

Article

# Preparedness and Experiences of Evacuees from the 2016 Fort McMurray Horse River Wildfire <sup>†</sup>

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<sup>†</sup> This manuscript is an extended version of the conference paper “Residents’ experiences of the 2016 Fort McMurray Wildfire, Alberta”, presented at the 8th International Conference on Forest Fire Research.

Received: 18 February 2019; Accepted: 3 March 2019; Published: 6 March 2019



**Abstract:** The 2016 Fort McMurray Horse River Wildfire that caused the evacuation of more than 88,000 residents from the Regional Municipality of Wood Buffalo (RMWB), Alberta is the largest wildfire evacuation in Canadian history. This paper presents results of an online survey of 447 evacuees in June when some residents had returned to RMWB, and others were still living elsewhere. Results of this online survey show that many survey respondents were not aware of the high wildfire risk leading up to May 3rd and social cues indicated they should carry on as usual. Many respondents received little if any warning time to enable them to prepare. Most respondents had a vehicle, but traffic impediments caused some to run out of gas, food and water on the drive away from Fort McMurray. Most respondents stayed in more than one location, with most staying with friends and family for at least part of the evacuation. Some respondents faced challenges including financial difficulties, finding suitable accommodation, and dealing with insurance, and some received insufficient information. Help was offered to evacuees by a vast array of sources including organizations, businesses, communities, and residents. The results of this study show that most survey respondents were not prepared before they had to leave, which increased reliance on help provided by others.

**Keywords:** wildfire; evacuation; preparedness; risk perception; social cues; environmental cues; warning; traffic; host communities; accommodation; help; support

## 1. Introduction

Evacuations are used in Canada and elsewhere to protect public safety in the event of a wildfire and other hazards. Mandatory evacuations require residents to leave, while voluntary evacuations enable residents to choose whether or not to leave. Researchers in several countries have examined residents’ wildfire evacuation intentions during a potential future wildfire [1–4], and decision-making and actions during an actual wildfire [5–9]. These studies provide important insights into whether or not residents will take recommended protective action and factors that influence their intentions and actions.

Researchers have also examined the impacts of wildfire evacuations on the health and well-being of evacuees. Existing research clearly shows that wildfire evacuees experience stress and anxiety during the evacuation process due to disruptions in daily routines, loss of control, uncertainty about personal safety and the safety of their homes, and proximity of danger [1,10,11]. Social support has been found to reduce negative impacts of wildfire evacuations for evacuees [12]. Scharbach and Waldram [13] examined the impacts of the wildfire evacuation of Hatched Lake Denesuline First Nation and found that splitting up families during the evacuation negatively affected their wellbeing. Kent and colleagues [11] found that evacuations may have positive impacts when people have an opportunity

to get to know one another. Communication also affects the wellbeing of evacuees, with inadequate communication increasing distress and abundant and timely information helping residents to cope with the stressful situation [14–16].

Only a small number of studies has examined in detail the experiences of wildfire evacuees during the process of evacuation. Cohn and colleagues [1] examined evacuation experiences of residents during three fires in the United States: Hayman Fire in Colorado (More than 5000 evacuated for 1–2 weeks), Rodeo-Chediski fire in northern Arizona (more than 32,000 evacuated for 1–2 weeks), and Cave Gulch/Bucksnot Fires in Montana (50–100 evacuated for 2–3 days). The researchers compared the perspectives of evacuees and public safety officials during five temporal evacuation stages: Anticipation, evacuation warning, displacement, notification of condition of home, and return and recovery. This study provides a valuable overview of wildfire evacuations from the perspectives of evacuees and emergency managers, however does not examine residents' evacuation experiences in detail, including the process of leaving their home and community and travelling to safety. Scharbach and Waldram [13] examine the concept of being 'at risk' and describe the evacuation experiences residents of Hatchet Lake Denesuline First Nation, a remote fly-in community of 1300 people in northern Saskatchewan, Canada which was evacuated for 10 days. The evacuation of Hatchet Lake Denesuline First Nation by air involved separation of families based on risk assessment which caused considerable distress and those deemed to be at low risk experienced social, cultural and health challenges. Further study is needed to examine evacuations in other contexts.

Being well prepared enables residents to effectively take protective action during a wildfire, in this case by evacuating [17]. For residents, preparedness before an evacuation includes being aware of the local wildfire risk and the potential need to evacuate, having a plan for how to evacuate if required to do so, and having emergency supplies organized in advance. Only a small number of studies have examined residents' preparedness to evacuate due to wildfire. McLennan and colleagues [18] examined seven post-fire studies in Australia and found that only between 6–27% of residents who planned to evacuate had an adequate level of preparation to leave safely. McNeill and colleagues [19] examined high wildfire risk communities that had recently experienced a wildfire in Western Australia, and found that perceived risk severity predicted greater evacuation preparation. Further study is needed to examine residents' preparedness for wildfire evacuation.

The present study contributes to existing literature by examining the wildfire evacuation experiences of residents of urban Fort McMurray in the Regional Municipality of Wood Buffalo, Canada who evacuated for one month or more due to the Horse River fire which destroyed 2400 homes in Fort McMurray and caused the evacuation of more than 88,000 residents. The two research questions that guide this study were:

- (1) How prepared were residents to evacuate on 3 May 2016?
- (2) What were residents' experiences leaving their home and community, and staying in a safe place?

Lindell and Perry's (2012) [20] protective action decision model (PADM) describes stages that occur before someone takes protective action, therefore will provide insights into the process that led up to the evacuation of residents from Fort McMurray. The first stage in PADM is a pre-decision process including reception, attention and comprehension of warnings; or exposure, attention and interpretation of environmental/social cues. The next stage includes perceptions of threats, protective actions, and stakeholders. Once the pre-decision process is complete and core perceptions activated, the next stage involves risk identification, risk assessment, protective action search, protective action assessment, and protective action implementation. The outcome of this process may be influenced by situational factors and impediments.

The Regional Municipality of Wood Buffalo (RMWB) is located in the boreal forest of north-eastern Alberta (see Figure 1). RMWB includes the Fort McMurray urban centre and several rural settlements, including First Nations and Métis communities. The 2016 Census [21] provides information about the RMWB. The population of RMWB in 2016 was 71,589 persons, with 66,573 residents living in urban

Fort McMurray. The average age in RMWB was 33.1 compared to 37.8 for the province of Alberta. The population of RMWB is multicultural, with more than one quarter of the population (26.7%) in 2016 a visible minority, slightly higher than the provincial average of 23.5%. 9.2% of the population in RMWB declared Aboriginal identity, compared to 6.5% for the province. Formal education levels were higher than the provincial average, with 59.6% of the population 15+ in RMWB having a postsecondary or trades certificate or diploma (55.2% for Alberta); 29.3% having a high school diploma (compared to 27.9% for Alberta); and 11% having no certificate, degree, or diploma (compared to 16.9% for Alberta). Employment rates and incomes are high, with a 72.6% employment rate in RMWB compared to 65.4% for Alberta as a whole. Household incomes are also high, with the median total income of RMWB households \$195,570 in 2015, compared to \$93,835 for the Province of Alberta; and at the individual level, the average total income of residents was \$77,481 compared to a provincial average of \$42,717. However there is considerable disparity, with 77% of the Fort McMurray population 15+ earning more than \$100,000/annum, and 18% earning less than \$20,000 per year. House values are also high, with the average value of dwellings \$619,344 compared to \$449,790 for the province of Alberta. In 2016, 67.6% of the 25,660 private households were owned, while 32.1% were rented, and 0.4% were First Nation band housing. The Regional Municipality of Wood Buffalo is home to oil sands development and related industries, with 30% of the labour force working in this industry. Two other major industries that employ local residents are construction (10%) and retail trade (8%).



**Figure 1.** Location of the Regional Municipality of Wood Buffalo, Alberta. Source: Regional Municipality of Wood Buffalo (<https://www.rmwb.ca/living/Communities.htm>).



The Horse River fire started on May 1st, 2016, and quickly grew in size due to extremely hot and dry conditions. At 8pm on May 1st, residents in Centennial trailer park were warned to leave their homes, with residents in Beacon Hill and Gregoire neighbourhoods on evacuation alert (see Figure 2). Two hours later, a state of local emergency was declared and a mandatory evacuation was ordered for residents of Centennial RV Park Campground, Prairie Creek and Gregoire. The next morning, the mandatory evacuation for Gregoire and Prairie Creek were rescinded. The wildfire continued to grow throughout the day on May 2nd, and at 8pm the fire reached the Athabasca River. Overnight, the fire jumped the Athabasca River (approximately 1 km distance).



**Figure 2.** Fort McMurray neighbourhoods. Source: Regional Municipality of Wood Buffalo.

For residents in Fort McMurray, the skies appeared sunny and clear the morning of May 3rd, with the smoke staying close to the ground due to a thermic inversion. At 11:00 am, representatives from the RMWB and the Provincial government held a media briefing. The media and residents were

told that fire conditions were extreme and were expected to worsen throughout the day. Residents were told by the Fire Chief that they should be prepared to act on short notice by having “a little plan in mind if you were told you had to leave your house, what would you take with you and where do you think you might go.” However residents were also told to carry on as usual, with the Fire Chief saying “people need to get on with their lives, people need to go to work, Mom needs to take the kids to school, and Dad takes the guys to the ball game afterwards” (<https://www.youtube.com/watch?v=55O3jp8thKM>).

At 1:15pm, the wildfire crested the hills along the west side of Fort McMurray, becoming visible to many residents [22]. At 2:31 pm, the wildfire entered the Beacon Hill neighbourhood. Three minutes later, at 2:34, an evacuation was ordered for Abasand, Grayling Terrace, and Beacon Hill neighbourhoods. The Thickwood neighbourhood was on a voluntary evacuation. At 2:52, the wildfire was sighted south of Thickwood, and at 3:31, an evacuation was ordered for the Thickwood, Gregoire, Waterways neighbourhoods, and Centennial Trailer Park. At 4:24, an evacuation was ordered for downtown Fort McMurray. At 5:30, Dickinsfield, Draper, Lower Townsite, Saline Creek, and Wood Buffalo were ordered to evacuate. At 6:49, all of Fort McMurray was ordered to evacuate. Due to traffic congestion on Highway 63, the one access road out of Fort McMurray, people living in neighbourhoods north of the Athabasca River were told to evacuate by driving north on Highway 63, while those living south of the river drove south. The estimated 15,000 to 20,000 evacuees who headed north stayed in industry work camps and Fort McKay First Nation. On May 4 after the fire started to head north and supplies in work camps began to run out, evacuees were either flown south to the cities of Edmonton or Calgary, Alberta, or drove back through Fort McMurray to communities south of RMWB.

In total, more than 88,000 residents of urban Fort McMurray and surrounding communities in RMWB evacuated their homes and communities due to the Horse River fire. By the time the fire was deemed to be under control on 4 July 2016, the fire had destroyed 2579 structures in Fort McMurray, and burned 589,552 hectares. Two young women died in a car crash on highway 63 during the evacuation. Government responses to this wildfire, including the evacuation, have been examined in studies completed by consulting companies following the wildfire [22–24]. These studies provide important insights into the government response to the wildfire, however further study is needed to examine the experiences of residents who fled from their homes and neighbourhoods in Fort McMurray.

## 2. Materials and Methods

This project started in May 2016 while residents of RMWB were still away from their homes and communities. Before data collection commenced, this study received ethics clearance from the University of Alberta’s Human Research Ethics Board 1. An online survey was selected as the data collection tool because it provided a way to contact evacuees who were staying in a variety of locations after fleeing from their home and communities. A short online survey was also appropriate for people who were very busy during and after the evacuation. It also provided a way to obtain information quickly from evacuees so that the details of their experiences would be fresh in their minds. An online survey also provided a way to obtain input from many evacuees [25].

The survey was developed by the author and a research assistant in May and early June. Closed-ended and open-ended questions were included, and the survey was designed to be completed within 10 min. Careful consideration was given to the questions included in the survey and wording of questions, given the sensitivity of the topic. Once the survey was prepared, it was emailed to two RMWB evacuees for feedback. Slight changes were made in response to feedback, and the survey was finalized in mid-June. The survey included questions about evacuees’ initial evacuation experiences, including learning about the wildfire, leaving, and staying elsewhere. Purposive sampling was used to try to recruit as many wildfire evacuees as possible. Once the survey was finalized, evacuees were recruited through the Facebook ‘Fort McMurray Evac Relocation Group’ and Twitter. Two First Nations and one First Nation organization in RMWB were also invited to post the survey on social



media. At the time of this online survey, this was the first collection of data from evacuees from the Horse River fire. A total of 447 respondents completed the online survey, with most completing the survey within the first 24 h that it was posted online on June 21, 2016. Descriptive statistical data analysis was completed using Survey Monkey.

The 447 respondents included 94% who normally lived in the Fort McMurray urban centre, while the other 6% lived in other communities in RMWB. Survey respondents included adults in a range of age groups from 18–25 to 75+ (Table 1). The survey was mainly completed by women (Table 1). Most respondents were employed, with 63.5% in full-time paid employment, 8.0% self-employed, 8.0% in part time/casual employment. 8.5% full time domestic/parenting duties, 7.7% unemployed (The unemployment rate in RMWB at the time of the survey was 6.8% (Statistics Canada 2017)), 4.9% retired, 1.8% and 2.6% did not provide their employment status. 8.1% of respondents were born in RMWB, 16.4% were born elsewhere in Alberta, with most respondents (66.9%) born elsewhere in Canada, and 8.6% were born outside of Canada. At the time of the wildfire, respondents had lived in their community in RMWB for varied lengths of time, with a median of 6–10 years (Table 1). Survey participants were asked how their home was affected by the wildfire. While most survey respondents reported that their home either had no (36%) or minor (41%) damage, 18% of respondents stated that their home was destroyed in the fire, and 3.6% of respondents said their home had suffered major damage.

**Table 1.** Demographic characteristics of online survey participants.

Length of Time Living in Community Where You Normally Live (Before the Evacuation (n = 390))		Age Characteristics (n = 389)		Gender (n = 389)	
Less than 1 year	4.1%	18–24	3.9%	Female	81.2%
1–5 years	28.2%	25–34	25.5%	Male	16.7%
6–10 years	28.5%	35–44	29.0%	Other	0.3%
11–20 years	19.7%	45–54	25.5%	No response	1.8%
More than 20 years	19.5%	55–64	13.1%		
		65–74	2.1%		
		75+	2.1%		

### 3. Results

#### 3.1. Preparedness

Fort McMurray is located in the fire prone boreal forest [26], and wildfires have occurred near Fort McMurray every few years in the past two decades, including significant wildfires in 2015, 2011 (3 fires), 2009 (2 fires), 2007, and 2003 [27]. Five large wildfires came within 20km of Fort McMurray between 1990 and 2012 [28]. The weather leading up to the 2016 wildfire season included a very dry and mild winter, followed by an unusually hot and dry spring [29]. In the last week of April, the Fort McMurray area experienced daily high temperatures in the 30s, low relative humidity of 15 percent, and winds approaching 25 km/hour [24]. Despite the location of the community in the boreal forest, past wildfires in the area, and weather leading up to the beginning of May 2016, when survey participants were asked to think back a few days before the evacuation and recall how they rated the wildfire risk, 44.8% perceived the threat to their community as being low or very low, with 28.7% recalling the risk as being moderate, and 25.5% perceiving the risk as high or very high (Table 2). Most survey participants also perceived the wildfire risk to their property and family as low to very low. As expressed by one respondent:

“Right up until my friends said they could see flames in our neighbourhood I felt like things weren’t too bad, I was in denial about the severity of the threat.”

(Respondent #267)

**Table 2.** Survey participants' rating of the wildfire threat a few days before the evacuation on a scale from '1' no threat to '5' very high threat (n = 418).

	'1' no Threat	'2' Low Threat	'3' Medium Threat	'4' High Threat	'5' Very High Threat	N/A (I did not Think about It.)	Total	Mean	St. Dev.
Perceived wildfire risk to my family	21.6%	33.3%	25.2%	11.5%	6.7%	1.7%	417	2.48	1.2
Perceived wildfire risk to my property	30.5%	36.1%	16.1%	10.1%	5.8%	1.4%	416	2.23	1.2
Perceived wildfire risk to my community	10.6%	34.2%	28.7%	15.4%	10.1%	1.0%	415	2.8	1.1

Beliefs that the wildfire risk was low or moderate despite environmental cues to the contrary were likely influenced by social cues which indicated that people should carry on as usual. Information received from trusted individuals downplayed the risk, for example the Fire Chief's advice to residents that the risk was high but they should carry on with their normal activities. One respondent explained:

"Had I known how close the fire was to the city, I would have left that morning. I asked a fire captain the day before and he told me it was far away and not to worry."

(Respondent #216)

Children went to school on May 2nd and 3rd, and businesses were also open. This meant that parents had to return to school to pick up their children before they evacuated, and in some cases teachers took children out of the city in their own vehicle when parents were unable to pick them up at the school. People who were at work until the mandatory evacuation was ordered had little if any time to prepare to leave. As two respondents explained:

"Children should not have been in schools on Monday or Tuesday [May 3<sup>rd</sup>]. Nor should we as staff. Evacuation should have been called a lot sooner. A school shouldn't have had to take children out in cars."

(Respondent # 179)

"Employees were kept at work because it wasn't a mandatory evacuation and didn't have adequate time to go back and retrieve any belongings."

(Respondent # 233)

Most survey respondents (96.7%) also indicated that this was the first time they had evacuated due to wildfire, with only 3.3% (13 respondents) having prior evacuation experience. Only two of these respondents had experience evacuating from RMWB due to wildfires before 2016, while other wildfire evacuation experiences were elsewhere in Canada.

Mandatory evacuations were ordered for Fort McMurray neighbourhoods throughout the day on May 3rd. However by the time the official evacuations were ordered, the wildfire was already clearly visible to Fort McMurray residents and homes had already started to burn in some neighbourhoods. As three survey respondents explained:

"Unacceptable that the people in Beacon Hill and Abasand basically had the fire at their back door before making their own decision to leave."

(Respondent #169)

"The city gave the residents of Beacon Hill no warning. When the warning came in at 2pm on May 3rd, it was already too late as homes were already on fire and I was unable to get to my house to collect anything."

(Respondent #132)

“The evacuation was very chaotic and we were not told to leave Beacon Hill until houses were already on fire.”

(Respondent #89)

When asked how they learned they would have to evacuate, the largest group of respondents (19.9%) did not receive any warning but decided to leave because of the environmental cues that they could see outside (Table 3). However many respondents received some form of notification from official sources or others. Many respondents left after hearing information provided on the radio (19.4%), and others were notified by a family member (15.3%). 9.8% learned that they would have to leave after seeing information posted on social media, 9.1% were told by their employer, and 7.9% were told by a friend or neighbour that they would have to leave. A few respondents received this information from an RCMP officer, TV or from the RMWB website [30].

**Table 3.** How respondents learned that they would have to evacuate (n = 417).

Cues	Percentage
I decided to leave because of what I could see	19.9%
Radio	19.4%
A family member	15.3%
A posting on social media (Facebook, Twitter, etc.)	9.8%
My employer	9.1%
A friend or neighbour	7.9%
Alberta Emergency Alert	5.0%
An RCMP (police) officer	2.2%
TV	0.7%
The Regional Municipality of Wood Buffalo website	0.7%
Other	9.8%

Most survey respondents recalled that they were either at work or home when they learned they had to evacuate. Many survey respondents had little or no time to prepare before they had to leave [30]. Importantly, 11.7% (48 respondents) said that they spent 0 min getting ready to leave (Table 4). 16.9% said that they spent less than 15 min to get ready, while another 39.1% said that they spent between 15 min and 1 h getting ready. 16.6% spent between 1 and 2 h to get ready to leave, and only 8.6% said that they spent more than 2 h getting ready. Survey respondents also described the lack of preparation time:

“I wish the order of evacuation was made early as I left to pick up kids and I couldn’t go back home. I left with no cloth[e]s or anything.”

(Respondent #425)

“Evac should have been about an hour or two earlier. Those working north of town had no time to go home and pack/prepare.”

(Respondent #277)

**Table 4.** Time spent preparing to leave (n = 409).

Number of Minutes	Percentage
0 min	11.7%
Less than 15 min	16.9%
15 min	10.3%
30 min	20.0%
45 min	8.8%
60 min	11.2%
75 min	1.5%
90 min	3.7%
105 min	0.2%
120 min	7.1%
More than 120 min	8.6%



The amount of time survey participants had to prepare before they left affected what they could take with them. 409 survey respondents described what they brought with them when they evacuated. 66.5% stated that they brought clothing, with most taking one change of clothes or enough clothes for two to three days. As two participants explained:

“Pets, food for pets, medications, and clothes for 2 days. Believed they would have it under control within a few hours, and we would get back home.”

(Respondent #415)

“The dog, personal financial documents, change of clothes, passport, laptop, cellphone charger, water.”

(Respondent #285)

However, some respondents were able to take enough clothing for an extended period. As one participant stated:

“Our sleeping bags, pillows, lots of water, clothing for a month in a suitcase, emergency travel kit, fruit, granola bars, family photo album, block of Balderson cheese and a bottle of Chardonnay.”

(Respondent #401)

42.8% stated that they brought documents such as a passport and other important documents. 38.9% brought pets and pet-related items with them. 25.67% stated that they brought food with them, with some who brought snacks for a short trip, while others brought enough food for a few days; and 22% brought water. Other items brought by many respondents include photos (19.8%), a computer(s) or hard drive (14.7%), and sentimental items (13.9%). A few participants mentioned that it was difficult to decide what to take. As one participant explained,

“I was in a daze as to what to take . . . nothing seemed important to me at the time, just getting out safely.”

(Respondent #31)

9.3% of respondents said they did not take anything with them. Only four respondents stated that they brought an emergency kit/bag with them.

### 3.2. Leaving Their Home and Community

Most survey participants (86.1%) left their community in their household vehicle. However 7.4% left in a vehicle of a neighbour or friend, a family member who lives elsewhere, or someone who they did not know before the evacuation. A few respondents left in a company vehicle or with a co-worker, a few left by bus, one left in their RV. Three respondents were told by the RCMP to leave on foot, as one explained:

“Even though we left in our household vehicle, [we] had to leave the vehicle and run and the fire was so close and the traffic was so bad. RCMP ordered us to ditch our vehicle and run.”

(Respondent #347)

52.7% of respondents reported that they had problems leaving their community [30]. Traffic delays were common as residents were leaving their neighbourhood and then once they were on Highway 63. Many residents' vehicles ran out of gas, and some were not sure whether they should go north or south on Highway 63. Some survey respondents were separated from family members and friends, and others did not have enough food or water during the drive away from Wood Buffalo. Many survey respondents had to leave while the fire was burning around them. In the words of two survey respondents:

“I hope it is something I never have to experience again . . . Sitting in stand still traffic watching fire coming towards you is something no one can imagine until you go thru it . . . .”

(Respondent #31)

“We had to literally drive through mountains of flames to make it out . . . if we had to stop or slow down we would have died in our car.”

(Respondent #49)

At the end of the survey when respondents were invited to provide any additional comments, three mentioned that residents were courteous as they were driving out of the city:

“I was impressed how courteous most people were on the drive out of town. Sometimes I changed lanes in the long line of traffic as I did not know where I was going and people let me into their lane.”

(Respondent #59)

“ . . . People would be letting you merge in when there were flames right beside your vehicle.”

(Respondent #78)

“Everyone was very calm while we evacuated Abasand. Everyone took their turns merging. The fire was all around us as we left, but we kept our cool so we wouldn't scare our daughter.”

(Respondent #362)

### 3.3. *Staying in a Safe Place*

Evacuees stayed in a variety of locations during the evacuation (Table 5). While 39.0% of respondents stayed in one place for the whole evacuation, 61.0% stayed in more than one town/city/community [30]. Residents who had to travel north out of Fort McMurray stayed in Fort McKay First Nation or a work camp, then went south and stayed in a second community. For example, Respondent #442 drove north and stayed in Fort McKay for one night, then stayed in Edmonton for the rest of the time; while Respondent #270 stayed in a work camp for two days then flew to the province of Ontario. Some evacuees travelled south but stayed near Fort McMurray the first night, and then continued their journey south the next day. As one respondent explained, “We first ran to Gregoire Lake, then next morning we again had to run for our life. When we ran again we went to Spruce Grove (in the Edmonton Metropolitan Area)” (Respondent # 338). Nearly half of survey respondents (218) stayed in the City of Edmonton, the closest city south of Fort McMurray, or its surrounding metropolitan area. Some survey respondents travelled further south to Red Deer (13 respondents) or Calgary (56 respondents). 180 respondents stayed in other towns and communities around Alberta. 138 respondents left Alberta and stayed in another province during their evacuation, and nine respondents left Canada to stay in another country.

In these locations, survey respondents stayed in various types of accommodation (Table 6), with some respondents staying in more than one type. Most people (72.6%) stayed with friends and family, and half (50%) stayed in a hotel room. About 20% of respondents stayed in a camper or rented apartment/house. Interestingly, 5% of respondents (21) stayed with someone they had not met before the evacuation, and nine survey respondents reported that they slept in their vehicle.

**Table 5.** Where survey respondents stayed during their evacuation (n = 163).

In Alberta		Another Canadian Province/Territory		Outside Canada	
Work camps in RMWB	21	British Columbia	45	United States	3
Anzac in RMWB	11	Ontario	35	Other Countries	6
Lac La Biche (220 km NE Edmonton)	24	Newfoundland	15		
Athabasca (145 km North Edmonton)	16	Saskatchewan	14		
Boyle (163 km North Edmonton)	10	Nova Scotia	11		
Edmonton City or Metropolitan Area	218	New Brunswick	7		
Red Deer	13	Manitoba	6		
City of Calgary	56	Prince Edward Is.	3		
Other towns and communities	180	Quebec	1		
		Northwest Territories	1		

**Table 6.** Types of accommodation for survey respondents (n = 412).

Where Survey Respondents Stayed during the Evacuation	Number of Respondents
I stayed with friends and family	299
A hotel room	206
A camper	91
A rented apartment or house	80
A work camp	25
I stayed with someone I had not met before the evacuation	21
A summer home/cabin	16
My own home outside of Fort McMurray	10
My car/truck	9
A cot in an arena	9
A rented room in a house or apartment	9
A room in a university/college dormitory	8
Other	14

Once they were staying elsewhere, most (81.8%) survey respondents stated that they did not have any problems, while the remaining respondents experienced problems including financial challenges, and trouble finding accommodation being the two most frequently mentioned concerns. Challenges with insurance and finding accommodation that accepted pets were also mentioned by several respondents. During the evacuation, survey respondents obtained information in a variety of ways, with the main sources being social media (88.3%) and news (70.2%), followed by friends and family (54.2%) and RMWB (46.8%) or Government of Alberta (46.3%). However 46.1% of survey respondents stated that they did not receive enough information during the evacuation [30].

74.4% of survey respondents stated that they received help during the evacuation from a vast array of sources including friends, family, strangers, aid organizations, the government of Alberta, and businesses, to name a few. In the words of a few survey respondents:

“People were handing out food and water on the highway where traffic was backed up.”

(Respondent #416)

“In every town we stopped in people were amazingly kind and helpful, going out of their way to do whatever they could to help and accommodate us.”

(Respondent #294)

“So many people gave donations of food! Restaurants gave us free food, hotels have discounted rates, and stores gave us discounts to buy new clothes. The help we received was astounding.”

(Respondent #238)

“My family helped, Red Cross, the government funding, my insurance company, and various businesses were very generous. Evac centres.”

(Respondent # 438)

“Complete strangers put me up in a camper in Leduc. They paid for the campsite the entire time I was there.”

(Respondent #433)

“The animal care centre at the evacuation centre was very helpful, and a neighbour drove out of town with me and helped me with the driving.”

(Respondent #432)

When asked what help they had received during the evacuation, one survey respondent simply stated “Too many to list. It was unbelievable . . . the kindness was so humbling.” (Respondent #440) People in communities near Fort McMurray provided shelter, food, and water. Residents in Edmonton and elsewhere in Alberta invited evacuees to stay with them in their homes, volunteered, and donated. Financial support from the Government of Alberta and the Red Cross, and donations from other organizations were appreciated by survey respondents. However some survey respondents experienced challenges accessing funds from the Red Cross.

69.82% of respondents stated that they had positive experiences during the evacuation, including being thankful for the help they received, and experiencing the strength and resilience of Fort McMurray residents. In the words of a few participants:

“Made some wonderful new friends and experienced the kindness of friends and strangers alike along the way.”

(Respondent #434)

“Many, many positive experiences in Edmonton of the generosity and compassion of the community, the province, and the country at large, ranging from a free cup of coffee to the hugs of strangers to the government debit card.”

(Respondent #355)

Once the Government of Alberta allowed evacuees to start returning on June 1st, survey respondents began to return to RMWB, with most returning within 4 weeks of June 1st (Table 7).

However some survey respondents stayed away until July or for longer. At the time of the survey in late June 217 respondents reported that they had returned to RMWB, 154 stated that they planned to return, 20 were planning to or had moved away from RMWB, and 17 were unsure of their plans. Therefore most respondents either had or planned to return to RMWB, with less than 5% who were not planning to return.



**Table 7.** Length of stay elsewhere (n = 406).

How Long Did You Stay away from Your Community?	Respondents (%)
Less than 1 week	0.7
1 week	0.5
2 weeks	0.5
3 weeks	2.2
4 weeks	22.7
5 weeks	18.2
6 weeks	17.5
7 weeks	11.6
8 weeks	9.1
9 weeks	2.7
10 weeks	2.2
More than 10 weeks	12.1
Total	100

#### 4. Discussion

The results of this study show that most survey respondents were not prepared to evacuate when they had to leave their homes and communities. Many respondents were not aware of the very high wildfire risk to their community, home or family preceding May 3rd, and social cues told them to carry on as usual leading up to and on May 3rd, with schools and businesses open. For most respondents, this was their first evacuation experience. Many respondents received little if any official warning before they had to leave and instead left due to the environmental cues which made it clear that the threat was immediate. However some received warnings from official sources, friends and family, and other sources. Most respondents were able to take clothing and many took important documents, however only  $\frac{1}{4}$  of respondents mentioned bringing food and water. Fortunately, most respondents had a vehicle that they used to evacuate, but some respondents relied on others to enable them to leave. Some of those who had a vehicle experienced situational impediments due to road access problems and traffic congestion. Some respondents ran out of gas, food, and water on the long drive away from Fort McMurray. For many survey respondents, the evacuation was a multi-stage process involving staying in more than one location. Most survey respondents stayed with friends and family during at least one part of the evacuation. Although most respondents were looked after once they arrived in a safe place, some respondents experienced financial difficulties, challenges finding suitable accommodation, and problems dealing with insurance. Although media coverage of this wildfire and evacuation was extensive, some respondents did not receive enough information. Most survey respondents received help during this evacuation from a variety of sources throughout the evacuation, which helped them to leave their home and community, reach a safe place, and meet their essential needs (food, water, clothing, and accommodation) during the evacuation. The help provided to survey respondents was remembered as a positive part of their evacuation experience.

The results that many respondents rated the wildfire risk to their community, property, or family as low to moderate before May 3rd is surprising due to the conditions leading up to the start of this wildfire, and studies which indicate that residents living in high wildfire risk areas are usually aware of the risk [31–33]. Whittaker and colleagues [9] found a high level of awareness preceding the 2009 Black Saturday fires in Victoria, Australia, however this is likely partly due to extensive media coverage to warn residents of the extreme fire risk [34]. In Fort McMurray, social cues indicated that survey respondents should carry on as usual. The importance of early warnings for protecting lives and reducing injuries is well established in the broader hazards [35–37] and in the wildfire literature [38,39]. Very limited if any warning time provided to residents due to a wildfire also occurred five years earlier in northern Alberta when residents of the Town of Slave Lake received little if any warning when a wildfire entered their town in 2011 [40]. McLennan and colleagues [18] also found that residents in Australia who planned to evacuate had a low level of preparedness.

The results of this study show that evacuees' low levels of preparedness combined with long traffic delays [30] made it difficult for people to evacuate, and increased residents' distress as they were leaving and once they arrived in a safe place. Despite leaving late and traffic delays, survey respondents reported courteous driving on the way out of Fort McMurray, in line with research which shows that panic behaviour is very unlikely to occur, particularly if people are evacuating with people who are familiar to them including family, friends, and neighbours [41–43]. The findings that almost 40% of survey respondents brought pets with them when they evacuated, and some respondents had difficulty finding accommodation that would enable their pets to stay with them confirms the need to identify ways to look after pets during evacuations [44].

Those survey respondents who were not prepared fortunately received support from others to meet their basic needs, including transportation out of Fort McMurray, food, water, clothing, and accommodation. Existing studies clearly show that residents and organizations within an area affected by a wildfire [45,46] and other hazard events [47] provide important sources of help to those directly affected. For example, Carroll and colleagues [45] found that after the Rodeo-Chediski fire in the U.S., residents helped neighbours by providing shelter and support. In this case, the substantial amount of help provided to evacuees from residents in other communities within RMWB, elsewhere in Alberta, and beyond may be due to the number of people who evacuated, the extensive use of social media and media coverage of this wildfire [48].

## 5. Conclusions

The Horse River (Fort McMurray) wildfire caused the largest wildfire evacuation in Canadian history. The results of this study show that many survey respondents received little if any warning, and were not aware of the wildfire risk and potential need to evacuate, which meant that most were not prepared to leave and instead needed to rely on residents, communities, and service providers to meet their essential needs. The non-random sampling approach in this study means that the results presented in this paper cannot be generalized to the whole population of RMWB that evacuated due to the May 2016 Horse River wildfire. The use of an online survey distributed through social media meant that some people who do not use social media would not have been able to participate. However, the results provide important insights into whether residents were prepared before they had to evacuate due to this wildfire, and the experiences of evacuees leaving their home, travelling to a safe place, and staying elsewhere during the evacuation that lasted one month or longer. Additional research would be useful in several areas. Further examination of the helping behaviours that occurred during the Horse River wildfire would be a valuable contribution. Research on the experiences of evacuation host communities—those communities where residents stay during evacuation—would also be very valuable.

Despite the limitation of the sampling approach used for this study, there are important implications for authorities. The results of this study clearly show the need to increase the wildfire risk awareness of residents living in Fort McMurray, the surrounding Regional Municipality of Wood Buffalo, and in other communities at high risk from wildfires. Increased awareness will help to encourage residents to prepare [20]. The results of this study also reinforce the importance of providing timely warnings. The Government of Canada recommends that residents are prepared for 72 h after an emergency. Although a few survey respondents had an evacuation kit and many took enough clothing for 3 days and important documents, many survey respondents were not adequately prepared. Further efforts should be made to increase preparedness of residents living in high risk communities.

**Funding:** This research received no external funding.

**Acknowledgments:** My sincere thanks to the hundreds of evacuees who completed the online survey while many were still evacuated and others had returned home and were in the early stages of the recovery process. Thank you to Leah Anderson who prepared the online survey, and to Fort McMurray Evac Relocation Help Group and others who posted the survey link on social media. Thank you to Miles Parenteau for assistance with Figure 1,

Khan Rahaman for preparing Figure 2, and two anonymous reviewers whose comments helped to improve this paper.

**Conflicts of Interest:** The author declares no conflict of interest.

## References

1. Cohn, P.J.; Carroll, M.S.; Kumagai, Y. Evacuation behavior during wildfires: Results of three case studies. *West. J. Appl. For.* **2006**, *21*, 39–48. [[CrossRef](#)]
2. Cote, D.W.; McGee, T.K. An exploration of residents' intended wildfire evacuation responses in Mt. Lorne, Yukon, Canada. *For. Chron.* **2014**, *90*, 498–502. [[CrossRef](#)]
3. Mozumder, P.; Raheem, N.; Talberth, J.; Berrens, R.P. Investigating intended evacuation from wildfires in the wildland-urban interface: Applications of a bivariate probit model. *For. Policy Econ.* **2008**, *10*, 415–423. [[CrossRef](#)]
4. Paveglio, T.; Prato, T.; Dalenberg, D.; Venn, T. Understanding evacuation preferences and wildfire mitigations among Northwest Montana residents. *Int. J. Wildland Fire* **2014**, *23*, 435–444. [[CrossRef](#)]
5. McCaffrey, S.; Wilson, R.; Konar, A. Should I Stay or Should I Go Now? Or Should I Wait and See? Influences on Wildfire Evacuation Decisions. *Risk Anal.* **2018**, *37*, 1390–1404. [[CrossRef](#)] [[PubMed](#)]
6. McGee, T.K.; Mishkeegogamang Ojibway Nation; Christianson, A.C. Residents' wildfire evacuation actions in Mishkeegogamang Ojibway Nation, Ontario, Canada. *Int. J. Dis. Risk Reduct.* **2019**, *33*, 266–274. [[CrossRef](#)]
7. McLennan, J.; Elliott, G.; Omodei, M. Householder decision-making under imminent wildfire threat: Stay and defend or leave? *Int. J. Wildland Fire* **2012**, *21*, 915–925. [[CrossRef](#)]
8. McLennan, J.; Elliott, G.; Omodei, M.; Whittaker, J. Household safety-related decisions, plans, actions and outcomes during the 7 February 2009 Victorian (Australia) wildfires. *Fire Saf. J.* **2013**, *61*, 175–184. [[CrossRef](#)]
9. Whittaker, J.; Haynes, K.; Handmer, J.; McLennan, J. Community safety during the 2009 Australian 'Black Saturday' bushfires: An analysis of household preparedness and response. *Int. J. Wildland Fire* **2013**, *22*, 841–849. [[CrossRef](#)]
10. Afifi, W.A.; Felix, A.D.; Afifi, T.D. The impact of uncertainty and communal coping on mental health following natural disasters. *Anxiety Stress Coping Int. J.* **2012**, *25*, 329–347. [[CrossRef](#)] [[PubMed](#)]
11. Kent, B.; Gebert, K.; McCaffrey, S.; Martin, W.; Calkin, D.; Schuster, E.; Martin, I.; Bender, H.W.; Alward, G.; Kumagai, Y.; et al. *Social and Economic Issues of the Hayman Fire*; Gen Tech Rep RMRS-GTR-114; USDA: Fort Collins, CO, USA, 2003; pp. 315–396.
12. Felix, E.D.; Afifi, W. The role of social support on mental health after multiple wildfire disasters. *J. Community Psychol.* **2015**, *43*, 156–170. [[CrossRef](#)]
13. Scharbach, J.; Waldram, J.B. Asking for a Disaster: Being "At Risk" in the Emergency Evacuation of a Northern Canadian Aboriginal Community. *Hum. Organ.* **2016**, *75*, 59–70. [[CrossRef](#)]
14. Asfaw, H.W.; Sandy Lake First Nation; McGee, T.K.; Christianson, A.C. Evacuation preparedness and the challenges of emergency evacuation in Indigenous communities in Canada: The case of Sandy Lake First Nation, Northern Ontario. *Int. J. Disaster Risk Reduct.* **2019**. [[CrossRef](#)]
15. McCool, S.F.; Burchfield, J.A.; Williams, D.R.; Carroll, M.S. An event-based approach for examining the effects of wildland fire decisions on communities. *Environ. Manag.* **2006**, *37*, 437–450. [[CrossRef](#)] [[PubMed](#)]
16. Stidham, M.; Toman, E.; McCaffrey, S.M.; Schindler, B. Improving an inherently stressful situation: The role of communication during wildfire evacuations. In *Proceedings of the Second Conference on the Human Dimensions of Wildland Fire*; McCaffrey, S.M., Fisher, C.L., Eds.; Gen. Tech. Rep. NRS-P-84; US Department of Agriculture, Forest Service, Northern Research Station: Newtown Square, PA, USA, 2011; pp. 96–103.
17. McGee, T.; Eriksen, C. Defensive Actions and People Preparedness. In *Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires*; Springer: Cham, Switzerland, 2018. [[CrossRef](#)]
18. McLennan, J.; Paton, D.; Wright, L. At-risk householders' responses to potential and actual bushfire threat: An analysis of findings from seven Australian post-bushfire interview studies 2009–2014. *Int. J. Wildland Fire* **2015**, *12*, 319–327. [[CrossRef](#)]
19. McNeill, I.M.; Dunlop, P.D.; Heath, J.B.; Skinner, T.C.; Morrison, D.L. Expecting the Unexpected: Predicting the Physiological and Psychological Wildfire Preparedness from Perceived Risk, Responsibility, and Obstacles. *Risk Anal.* **2013**, *33*, 1829–1843. [[CrossRef](#)] [[PubMed](#)]

20. Lindell, M.K.; Perry, R.W. The protective Action Decision Model: Theoretical Modifications and Additional Evidence. *Risk Anal.* **2012**, *32*, 616–632. [[CrossRef](#)] [[PubMed](#)]
21. Statistics Canada. Alberta [Province] and Canada [Country] (Table. Census Profile. 2016 Census. Statistics Canada Catalogue No. 98-316-X2016001. Ottawa. Released 29 November 2017. Available online: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E> (accessed on 5 December 2018).
22. KPMG. *May 2016 Wood Buffalo Wildfire Post-Incident Assessment Report*; Prepared for Alberta Emergency Management Agency; Final Report; KPMG: Amstelveen, The Netherlands, 2017.
23. KPMG. *Regional Municipality of Wood Buffalo Lessons Learned and Recommendations from the 2016 Horse River Wildfire*; Final Report; KPMG: Amstelveen, The Netherlands, 27 July 2017.
24. MNP. *A Review of the 2016 Horse River Wildfire: Alberta Agriculture and Forestry Preparedness and Response*; MNP: Edmonton, AB, Canada, 2017.
25. Evans, J.R.; Mathur, A. The value of online surveys: A look back and a look ahead. *Internet Res.* **2018**. [[CrossRef](#)]
26. McGee, T.; McFarlane, B.; Tymstra, C. Wildfire: A Canadian Perspective. In *Wildfire Hazards, Risks, and Disasters*; Paton, D., Ed.; Elsevier: Amsterdam, The Netherlands, 2015. [[CrossRef](#)]
27. Schmitte, B. (Government of Alberta, Fort McMurray, Canada). Personal communication, 2019.
28. Bereska, W. *Fort McMurray Wildfire Management Area Wildfire Hazard and Risk Analysis and FireSmart Vegetation Mitigation Priorities*; Wildfire Consulting; Alberta Environment and Sustainable Resource Development: Edmonton, AB, Canada, 2013.
29. Landis, M.S.; Edgerton, E.S.; White, E.M.; Wentworth, G.R.; Sullivan, A.P.; Dillner, A.M. The impact of the 2016 Fort McMurray Horse River Wildfire on ambient air pollution levels in the Athabasca Oil Sands Region, Alberta, Canada. *Sci. Total Environ.* **2018**, *618*, 1665–1676. [[CrossRef](#)] [[PubMed](#)]
30. McGee, T.K. Residents' Experiences of the 2016 Fort McMurray Wildfire. Presented at Advances in Forest Fire Research 2018, Coimbra, Portugal, 9–16 November 2018. [[CrossRef](#)]
31. McCaffrey, S.; Toman, E.; Stidham, M.; Shindler, B. Social science research related to wildfire management: An overview of recent findings and future research needs. *Int. J. Wildland Fire* **2013**, *22*, 15–24. [[CrossRef](#)]
32. McCaffrey, S.M. Community wildfire preparedness: A global state-of-the-knowledge summary of social science research. *Curr. For. Rep.* **2015**, *1*, 81–90. [[CrossRef](#)]
33. Langer, E.R.; McGee, T.K. Wildfire risk awareness and prevention by predominantly Maori rural residents, Karikari Peninsula, Aotearoa New Zealand. *Int. J. Wildland Fire* **2017**, *26*, 820–828. [[CrossRef](#)]
34. Handmer, J.; O'Neill, S. Examining bushfire policy in action: Preparedness and behaviour in the 2009 Black Saturday fires. *Environ. Sci. Policy* **2016**, *63*, 55–62. [[CrossRef](#)]
35. Quarantelli, E.L. Perceptions and reactions to emergency warnings of sudden hazards. *Ekistic* **1984**, *s51*, 511–515. Available online: <https://www.jstor.org/stable/43621919> (accessed on 5 March 2019).
36. Mileti, D.S.; Sorensen, J.H. *Communication of Emergency Public Warnings: A Social Science Perspective and State-of-the-Art Assessment*; Technical Report ORNL-6609; Federal Emergency Management Agency: Washington, DC, USA, 1990. [[CrossRef](#)]
37. Ebi, K.L.; Schmier, J.K. A Stitch in Time: Improving Public Health Early Warning Systems for Extreme Weather Events. *Epidemiol. Rev.* **2005**, *27*, 115–121. [[CrossRef](#)] [[PubMed](#)]
38. Cao, Y.; Boruff, B.J.; McNeill, I.M. Is a picture worth a thousand words? Evaluating the effectiveness of maps for delivering wildfire warning information. *Int. J. Disaster Risk Reduct.* **2016**, *19*, 179–196. [[CrossRef](#)]
39. Cao, Y.; Boruff, B.J.; McNeill, I.M. The smoke is rising but where is the fire? Exploring effective online map design for wildfire warnings. *Nat. Hazards* **2017**, *88*, 1473–1501. [[CrossRef](#)]
40. KPMG. *Lesser Slave Lake Regional Urban Interface Wildfire—Lessons Learned Final Report*; KPMG: Amstelveen, The Netherlands, 6 November 2012. Available online: <http://www.aema.alberta.ca/documents/0426-Lessons-Learned-Final-Report.pdf> (accessed on 5 March 2019).
41. Perry, R.W.; Lindell, M.K. Understanding Citizen Response to Disasters with Implications for Terrorism. *J. Conting. Crisis Manag.* **2003**, *11*, 49–60. [[CrossRef](#)]
42. Mawson, A.R. Understanding Mass Panic and Other Collective Responses to Threat and Disaster. *Psychiatry Interpers. Biol. Process.* **2005**, *68*, 95–113. [[CrossRef](#)]
43. Gantt, P.; Gantt, R. Disaster Psychology: Dispelling the Myths of Panic. *Prof. Saf.* **2012**, *57*, 42–49.



44. Onukem, M. Assessment of emergency/disaster preparedness and awareness for animal owners in Canada. *Int. J. Emerg. Serv.* **2016**, *5*, 212–222. [[CrossRef](#)]
45. Carroll, M.S.; Cohn, P.J.; Seesholtz, D.N.; Higgins, L.L. Fire as a galvanizing and fragmenting influence on communities: The case of the Rodeo-Chediski fire. *Soc. Nat. Resour.* **2005**, *18*, 301–320. [[CrossRef](#)]
46. Gershgol, S.M.; Cantrell, L.; Mutrux, B. Disaster relief efforts of pharmacy students during California wildfires. *Am. J. Health-Syst. Pharm.* **2008**, *65*, 2006–2007. [[CrossRef](#)] [[PubMed](#)]
47. Whittaker, J.; McLennan, B.; Handmer, J. A review of informal volunteerism in emergencies and disasters: Definition, opportunities and challenges. *Int. J. Disaster Risk Reduct.* **2015**, *13*, 358–368. [[CrossRef](#)]
48. Boulianne, S.; Minaker, J.; Haney, T.J. Does compassion go viral? Social media, caring, and the Fort McMurray wildfire. *Inf. Commun. Soc.* **2018**, *21*, 697–711. [[CrossRef](#)]



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