates emergency communications, disseminates information, and assists in emergency situations
Emergency Operations Liaison	Coordinates emergency contacts, financial planning, resource allocation, and community recovery support
Emergency Operations Centre	Includes the Emergency Coordinator, Communications, and Operation Liaison
Outreach and Information Officer	Responsible for community awareness and outreach efforts

Table 3: Roles external to the community

Role	Description
Utility / Public Works	Relevant Utility or public works
Transport Ministry	Governmental transport authority
Host Communities/Evacuation Centres	Nearby communities with the means to support evacuation
Evacuation Centre Coordinator	Responsible for preparation, upkeep, and use of the hosting plan Coordinates reception, and manages hosting effort
Evacuation Centre Communications	Prepares and facilitates communications and information dissemination within the host community
Evacuation Centre Liaison	Coordinates host community contacts, financial planning, resource allocation, and hosting support
External Emergency Operations Liaison	Main point of contact with external and government agencies
Media	Communicate accurate and helpful information to residents, evacuees and host communities
Local Volunteer Organization	Fulfill roles as needed
Indigenous Services Canada	Funds and supports efforts related to fire safety

A series of 31 Tables were then developed to further outline each of the roles in more detail. Each role, designated as 'Lead Role' in each table was then connected to a list of 'Supporting Roles' as well as the associated responsibilities during each of the three stages of a wildfire event. The full set of Tables is listed in the indexing table, Table 4. For ease of use, and as shown in the second column of indexing table, Table 4, the detailed 'Roles and Responsibilities' Tables are sorted by specific key functions that need to be fulfilled in each stage of planning and management of a wildfire event (before, during and after the fire). Columns 3 and 4 of Table 4 then provide the name and number for each specific table related to each key function as well.

Table 4: Indexing Table for all other Tables

Timeline	Subcategory	Table Name	Table Number
Before Fire	Emergency Planning	Host Community Plan	Table 5
Before Fire	Emergency Planning	Communication Plan	Table 6
Before Fire	Emergency Planning	Evacuation Plan	Table 7
Before Fire	Emergency Planning	Financial Plan	Table 8
Before Fire	Emergency Preparedness	Checklists and Handouts	Table 9
Before Fire	Emergency Preparedness	Emergency Responder Preparedness	Table 10
Before Fire	Emergency Preparedness	Community Preparation	Table 11
Before Fire	Emergency Preparedness	Evacuation Centres	Table 12
Before Fire	Outreach	Fire Safety Outreach	Table 13
During Fire	Incident Identification	Incident identification	Table 14
During Fire	Decision to Evacuate	Decision to Evacuate	Table 15
During Fire	Communications	Accuracy	Table 16
During Fire	Communications	Internal Communications	Table 17
During Fire	Communications	External Communications	Table 18
During Fire	Preparation	Preparing Homes	Table 19
During Fire	Preparation	Emergency Services	Table 20
During Fire	Evacuation	Pre-Evacuation	Table 21
During Fire	Evacuation	Evacuation	Table 22
During Fire	Evacuation	Resource and Financial	Table 23
During Fire	Evacuation	Special Considerations	Table 24
During Fire	Host Communities	Pre-Reception	Table 25
During Fire	Host Communities	Reception	Table 26
During Fire	Host Communities	Hosting	Table 27
During Fire	Emergency Response and Maintaining Community (During Fire)	Emergency Operations Centre	Table 28
During Fire	Emergency Response and Maintaining Community (During Fire)	Emergency Responders	Table 29
During Fire	Emergency Response and Maintaining Community (During Fire)	Advisors and Volunteers	Table 30
During Fire	Emergency Response and Maintaining Community (During Fire)	External Organizations	Table 31
After Fire	Emergency Response and Maintaining Community (After Fire)	Pre-Return	Table 32
After Fire	Emergency Response and Maintaining Community (After Fire)	Repatriation	Table 33
After Fire	Emergency Response and Maintaining Community (After Fire)	Celebrate and Acknowledge	Table 34
After Fire	Financial and Resources	Resources and Financial Supports	Table 35
After Fire	Rebuild and Recover	Rebuild and Recover	Table 36

3.1 Before the Fire

Ten of the tables outline lead roles, supporting roles and tasks that should be considered, and if possible, put in place before a wildfire event. These are further categorized into roles and tasks related to Emergency Planning, Emergency Preparedness, and Outreach.

3.1.1 Emergency Planning

Five tables are included in the Emergency Planning category. These include specific plans for setting up a Host Community (Table 5), Communication (Table 6) and overall Evacuation (Table 7), as well as making a Financial Plan (Table 8).

Table 5: Host Community Plan Responsibilities

Host Community Plan		
Lead Role	Supporting Role(s)	Task
Emergency Coordinator	Local Leader, Health & Transportation Advisors	Maintain list of viable host communities
Emergency Coordinator	Local Leader, Host Communities	Create plan for emergency hosting with Host Communities
Evacuation Centre Liaison	Local Leader	Develop/maintain list of internal liaisons for evacuee well-being during evacuation
Local Leader	Residents, Emergency Coordinator, Health & Transportation Advisors, Host Community	Ensure needs can be met by potential host communities

Table 6: Communication Plan Responsibilities

Communication Plan		
Lead Role	Supporting Role(s)	Task
Local Leader	Emergency Communications	Develop contact line for Residents during emergency
Emergency Communications	Emergency Coordinator, Local Leader	Develop plan (with channels) for communication during evacuation, add to Emergency Plan
Emergency Coordinator	Emergency Responders	Share alternative evacuation plans with Emergency Responders
Emergency Communications	Emergency Operations Liaison, Local Leader	Establish communication with external organizations
Emergency Operations Liaison	Emergency Coordinator, External Emergency Operations Liaison	Develop/update External Organization/Government Agency Liaison contact list

Table 7: Evacuation Plan Responsibilities

Evacuation Plan		
Lead Role	Supporting Role(s)	Task
Emergency Coordinator	Everyone	Develop Emergency Plan with stakeholders and evacuation communication protocol
Environmental Advisor	Emergency Coordinator, Local Leader, Health Advisor	Establish wildfire checkpoints to trigger evacuation with Internal Emergency Responders
Emergency Operations Liaison	Emergency Coordinator, Local Leader	Maintain/Update evacuation plan, list of host communities, alternative evacuation plans
Emergency Operations Liaison	Emergency Coordinator, Local Leader	Identify essential people to remain during emergency
Health Advisor	Local Leader, Emergency Coordinator	Develop/maintain list of priority evacuees and caretakers, communicate list regularly including to External Agencies
Health Advisor		Maintain/update list of medical treatment needs for each priority evacuee
Health Advisor	Ambulance	Circulate updated list of high-risk evacuees with needs to local Ambulance Stations
Transportation Advisor	Emergency Communications, Outreach and Information Officer	Develop/communicate transportation plan for community evacuation
Transportation Advisor	Transport Ministry	Develop evacuation routes and plan
Transportation Advisor	Health Advisor, Emergency Coordinator	Account for needs of high priority evacuees and caretakers in transportation plan
Transportation Advisor	Health Advisor, Emergency Coordinator	Establish priority evacuation plan for high risk populations and caretakers
Local Leader	Residents	Ensure Residents have appropriate evacuation plans
Emergency Coordinator		File alternative evacuation plans for Residents
Transportation Advisor	Emergency Coordinator	Check individual alternative evacuation plans for adequate transportation
Internal Emergency Responders		Review evacuation plan
Transportation Advisor	Transport Ministry	Arrange transport/minimize potential transportation delays in evacuation (if necessary)
Emergency Coordinator	Advisors	Continually update Emergency Plan with Advisors
Emergency Coordinator	Emergency Operations Liaison	Maintain/update Emergency Plan

Table 8: Financial Plan Responsibilities

Financial Plan		
Lead Role	Supporting Role(s)	Task
Emergency Operations Liaison	Local Leader, Emergency Coordinator	Develop emergency financial plan including local businesses, host communities and Indigenous Services Canada
Emergency Operations Liaison	Local Leader, Emergency Coordinator, Advisors	Account for Advisor tasks in Emergency and financial plans
Indigenous Services Canada		Ensure eligibility criteria are clear and well communicated
Emergency Operations Liaison	Local Leader	Register with assistance programs from external organizations
Emergency Operations Liaison	Local Leader	Investigate funding for essential emergency personnel

3.1.2 Emergency Preparedness

Four more tables include roles and tasks related to Emergency Preparedness. Important checklists and handouts are itemized in the Checklists and Handouts table (Table 9). These should be made and disseminated before the fire. Pre-fire emergency responder preparedness tasks are listed in Table 10, while other elements of community preparedness to put in place before the fire are contained in Table 11. Pre-planning related to potential relocation in the event of an evacuation is in Table 12 (Evacuation Centers).

Table 9: Creation of Checklists and Handouts

Checklists and Handouts		
Lead Role	Supporting Role(s)	Task
Emergency Operations Liaison	Residents	Develop/distribute emergency financial checklist
Outreach and Information Officer	Emergency Coordinator, Emergency Operations Liaison	Create and distribute an evacuation preparation and belongings checklist
Local Leader, Emergency Coordinator, Advisors	Emergency Responders	Provide Residents with simplified evacuation overview and plans
Outreach and Information Officer	Health Advisor	Create emergency supply kit checklist, encourage and help Residents make kits

Table 10: Emergency Responder Preparation Responsibilities

Emergency Responder Preparedness		
Lead Role(s)	Supporting Role(s)	Task
Ambulance	Health Advisor, Emergency Coordinator	Obtain/maintain list of high risk evacuees that require ambulance, special medical needs
Local Fire Department	Emergency Coordinator	Create/add Fire Suppression Checklist to Emergency Plan
Local Fire Department	Local Leader, Outreach and Information Officer	Learn/develop/assist in WUI fire safety training and drills
Local Fire Department	Wildland Firefighters, External Emergency Responders	Assess needs and roles for internal/external fire services and wildland firefighters
Internal Emergency Responders	Local Leader, Wildland Firefighters	Establish access plan for properties and roadways
Wildland Firefighters	Local Fire Department	Determine roles for fire suppression

Table 11: Community Preparation Responsibilities

Community Preparation		
Lead Role	Supporting Role(s)	Task
Outreach and Information Officer	Environment Advisor, Agriculture Advisor, Emergency Responders	Assess structures and assets in WUI for fire resilience
Environmental Advisor	Residents	Evaluate community, create WUI fire priority zones and management protocols
Environmental Advisor	Residents, Emergency Responders	Help plan/organize installation of fire/fuel breaks
Environmental Advisor	Utilities/Public Works	Monitor and clear areas near power lines
Agriculture Advisor	Residents	Assess agricultural assets and plan approach for preservation in fire
Transportation Advisor	Transport Ministry	Obtain reflective, non combustible signs for the roadways
Transportation Advisor	Transport Ministry	Manage roadways/plan access for fire crews/vehicles
Residents	Emergency Coordinator, Transportation & Health Advisors	File individual alternative evacuation plans if applicable
Residents	Outreach and Information Officer	Prepare emergency supply kit according to checklist
Residents		Have firefighting tools (shovel or garden water hose) ready
Residents		Keep firefighting tools propped against house and visible

Table 12: Evacuation Centre Responsibilities

Evacuation Centres		
Lead Role	Supporting Role(s)	Task
Evacuation Centre Coordinator	Local Leader, Emergency Coordinator	Develop emergency hosting plan
Evacuation Centre Coordinator	Local Leader, Emergency Coordinator, Evacuation Centre Communications & Liaison	Plan with community to meet evacuation needs
Evacuation Centre Coordinator	Health Advisor	Obtain/maintain list of high risk evacuees and caretakers
Evacuation Centre Coordinator	Emergency Operations Liaison	Understand emergency financial plan
Evacuation Centre Coordinator		Discuss sensitive issues (family, cultural, stress, fear) with staff and volunteers
Evacuation Centre Coordinator	Local Leader, Emergency Coordinator	Develop reporting system (security, insensitivity, needs)
Evacuation Centre Communications	Emergency Communications	Obtain community communication plan and protocols
Evacuation Centre Liaison	Emergency Operations Liaison	Obtain updated Internal liaison list
Evacuation Centre Liaison		Develop/maintain relationships with external organizations for support, relief, supplies

3.1.3 Outreach

Finally, outreach activities are also critical ‘Before the Fire’ (Table 13).

Table 13: Outreach Responsibilities

Wildfire Safety Outreach		
Lead Role	Supporting Role(s)	Task
Outreach and Information Officer	Emergency Responders, Residents	Organize wildfire safety outreach education for community
Outreach and Information Officer	Local Leader, Emergency Coordinator, Advisors	Coordinate evacuation drills, WUI fire educational programs for community with Emergency Responders
Emergency Operations	Outreach and Information Officer	Help secure funding, resources for WUI fire safety and prevention education with Emergency Responders

3.2 During the Fire

The next 18 tables summarize roles and tasks that relate to functions that should be undertaken during a wildfire event. Many of these are extremely important, particularly when an evacuation is deemed necessary.

3.2.1 Incident Identification and Decision to Evacuate

The roles and tasks relating to the early stages of wildfire identification and assessment are listed in Table 14, while those related to the decision to evacuate are in Table 15.

Table 14: Incident Identification Responsibilities

Incident Identification		
Lead Role	Supporting Role(s)	Task
Residents	Emergency Coordinator and Local Leader	Report fires to Emergency Coordinator and Local Leader
Local Leader	Emergency Coordinator & Communications, Emergency Operations Liaison	Setup Emergency Operations Centre
Emergency Operations Centre	Local Leader, Health/Environment Advisors	Determine nature and scope of the incident

Table 15: Evacuation Decision Responsibilities

Decision to Evacuate		
Lead Role	Supporting Role(s)	Task
Local Leader	Emergency Management Duty Officer (PEOC), Emergency Coordinator & Communications	Declare state of emergency and notify PEOC
Emergency Operations Liaison	Local Leader, Provincial or Territorial Government, Indigenous Services Canada	Time permitting, work with relevant parties to determine evacuation decision
Local Leader	Emergency Coordinator, Emergency Operations Liaison	Inform relevant parties/determine evacuation decision with Provincial/Territorial government, Indigenous Services Canada

3.2.2 Communications

The next three tables are related to different aspects of communication during an event, including the importance of accuracy in communication (Table 16), followed by avenues of internal communication (Table 17) and communications with external agencies (Table 18).

Table 16: Information Accuracy Responsibilities

Accuracy		
Lead Role	Supporting Role(s)	Task
Media	Emergency Communications, Local Leader	Communicate accurate and helpful information to residents, evacuees and host communities
Emergency Communications	Local Leader, Media	Screen/modify media messaging for accuracy/appropriateness
Outreach and Information Officer	Local Leader, Emergency Coordinator & Communications	Have informational materials approved by Local Leader, Emergency Operations
Outreach and Information Officer	Local Leader, Emergency Communications	Redirect or respond to inquires accurately and promptly

Table 17: Internal Communication Responsibilities

Communication with Internal Persons		
Lead Role	Supporting Role(s)	Task
Emergency Communications	Residents	Communicate fire progression to Residents; Implement communication plan
Residents		Share emergency updates with friends and family
Local Leader	Emergency Communications, Media	Regularly communicate incident status, monitor releases
Emergency Communications	Local Leader	Provide real-time communication for Residents about the fire location, extent and wildfire direction of travel through media, radio, website, social media
Local Leader	Emergency Communications	Communicate evacuation pending (as much warning as possible) and type of evacuation
Local Leader	Emergency Communications, Residents	Give evacuation order (as much warning as possible) Communicate timeline and how residents can prepare
Emergency Operations Centre	Local Leader, Emergency Communications, Coordinator & Operations Liaison	Communicate relevant information to respective parties

Table 18: External Communications Responsibilities

External Communications		
Lead Role	Supporting Role(s)	Task
Emergency Communications	Evacuation Centre Communications	Create communication plan with Evacuation Centre Communications
Emergency Communications	Provincial emergency management agencies, Government, Emergency Responders	Communicate with all agencies and disseminate information Communicate with local businesses and neighbouring communities
Emergency Communications	Emergency Responders	Help establish perimeters, help move people to safety
Emergency Communications	Emergency Responders, Local Leader, Government	Inform/communicate progress of evolving situation
Local Leader	Emergency Communications	Utilize Emergency Communications to contact necessary services, and other relevant groups
Health Advisor	Evacuation Centre	Communicate special medical requirements of evacuees to Evacuation Centres
Emergency Operations Liaison	Emergency Responders	Contact mutual aid partners, report status, request resources
Emergency Operations Liaison	Emergency Communications, External Emergency Operations Liaison	Coordinate flow of information between Emergency Operations Centre, External Organizations
Emergency Operations Liaison	External Emergency Operations Liaison	Request external resources as needed
Emergency Coordinator	Emergency Responders	Ensure individual alternative evacuation plans are known and respected by all

3.2.3 Evacuation Preparation

As the need for evacuation becomes imminent, several steps for preparation of homes and buildings for evacuation are outlined in Table 19 and for emergency services in Table 20.

Table 19: Preparing Homes Responsibilities

Preparing Homes	
Lead Role	Task
Residents	Load valuables and prepare vehicle for quick departure
Residents	Turn off propane/natural gas valves
Residents	Fill sinks, tubs, and buckets with water, gather towels
Residents	Close windows/doors, move combustibles away
Residents	Cover openings/door gaps with towels/fire-resistant materials

Table 20: Emergency Services Preparation Responsibilities

Emergency Services		
Lead Role(s)	Supporting Role(s)	Task
Emergency Responders		Establish and maintain a secure incident perimeter
Local Fire Department, Wildland Firefighters	Local Leader, Emergency Coordinator, Emergency Communications, Emergency Operations Liaison	Define nature/scope of incident, assemble structural/wildfire suppression crews

3.2.4 Evacuation

As the evacuation begins, steps for immediately before and during evacuation are in Tables 21 and 22. Due to the importance of resource and financial protocols, as well as the numerous special considerations that are important during an evacuation, tasks and functions related to these are in Resource and Financial Table 23 and Special Considerations Table 24, respectively.

Table 21: Pre-Evacuation Responsibilities

Pre-Evacuation		
Lead Role	Supporting Role(s)	Task
Residents	Emergency Operations Centre, Emergency Coordinator	Register for evacuation at Emergency Operations Centre
Emergency Co-ordinator	Emergency Operations Liaison	Register and track evacuees, share information with Emergency Operations Liaison
Residents	Emergency Coordinator	Request needed resources from Emergency Co-ordinator
Transportation Advisor	Transport Ministry	Secure necessary external vehicles for evacuation
Transportation Advisor	Health Advisor, Emergency Services	Coordinate evacuation through private vehicle, bus or air transportation

Table 22: Evacuation Responsibilities

Evacuation		
Lead Role	Supporting Role(s)	Task
Residents	Local Leader, Emergency Communications, Local/External Emergency Responders	Evacuate according to instructions
Transportation Advisor	Emergency Coordinator, Emergency services, Health advisor, Local Leader	Organize transport during evacuation
Transportation Advisor	Local Leader, Emergency Coordinator, Emergency Communications, Emergency Operations Liaison	Communicate/support individual alternative evacuation plans
Transportation Advisor	Emergency Responders	Manage traffic, detours and crowds
Internal Emergency Responders	Emergency Coordinator	Support individual alternative evacuation plans

Table 23: Resource and Financial Responsibilities

Resources and Financial		
Lead Role	Supporting Role(s)	Task
Emergency Operations Centre	Emergency Communications, Coordinator & Operations Liaison	Co-ordinate resource allocation
Emergency Operations Liaison	Local leader, Residents	Track expenses of anything paid by the band
Emergency Operations Liaison	Residents	Remind Residents of receipt/reimbursement requirements
Residents	Emergency Operations Liaison	Keep receipts for evacuation expenses
Emergency Operations Centre	Emergency Communications, Coordinator & Operations Liaison	Track information for reimbursement of response and evacuation costs

Table 24: Special Considerations

Special Considerations		
Lead Role	Supporting Role(s)	Task
Health Advisor		Oversee evacuation of high risk evacuees with caretakers
Ambulance	Health Advisor	Assist in evacuation of high risk or injured people
Health Advisor	Ambulance	Monitor medication needs and status of evacuees, arrange medication access at host sites
Health Advisor	Ambulance	Oversee sustained medical attention through evacuation as needed
Agriculture Advisor	Residents	Assist with evacuation and care of livestock (or slaughter and disposal of injured livestock)

3.2.5 Host Communities

Considerations related to the host communities for the evacuees are also extremely important during a wildfire evacuation. The three main functions within a host community are summarized in terms of tasks during pre-reception, reception and hosting phases in Tables 25, 26, and 27 respectively.

Table 25: Pre-Reception Responsibilities

Pre-Reception	
Lead Role	Task
Evacuation Centre Coordinator	Activate reception centre and communication channels
Evacuation Centre Liaison	Obtain support from external organizations

Table 26: Reception Responsibilities

Reception		
Lead Role	Supporting Role(s)	Task
Evacuation Centre Coordinator	Emergency Coordinator & Operations Liaison	Register and track evacuees arriving
Evacuation Centre Coordinator	Health Advisor	Prioritize high risk evacuees and caretakers when accommodations limited
Health Advisor	Evacuation Centres, Emergency Responders	Oversee that health care concerns of evacuees receive attention
Evacuation Centre Coordinator	Evacuation Centre Communications	Inform evacuees of systems, procedures and options at host community
Evacuation Centre Coordinator	Evacuation Centre Communications	Inform evacuees of reporting system (security, insensitivity, needs)

Table 27: Hosting Responsibilities

Hosting		
Lead Role	Supporting Role(s)	Task
Host Community, Evacuation Centre	Local Leader, Emergency Operations Liaison	Understand emergency hosting plan, provide for evacuees and special needs
Evacuation Centre Coordinator		Provide resources in the hosting plan
Evacuation Centre Liaison		Liaise with external organizations for necessary supplies, resources
Evacuation Centre Coordinator	Evacuation Centre Liaison	Organize culturally appropriate activities
Evacuation Centre Coordinator		Have flexible meal times, have food and beverages outside of meal times
Evacuation Centre Liaison	Emergency Operations Liaison	Recruit Internal Liaisons from amongst evacuees
Evacuation Centre Communications	Emergency Communications	Distribute reliable information to evacuees on emergency status
Evacuation Centre Liaison	Health Advisor	Provide assistance to evacuees to adjust to life outside home/in a larger community
Evacuation Centre Coordinator	Emergency Operations Liaison	Assist in record keeping and financial receipts
Evacuation Centre Coordinator	Evacuation Centre Liaison	Develop safe, secure and comfortable environment for evacuees, address concerns
Host Community, Evacuation Centre		Provide evacuees with communication devices, phone chargers

3.2.6 Emergency Response and Maintaining Community During the Fire

At the same time as evacuation is taking place, emergency response must also be managed. Key functions are outlined in terms of emergency operations and emergency response in tables focused around Emergency Operations Center (Table 28) and coordination of emergency responders (Table 29). As events progress, as well, various Advisors and Volunteers have key roles to fulfill in decision-making and support (Table 30). Finally, there are a number of external organizations that must be engaged as outlined in Table 31.

Table 28: Emergency Operations Centre Responsibilities

Emergency Operations Centre		
Lead Role	Supporting Role(s)	Task
Emergency Operations Centre	Emergency Communications, Emergency Coordinator, Emergency Operations Liaison	Includes Emergency Communications, Emergency Coordinator, Emergency Operations Liaison
Emergency Operations Centre	Emergency Communications, Emergency Coordinator, Emergency Operations Liaison	Activate financial plan
Local Leader	Any	Assess/ monitor public safety and property protection
Emergency Operations Liaison	Emergency Coordinator	Coordinate/monitor response for safety and effectiveness
Emergency Communications	Evacuation Centre Communications	Maintain contact with evacuation site(s)
Emergency Communications	Evacuation Centre Communications	Maintain contact with evacuation reception centers
Emergency Coordinator	Emergency Center	Direct emergency operation (may be decision maker or facilitator)
Emergency Operations Centre	Emergency Communications, Emergency Coordinator, Emergency Operations Liaison	Co-ordinate evacuation and suppression efforts
Emergency Coordinator		Help request and distribute resources as needed
Emergency Coordinator	Local Leader	Manage on-site response efforts, decisions, establish mutual priorities for resource allocation
Emergency Operations Liaison	Transportation Advisor, Emergency Coordinator	Coordinate transfer of resources to the emergency site(s)
Emergency Coordinator	Local Leader	Co-ordinate resource allocation to off-site needs
Emergency Coordinator	Emergency Operations Liaison	Assess evolving resource requirements Involve provincial/federal/external resources as needed

Table 29: Emergency Responders Responsibilities

Emergency Responders		
Lead Role(s)	Supporting Role(s)	Task
Emergency Responders		Protect life and property within jurisdiction
Wildland Firefighters		Create defensive breaks in wildfire scenario
Wildland Firefighters	Government	Protect forest and range resources on public lands within their jurisdiction
Internal Emergency Responders		Fire suppression as appropriate
All Emergency Responders	Local Leader, Emergency Coordinator, Communications & Operations Liaison	Update incident progress
Environmental Advisor	Emergency Responders	Coordinate/monitor environmental aspects of incident response for safety and effectiveness
Local Fire Department	Wildland Firefighters, External Emergency Responders	Assist Wildland Firefighters, External Emergency Responders

Table 30: Advisor and Volunteer Responsibilities

Advisors and Volunteers		
Lead Role(s)	Supporting Role(s)	Task
Health Advisor	All	Address incident specific health concerns (evacuees, responders, leaders)
Agriculture Advisor		Assess/develop plan for mitigation of fire impact on Agricultural Resources
Local Volunteer Organization		Local volunteers fulfill roles as needed

Table 31: External Organizations Responsibilities

External Organizations		
Lead Role(s)	Supporting Role(s)	Task
External Emergency Operations Liaison	Government	Fulfill mandated agency responsibilities
External Emergency Operations Liaison	Local Leader, Emergency Communications & Operations Liaison	Work with community representatives, strive for transparency in decisions
External Emergency Operations Liaison	Emergency Operations Liaison	Provide external perspective/input on situation
External Emergency Operations Liaison		Provide/arrange specialized leasing, purchasing, or borrowing of emergency products or services
External Emergency Operations Liaison	Local Leader, Emergency Coordinator & Operations Liaison	Assess evolving resource requirements, access provincial or federal resources
External Emergency Operations Liaison	Emergency Operations Liaison	Request information from Emergency Operations Centre as needed
External Emergency Operations Liaison	Emergency Operations Liaison	Assist with requests for support, materials and supplies beyond capacity of the municipality
External Emergency Operations Liaison		Contact external partners with status updates, resource requests

3.3 After the Fire

The last four tables contain important tasks conducted after a wildfire.

3.3.1 Emergency Response and Maintaining Community After the fire

Preparations begin for evacuees to return home (Table 32) as the wildfire event subsides. Additional actions are also necessary including repatriation with the community (Table 33), celebrating the return and acknowledging the fears and losses that have been incurred, as well as the community members, volunteers, emergency responders and others who led and supported the community through their wildfire ordeal (Table 34).

Table 32: Pre-return Responsibilities

Pre-Return		
Lead Role(s)	Supporting Role(s)	Task
Local Leader	Emergency Coordinator & Communications, Advisors	Decide, order, communicate return home
Emergency Communications	Emergency Coordinator, Local Leader	Distribute return home messages to evacuees and host communities
Evacuation Centre Coordinator		Connect evacuees to their belongings
Evacuation Centre Coordinator	Emergency Coordinator	Aid in return home of evacuees, family and belongings
Evacuation Centre Coordinator		Unite families for travel when possible
Evacuation Centre Coordinator	Health Advisor, Transportation Advisor	Guide high risk populations and caretakers to board correct transportation

Table 33: Repatriation Responsibilities

Repatriation		
Lead Role(s)	Supporting Role(s)	Task
Emergency Operations Centre	Emergency Communications, Coordinator & Operations Liaison	Co-ordinate return home
Transportation Advisor	Emergency Coordinator, Health Advisor, Local Leader	Organize transport for return home
Emergency Operations Liaison	Residents	Coordinate external resources necessary for the return home
Internal Emergency Responders	Transportation Advisor	Assist in return home
Ambulance	Health Advisor	Assist in repatriation of high risk or injured people
Local Volunteer Organization		Local volunteers fulfill roles as needed

Table 34: Celebrate and Acknowledge Efforts

Celebrate and Acknowledge		
Lead Role(s)	Supporting Role(s)	Task
Local Leader	All	Embrace return home, take stock, acknowledge fears, loss
Local Leader		Recognize essential staff for their efforts
Health Advisor	Emergency Operations, Outreach and Information Officer	Arrange/communicate counselling and healthcare resources for Residents

3.3.2 Resources and Financial Supports

Necessary to recovery are resources and financial supports as outlined in Table 35.

Table 35: Resources and Financial Supports

Resources and Financial Supports		
Lead Role(s)	Supporting Role(s)	Task
Emergency Operations Liaison	Emergency Communications, Local Leader	Communicate financial support and available resources for reimbursement, recovery
Residents	Emergency Operations Liaison	Request reimbursement for evacuation costs
Emergency Operations	Local Leader	File/request reimbursement for evacuation expenses
Agriculture Advisor	Emergency Operations Liaison	Account for agricultural losses in reimbursement process
Health Advisor	Local Leader, Emergency Operations Liaison	Account for medical and counselling needs in the reimbursement process
Emergency Operations Liaison	Transportation, Environment, Health Advisor, Residents	Collect information from Residents and Advisors for reimbursement
Evacuation Centre Coordinator	Emergency Operations Liaison	Compile records and accounts for reimbursement
Emergency Operations Centre	Local Leader, Emergency Operations Liaison	Manage reimbursement process and reports needed with local/Provincial/Federal government officials
Emergency Operations	Local Leader	Oversee reporting and delivery to Indigenous Services Canada
Emergency Operations	Health Advisor, Local Leader	Establish funding mechanisms for immediate, long term community medical and counselling
Emergency Operations Liaison	Emergency Coordinator, Health Advisor	Establish funding for immediate and long term community social and financial support
Indigenous Services Canada		Fund and support for efforts related to fire safety

3.3.3 Rebuild and Recover

The final step is beginning the journey of recovering and rebuilding the community as outlined in Table 36.

Table 36: Rebuild and Recover

Rebuild and Recover		
Lead Role(s)	Supporting Role(s)	Task
Local Leader	Emergency Communications & Coordinator	Listen to Resident experiences, work to improve future emergency plans
Evacuation Centre Communications	Local Leader, Emergency Coordinator, Evacuation Centre Coordinator & Liaison	Listen to resident/community experiences, work to improve hosting plan for the future
Environmental Advisor	Residents, Emergency Responders	Monitor environmental impact during and after fire
Police		Protect community from looting
Local Fire Department, Police		Conduct necessary investigations, safeguard evidence
Internal Emergency Responders	All	Assist in rebuilding community
Utility / Public Works		Assess and re-establish damaged infrastructure
Transport Ministry		Maintain, repair, expedite reopening of transport infrastructure to community
Transport Ministry		Secure external transportation corridors affected by the incident

Preliminary review of existing resources identified many that would aid in providing supplemental information and example document templates relating to tasks and roles defined in these tables. Thus a search was done for materials specific to each task. Results are discussed in the next section.

4 Resources

4.1 Informational and Outreach Material

Over 77 resources, including documents, guidelines and tools, were identified as background materials in the conduct of the present research. Some, such as poster materials from the National Fire Protection Association (NFPA) and Federal Emergency Management Agency (FEMA) in the United States provide excellent imagery and advice for discrete elements of wildfire planning, such as preparation of homes and properties in case of wildfire [27, 28]. Other materials focus on more general concepts of wildfire planning and management [8, 12]. There are very few documents, however, that clearly connect what needs to be done, with when it should be done and who should be responsible [24]. This gap led to the overall Roles and Responsibility framework adopted here.

This section focuses on the resources applicable as support materials for those undertaking roles and tasks outlined in Section 3. In compiling resources for this purpose, priority was given to resources and experiences from Indigenous communities, followed by more general documentation for small or remote communities³. Many of the listed resources contain excellent information to aid in planning for WUI emergency situations. Thus, they form a library of materials that can be accessed for extending knowledge and understanding related to many of the roles and their responsibilities, or alternately to find pre-made materials for use in planning, education and management of wildfire events.

For ease of navigating the information, the resources are sorted into five main categories:

- Outreach Materials
- Evacuation Procedures
- Technical Documentation
- Active Wildfire/Smoke Maps
- Related Research and Case Studies

They were then ranked for their potential utility, from sources containing information of use across multiple roles to those that may be least used. The 14 sources applicable to the maximum number of roles are listed, each with a brief summary, in Table 37⁴.

This database of resources creates a large informational database complementary with the tables from Section 3, and increasing the span of information compiled as part of the overall framework.

³The list included here is not exhaustive nor will it remain up-to-date as our knowledge of WUI preparation, control and evacuation grows. Instead, to remain effective, the list should be regularly maintained and improved.

⁴It is recommended that individual community members and others assuming key roles in WUI fire events should be familiar with at least some of these supplementary materials relating to their roles and responsibilities.

Table 37: Most Utilized Informational Materials

Resource	Description
FNESS Wildfire Resources (2022) [29]	A summary of a significant number of other resources, separated into categories of Before, During and After the fire
Indigenous communities emergency operations (British Columbia Government) [30]	Guides and templates related to many parts of wildfire events
First Nations Wildfire Evacuations (Tara McGee) [8]	A comprehensive book with a focus on experiences and advice for evacuation specific to Indigenous communities
Emergency Water Supplies and Treatment (Colorado State University) [31]	A fact sheet and guide for preparing emergency safe drinking water
AirNow Smoke and AirQuality Map, Firesmoke Map [32]	Fire, smoke, and/or air quality maps
First Nations Health Authority [33]	Resources related to health concerns in relation to wildfire events, including a guide for returning to homes after a wildfire
Household Preparedness Guide (British Columbia Government)	An extensive guide with a focus on material for residents, but is applicable beyond
Get Prepared Canada [34]	A Wide range of information sorted into before, during and after the fire
FireSmart Canada: Protecting Your Community from Wildfire [17]	An extensive guide and comprehensive approach for community WUI fire planning and preparedness
FireSmart Canada Wildfire Evacuation Checklist [27]	Evacuation checklist example
FireSmart Canada Resources Webpage [35]	Information videos, checklists, outreach material
FEMA Wildfire Evacuation Outreach Materials [28]	A collection of premade outreach materials and examples, as well as information sorted into before, during and after the fire, and some related publications

5 Information Dissemination

A large volume of information is contained in the tables and resources in Sections 3 and 4, thus raising the issue of how best and most effectively to disseminate the information. For this, four different, but complementary, sets of materials were developed: sortable spreadsheets, an interactive web app, informational slide decks and brochures.

The spreadsheets are designed to summarize all of the information related to the roles and responsibilities in a series of columns. The first spreadsheet contains listings of all roles and their associated tasks. In this, each role is listed and every task for that role is entered on an individual row. A given row contains the following information, reading columns from left to right, shown in Table 38.

The second spreadsheet contains a list of 77 different outreach materials that formed the background of the present research. Each row contains the title of one of the listed sources. To the right are 15 columns, three containing the timelines, and 12 containing the titles of the key roles in WUI preparation and response. The ‘Yes’ or ‘No’ answer in each cell indicates whether the resource is relevant to a person fulfilling the given role. This enables a user to quickly determine which additional resources would be useful to a person filling the role.

Both spreadsheets are structured to enable a user to filter the information for multiple specific purposes. Ideally, this aids in finding targeted information for any one or a series of roles or time frames relating to a fire, as well as managing/updating listed tasks, roles and outreach databases.

The web app, slide decks and brochures are designed to function as a package, where the slides and brochures form accompanying, offline material for the web app. The web app, described in more technical detail in Appendix 6, compiles all tasks and roles in the spreadsheets into a user-interactive experience. Through the app, a user can select a role and a timeline during the fire to access specific task information for that role at that time. PowerPoint slide decks and brochures have also been completed for all internal and emergency responder roles, as well as roles associated with an evacuation centre. The slides are designed to be very versatile; they can be sorted into three presentations, one to show tasks for each of the aforementioned roles during each phase of a WUI event, or alternately, all of the slides for a single role could be combined together into a different presentation covering all of the tasks for a given role or set of roles.

Table 38: Labeling of Columns in Sortable Roles and Responsibilities Spreadsheet

Column Title	Description
Internal role (Yes/No)	defines whether the role is internal or external to the community
Role Name	specifies the role by the name used throughout the report
Supporting roles for the task (if any)	identifies other roles that are also associated with the task
Timelines	identifies when in the timeline the task is to be completed
Order number if sorted by timeline and role	
Task	long description of the task to be completed
Shortened Task	is the short description of the task used in the web app and informational materials
Order number if sorted by table	
Report Table	indicates the title of the table in the report that contains that task
Timeline subcategory	shows the sub-phase in which the task would be undertaken
Shown in the report table (yes/No)	indicates whether or not the task is shown in a table in the report
Slide deck and brochure exist (Yes/No)	indicates whether or not that task is contained in the informational materials

6 Conclusions

In this report, the need for a new wildfire planning framework with a focus on Indigenous communities was defined. Through the evaluation of existing informational resources and First Nation community wildfire case studies, key limitations and gaps were identified. These pointed to elements that should be addressed in planning and developing effective wildfire management strategies for remote communities. In particular, it was demonstrated that when effective actions were planned for, and implemented ‘Before the Fire’ and in the early stages ‘During the Fire’, experiences for community members later ‘During the fire’ and ‘After the fire’ were much improved; however, the planning and implementation of such actions required development of a new framework through which to define and coordinate specific roles and tasks important in effectively dealing with a wildfire. The proposed ‘Roles and Responsibilities’ framework was therefore developed as a basis through which to compile these findings into a single reference source that contained a listing of the roles and their associated responsibilities and to further develop this into a consistent informational package consisting of a variety of outreach materials. For this, first editions of the tools for dissemination and outreach were designed and created in the form of a web app, spreadsheets, slide decks, and brochure handouts.

For further development of the suggested framework and outreach materials, the following recommendations should be considered:

- Work directly with community leaders and knowledge keepers to understand specific wildfire fire threats and management challenges in their communities
- As more experience with wildfires in Indigenous communities is gained, modify the existing roles and responsibilities or create new roles with responsibilities as needed (adjusting related databases and tools)
- Develop a strategy for familiarization and education of community members and leaders with the material, outreach package and resources presented above.
- As more experience with use of the outreach package is gained, modify the existing roles and responsibilities or create new roles with responsibilities as needed (adjusting related databases and tools)
- As more experience with use of the outreach package is gained, modify the materials to improve their design and functionality
- Update and modify the web app code and design to increase accessibility
- Modify informational tools for specific communities with community-specific language and art
- Develop a long term strategy for on-going maintenance, improvement and updates to the resource database

References

- [1] Canadian Council of Forest Ministers. Canadian Wildland Fire Strategy: A 10-year Review and Renewed Call for Action, May, 2016, 15p.
url: <https://cfs.nrcan.gc.ca/publications?id=37108>, May 2016.
- [2] Public Safety Canada. Emergency Management Strategy for Canada: Toward a Resilient 2030, May 2019, 16p.
url: <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/mrgncy-mngmnt-strtgty/index-en.aspx> <https://scics.ca/en/product-produit/news-release-federal-provincial-territorial-ministers-release-emergencymanagement-strategy-for-canada/>, May 2019.
- [3] S. Sankey. Blueprint for wildland fire science in Canada (2019–2029). Technical report, Technical Coordinator, Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, Edmonton, AB., December 2018, 45p.
- [4] M. Gollner, R. Hakes, S. Canton, and K. Kohler. Pathways for Building Fire Spread at the Wildland Urban Interface. Fire protection research foundation report, University of Maryland, September 2015, 163p.
- [5] N. Bénichou, M. Adelzadeh, J. Singh, I Gomaa, N. Elsagan, M. Kinateder, C. Ma, A. Gaur, A. Bwalya, and M. Sultan. National guide for wildland-urban-interface fires: guidance on hazard and exposure assessment, property protection, community resilience and emergency planning to minimize the impact of wildland-urban interface fires. 2021, 196 p. doi: <https://doi.org/10.4224/40002647>.
- [6] S. Erni, L. Johnston, Y. Boulanger, F. Manka, P. Bernier, B. Eddy, A. Christianson, T. Swystun, and S. Gauthier. Exposure of the Canadian wildland–human interface and population to wildland fire, under current and future climate conditions. *Canadian Journal of Forest Research*, 51(9):1357–1367, September 2021. doi: 10.1139/cjfr-2020-0422.
- [7] H. Asfaw, Sandy Lake First Nation, T. McGee, and A. Christianson. Evacuation preparedness and the challenges of emergency evacuation in Indigenous communities in Canada: The case of Sandy Lake First Nation, Northern Ontario. *International Journal of Disaster Risk Reduction*, 34:55–63, March 2019. doi: 10.1016/j.ijdr.2018.11.005.
- [8] T. McGee, A. Christianson, and First Nations Wildfire Evacuation Partnership. *First Nations Wildfire Evacuations a Guide for Communities and External Agencies*. Purich Books, Vancouver, BC, Canada, 2021. ISBN 9780774880664.
- [9] K. Mottershead, T. McGee, and A. Christianson. Evacuating a First Nation Due to Wildfire Smoke: The Case of Dene Tha’ First Nation. *International Journal of Disaster Risk Science*, 11(3):274–286, June 2020. doi: 10.1007/s13753-020-00281-y.
- [10] Whitefish Lake First Nation 459, A. Christianson, and T. McGee. Wildfire evacuation experiences of band members of Whitefish Lake First Nation 459, Alberta, Canada. *Natural Hazards*, 98(1):9–29, August 2019. doi: 10.1007/s11069-018-3556-9.

- [11] Government of Northwest Territories. Community Wildfire Protection Plan K'átł'odeeche First Nation, . **url:** <https://www.gov.nt.ca/ecc/en/community-wildfire-protection-plan-katlodeeche-first-nation-2019>.
- [12] U.S. Fire Administration and FEMA. Creating a Community Wildfire Protection Plan, May, 2020, 16p. **url:** https://www.usfa.fema.gov/downloads/pdf/publications/creating_a_cwpp.pdf.
- [13] Residents' wildfire evacuation actions in Mishkeegogamang Ojibway Nation, Ontario, Canada. 33. doi: 10.1016/j.ijdr.2018.10.012.
- [14] FEMA National Mitigation Planning Program. Tribal Mitigation Planning. Handbook, May 2019, 84p. **url:** https://www.fema.gov/sites/default/files/2020-06/fema-tribal-planning-handbook_05-2019.pdf.
- [15] FEMA Federal Emergency Management Association. Hazard Mitigation Planning for Tribal Governments. Factsheet, March 2021, 2p. **url:** https://www.fema.gov/sites/default/files/documents/fema_planning-tribal_factsheet.pdf.
- [16] FEMA National Mitigation Planning Program. Tribal Mitigation Plan Review Guide. December 2017, 56p. **url:** https://www.fema.gov/sites/default/files/2020-05/FEMA_Policy_Tribal_Mitigation_Plan_Review_Guide.pdf.
- [17] Government of Alberta, Canadian Forest Service, and Parks Canada. *FireSmart: protecting your community from wildfire*. Partners in Protection, Edmonton, 2nd edition, July 2003. ISBN 978-0-662-34064-5. OCLC: 52457694.
- [18] Government of Northwest Territories. Community Wildfire Protection Plans-by community, Department of Environment and Climate Change. **url:** <https://www.enr.gov.nt.ca/en/services/wildfire-operations/community-wildland-fire-protection-plans/Community>.
- [19] Office of the Auditor General of Canada. Report 8 - Emergency Management in First Nations Communities, 2022, 33p. **url:** https://www.oag-bvg.gc.ca/internet/English/parl_oag_202211_08_e_44154.html.
- [20] Ajith P. Kaduwela, Amal P. Kaduwela, E. Jade, M. Brusseau, S. Morris, J. Morris, and V. Risk. Development of a low-cost air sensor package and indoor air quality monitoring in a california middle school: Detection of a distant wildfire. 69(9):1015–1022. doi: 10.1080/10962247.2019.1629362.
- [21] S. Singh, H. Singh, V. Sharma, V. Shrivastava, P. Kumar, S. Kanga, N. Sahu, G. Meraj, M. Farooq, and Suraj K. Singh. Impact of forest fires on air quality in wolgan valley, new south wales, australia—a mapping and monitoring study using google earth engine. 13(1):4. doi: 10.3390/f13010004.

- [22] J. Gilman, B. Lerner, W. Kuster, P. Goldan, C. Warneke, P. Veres, J. Roberts, J. De Gouw, I. Burling, and R. Yokelson. Biomass burning emissions and potential air quality impacts of volatile organic compounds and other trace gases from fuels common in the US. 15(24):13915–13938. doi: 10.5194/acp-15-13915-2015.
- [23] U.S. Fire Administration. How to create a community wildfire protection plan,” federal emergency management agency, Federal Emergency Management Agency. **url:** <https://www.usfa.fema.gov/blog/cb-062420.html>, Posted: 2020-06-24; Accessed: 2023-04-09.
- [24] Auditor General of Canada. Report of the Auditor General of Canada, Fall 2013. Technical report, Ottawa, Ont., 2013. OCLC: 875997428.
- [25] K. Porter, C. Scawthorn, and D. Sandink. An impact analysis for the National guide for wildland-urban-interface fires. National Research Council Of Canada Report, National Research Council of Canada, May 2021, 136p. **url:** <https://nrc-publications.canada.ca/eng/view/object/?id=b40907a1-0214-4cd3-a01a-a233011d0d93>.
- [26] FEMA Federal Emergency Management Association. Natural Hazard Mitigation Saves Interim Report. Fact Sheet, FEMA Federal Insurance and Mitigation Administration, June 2018, 2p. **url:** https://www.fema.gov/sites/default/files/2020-07/fema_mitsaves-factsheet_2018.pdf.
- [27] FireSmart Canada. Firesmartcanada last-minute Checklist for Protecting Your Home and Property from Wildfire. Fact sheet, April 2022, 1p. **url:** <https://firesmartbc.ca/wp-content/uploads/2019/04/FireSmartCanada-Evacuation-Checklist.pdf>.
- [28] U.S. Fire Administration. Wildfire evacuation outreach materials. **url:** <https://www.usfa.fema.gov/wui/outreach/wildfire-evacuation.html>, Posted: 2022-10-04; Accessed: 2023-06-02.
- [29] First Nations Emergency Services Society of British Columbia. Resilient first nations communities. **url:** <https://www.fness.bc.ca>, Accessed: 10-06-2023.
- [30] Government of British Columbia. BC gov indigenous communities emergency operations. **url:** <https://www2.gov.bc.ca/gov/content/safety/emergency-management/local-emergency-programs/indigenous-emergency-operations>, Accessed: 2023-06-02.
- [31] Colorado State University. Emergency Water Supplies and Treatment.pdf . **url:** https://drive.google.com/file/d/16tjVCRkg6eVjz48vsMuEJA7jas3YgBl/view?usp=embed_facebook, Accessed: 2023-06-02.
- [32] Airnow. Fire and Smoke Map. **url:** <https://fire.airnow.gov/>, Accessed: 2023-06-02.
- [33] First nations health authority: Wildfire response. **url:** <https://www.fnha.ca/what-we-do/environmental-health/wildfire-information>, Accessed: 2023-06-02.

- [34] Public Safety Canada. Wildfires. **url:** <https://www.getprepared.gc.ca/cnt/hzd/wldfrs-en.aspx>, Posted: 2018-12-21; Accessed: 2023-06-05. Last Modified: 2022-07-29.
- [35] Resources | FireSmart Canada. **url:** <https://firesmartcanada.ca/resources>, Accessed: 2023-06-02.

Appendix A: Web App Technical Information

A web app operating on the open-source JavaScript run time environment node.js was developed as a pilot project to present and distribute information from this report to a wide audience. The information is sorted and presented according to the same 'Role' and 'Timeline' groupings as previously described.

Dependencies

The app has the following dependencies:

Table 39: App Dependencies

Package	Version
jquery	3.7.0
jsdom	22.0.0
react	18.2.0
react-dom	18.2.0
react-scripts	5.0.1
web-vitals	2.1.4

App Design

The app is structured with two main JavaScript files, 'App.js' and 'taskData.js'. Images are primarily called from an image repository named 'graphics'. In the repository, there are sub-folders which contain the different groupings of images that are used in different parts of the app.

The 'taskData.js' JavaScript file stores all the information for each role and timeline. The 28 roles are assigned individual 'id' numbers and sorted by those numbers in an array. These correspond to an index number for each role. Within each role, there are three sub-arrays of text string tasks arranged according to the three main phases on the timeline of a wildfire event.

The graphics folder contains five images, and four subfolders which each contain 28 images. The five images in the graphics folder are the app background, the community map, as well as the 'before', 'during', and 'after' timeline icons since these are used across all roles. The four folders correspond to the role icons, as well as the task icons for a given timeline. The folder for the role icons is named 'roleicons', and the folders for the task icons are named 'BeforeFire', 'During Fire', and 'AfterFire' corresponding to the related timeline.

The 'App.js' JavaScript file contains the majority of the code. A series of classes, related to CSS styling, are also used throughout the app to create a more polished look and ensure functionality.

Within the 'App.js', all of the dependencies and images are initially imported, and then a component named 'App' is defined. Utilizing the 'useState' hook from React, a series of state variables are defined that relate to the roles and stages on the timeline. Event handling functions are then defined, which dynamically set the aforementioned state variables based on user events. A function to render the task lists is also defined. Once the content is initialized, the 'useEffect' hook from React is used to check whether the browser window is large enough to display the community map format of the app. If the window width is greater than 1200 pixels, the community map is displayed in the 'desktop' format, using absolute image positioning to place the role icons on the map on the user screen. If the browser window is less than 1200 pixels wide, then an array of clickable role icons is displayed on the user screen. When a user clicks one of the role icons, the event-handling function relating to that role is triggered, hiding the community map and displaying images representing the three stages of the timeline ('before', 'during', and 'after' the fire) for the given role. A user can then click a timeline phase image, where a similar event-handling function initiates the display of the task icons and the corresponding task list on the user screen. A back button is also displayed; clicking on this calls an event-handling function that returns the user to the community map view.

Web App Example Role Page

[Back](#)

Wildfire Preparedness



Local Leader



Tasks: Before the Fire



- Prepare community for emergency (pre-incident) with Emergency Co-ordinator
- Develop/maintain relationships with relevant agencies, communities, and businesses
- Ensure needs can be met by potential Host Communities
- Ensure Residents have appropriate evacuation plans
- Create emergency hosting plan with Emergency Coordinator and Host Communities
- Develop emergency financial plan with relevant parties
- Establish wildfire safety points to trigger evacuation
- Identify essential people to remain during emergency
- Develop/maintain a list of internal liaisons for evacuee well-being during evacuation
- Ensure access for Emergency Responders to properties and roadways
- Develop contact line for Residents during emergency

Slide Deck Example Role Page



Local Leader



1. Prepare community for emergency (pre-incident) with Emergency Coordinator
2. Develop/maintain relationships with relevant agencies, communities, and businesses
3. Ensure needs can be met by potential Host Communities
4. Ensure Residents have appropriate evacuation plans

Works With:



Emergency Coordinator
Tasks 1, 3, 4



Emergency Responders
Task 2



Residents
Task 3



Health Advisor
Task 3



Transportation Advisor
Task 3



Host Communities
Task 2, 3



Brochure Page Examples (centerfold and outside)

BEFORE	DURING	AFTER
 <p>Prepare community for emergency (pre-incident). Ensure Residents have appropriate evacuation plans. Create emergency hosting plan. (Emergency Coordinator, Host Communities)</p>	 <p>Setup Emergency Operations Centre.</p>	 <p>Decide, order, communicate return home. (Emergency Operations Centre)</p>
 <p>Develop/maintain relationships with relevant agencies, communities, and businesses. Ensure needs can be met by potential host communities. (Emergency Coordinator)</p>	 <p>Determine nature and scope of incident. Assess/ monitor public safety and property protection. (Emergency Operations Centre)</p>	 <p>Organize return home. (Emergency Operations Centre, Advisors)</p>
 <p>Develop emergency financial plan with relevant parties. (Emergency Coordinator, Host Communities, Government, Advisors)</p>	 <p>Inform relevant parties/determine evacuation decision. Declare state of emergency and notify PEOC. (Emergency Operations Centre, Government)</p>	 <p>Embrace return home, take stock, acknowledge fears, loss. Recognize essential staff for their efforts. (All)</p>
 <p>Establish wildfire safety points to trigger evacuation. (Environmental Advisor)</p>	 <p>Communicate evacuation pending (as much warning as possible) and type of evacuation. Give evacuation order, communicate timeline and how residents can prepare. (Emergency Communications)</p>	 <p>Communicate funding and reimbursement to Residents. (Emergency Operations Liaison)</p>
 <p>Identify essential people to remain during emergency. Develop/maintain list of internal liaisons for evacuee well-being during evacuation. (Emergency Operations Centre)</p>	 <p>Utilize Emergency Communications to contact necessary services, and other relevant groups. Regularly communicate incident status, monitor releases. (Emergency Communications)</p>	 <p>Listen to Resident experiences, work to improve future emergency plans. (Emergency Operations Centre)</p>
 <p>Ensure access for Emergency Responders to properties and roadways.</p>	 <p>Track expenses and justifications. (Emergency Operations Liaison, Residents)</p>	
 <p>Develop contact line for Residents during emergency. (Emergency Communications)</p>		



Illustrations by Hotdog Water Art

Contacts

Resources

Local Leader



[Province of British Columbia
Indigenous Communities
Emergency Operations](#)

[FNESS 2022 Wildfire Resources](#)

[AirNow Smoke and AirQuality](#)

[Get Prepared Canada](#)

[FireSmart Canada: Protecting
Your Community from Wildfire](#)



National Indigenous
Fire Safety Council
Conseil national
autochtone de la sécurité-incendie



UNIVERSITY OF
WATERLOO
FACULTY OF
ENGINEERING