

Wildfire Evacuation Planning: Insights from Communities in Alberta and British Columbia

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INTRODUCTION

Canadian communities in recent years have experienced severe and intense wildfires. In 2023 alone, wildfires burned 2.2 million hectares in Alberta, far exceeding the average annual area burned in the province over the previous two decades (Beverly and Schroeder, 2024). In addition, British Columbia experienced four of the most severe wildfire seasons of the last century in 2017, 2018, 2021, and 2023 (Parisien et al., 2023). This challenge necessitates preparedness and effective evacuation strategies to ensure safety among residents and to minimize the potential loss of life and property during future wildfire events.

This brief presents a profile of five communities in Alberta and British Columbia that have previously been affected by wildfires and/or are prone to experiencing wildfire events in the future. The report offers community-specific insights into evacuation decisions, preparedness, and logistical considerations during wildfire events. By understanding the specific needs and behaviors of these communities, policymakers, emergency management officials, and community leaders can tailor evacuation strategies to better meet the challenges posed by future wildfire events.

METHODOLOGY

An online survey was conducted from June to December 2023 to gather information on wildfire evacuation decisions and preparedness among residents of select communities in Alberta and British Columbia. Communities chosen for this research were: Nelson, Quesnel, and Salmon Arm in British Columbia, and Whitecourt and Canmore in Alberta. To obtain participants for this study, assistance was received from fire departments and city officials who distributed the survey to residents through social media pages, official newsletters, local news channels, and community events. The final sample consisted of 1497 respondents.

DEMOGRAPHIC OVERVIEW

The survey revealed a balanced age distribution among participants, with a median age of 51 and an age range of 18 to 90. 23.9% of respondents were young adults (18-35 years) and 25.5% were older adults (65+ years). More than half of the respondents identified as women (56.8%), 41% identified as men, and other genders (non-binary, transgender, two-spirit) comprised 1.3% of the respondents. A large majority of the survey respondents were white (82.4%) and only 5.5% were visible minorities. In addition, 39.7% of the participants reported having a disability, a high percentage being those with pain-related disabilities (9.8%). With regard to household income, 40% of the respondents had an income of \$100,000 or more, 31% had an income between \$50,000 and \$99,999, and 21.8% had an income less than \$50,000. A significant majority (77.4%) had higher education degrees (i.e., diploma/4-year/graduate/doctorate) and 62.2% were employed (full-time/part-time). 50% of the respondents lived in a single-family home, and a majority of the respondents (80.7%) owned their residences. A large majority owned at least one vehicle (96.3%) and only 3.2% were carless. Overall, while some demographic groups were underrepresented (e.g., visible minorities and carless residents), the sample contained a relatively diverse mix of participants and enabled us to obtain valuable insights from each community.



Wildfires burning in Kelowna, British Columbia in 2023
(Benjamin Hefford, with permission)

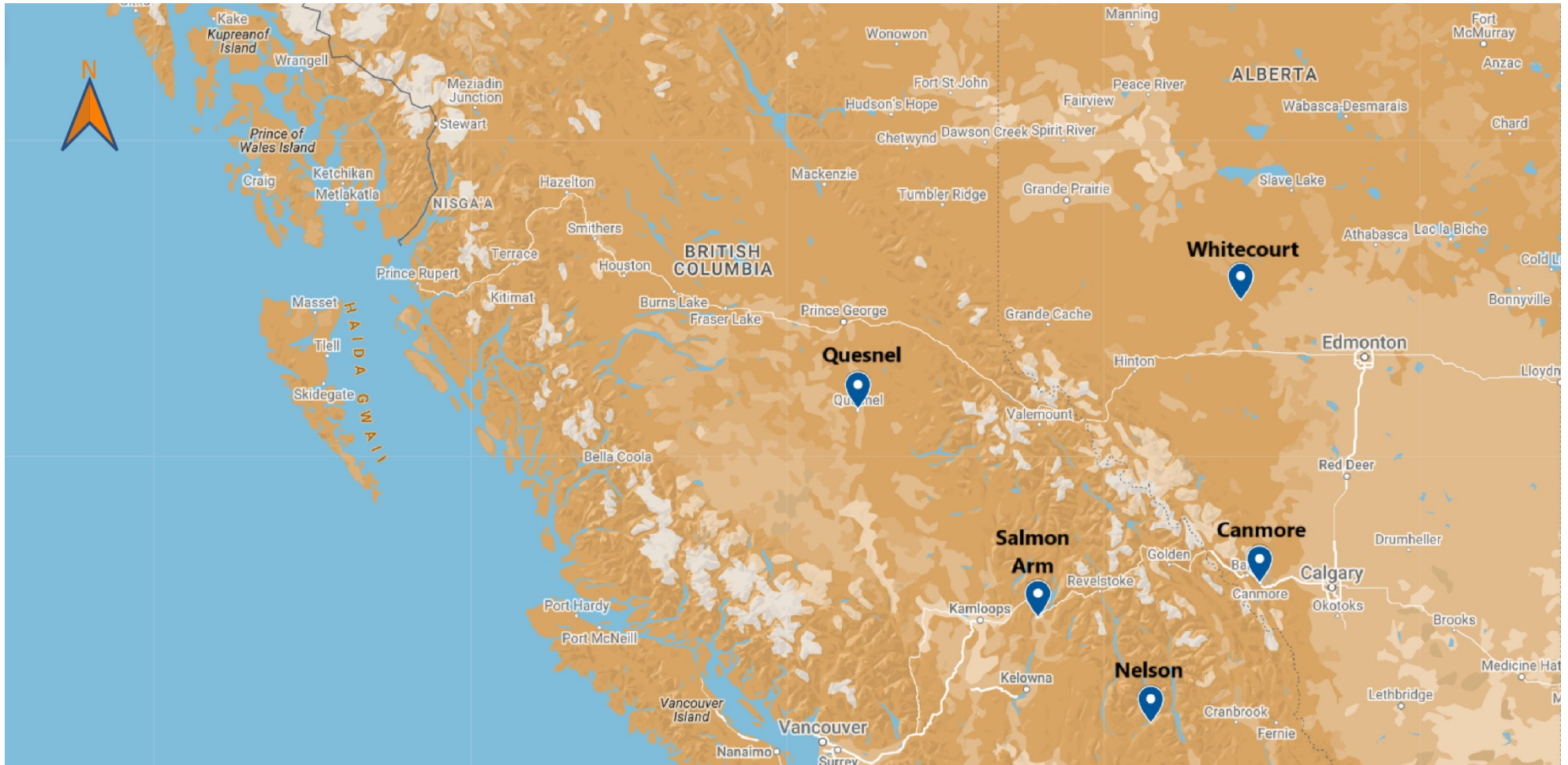


Figure 1. Map highlighting the 5 communities: Nelson, Quesnel, Salmon Arm, Whitecourt, and Canmore

COMMUNITY PROFILE: NELSON



Town of Nelson from The Great Northern Rail Train (Stephen Wong, with permission)

In Nelson, we received responses from 236 individuals. Of these, 214 were full-time residents, 16 were part-time residents, and 6 were visitors. To obtain an understanding of general evacuation behavior during a wildfire event, the survey first asked participants whether they would evacuate after receiving a mandatory order, and second, whether they would evacuate promptly. We found that 98% of respondents from Nelson would evacuate and 88% would do so promptly. While a majority would evacuate, only 32% reported that they were very/mostly prepared. More than half of the respondents (56%) indicated being somewhat/a little prepared, and 11% indicated that they were not prepared for an evacuation at all.

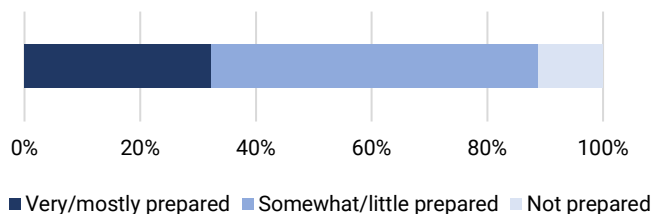


Figure 2. Preparedness levels – Nelson (n=232).

The survey further asked participants to consider where they expected to hear about mandatory evacuation orders. A summary of the results is presented in **Table 1**. Respondents primarily expected to receive texts containing mandatory evacuation information from the government (84%).

Table 1. Evacuation information channels and sources (n=236) (select all that apply)

	<i>Family/friends</i>	<i>Neighbours</i>	<i>Government</i>
<i>Text</i>	45%	35%	84%
<i>Phone call</i>	44%	31%	49%
<i>Conversation</i>	50%	56%	30%
<i>Social media</i>	39%	22%	60%

Apart from the sources listed in Table 1, respondents indicated other possible information sources they expected to receive evacuation information from. These are presented in **Table 2**. We found that 79% of the respondents from Nelson expected to receive evacuation information from the government through smartphone applications.

Table 2. Other evacuation information sources (n=236) (select all that apply)

	<i>Government</i>	<i>News outlet</i>
<i>Television</i>	51%	52%
<i>Radio</i>	58%	64%
<i>Website</i>	68%	55%
<i>Social media</i>	57%	51%
<i>Smartphone application</i>	79%	36%
<i>Billboard or road message sign</i>	60%	26%

We observed a generally balanced distribution of responses with regard to the time it would take respondents to prepare to leave their residence/accommodation during an evacuation. 23% would take less than 30 minutes, 28% would take 30 minutes to an hour, 29% would take one to two hours, and 19% would spend more than two hours preparing for an evacuation (see Figure 3).

As noted in Figure 4, a majority of the respondents from Nelson would use at least one personal vehicle (including an RV) to evacuate (91.8%). 2.5% would use public transit (bus or rail), 2.2% would use active modes (walking or biking), and 3.4% would carpool with non-household members. In addition, 19% of the respondents indicated that they would tow items behind their vehicle during an evacuation.

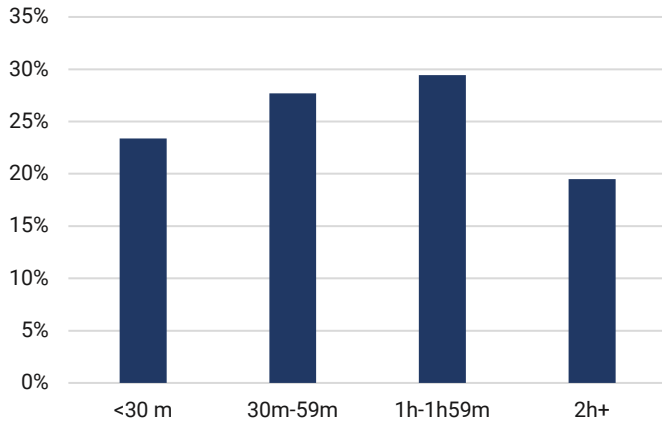


Figure 3. Evacuation prep time – Nelson (n = 231).

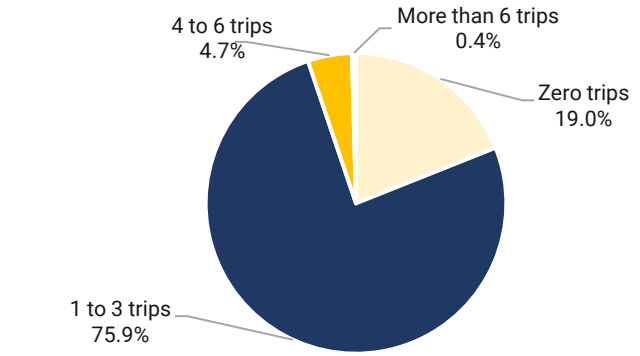


Figure 5. Number of vehicle trips – Nelson (n=232)

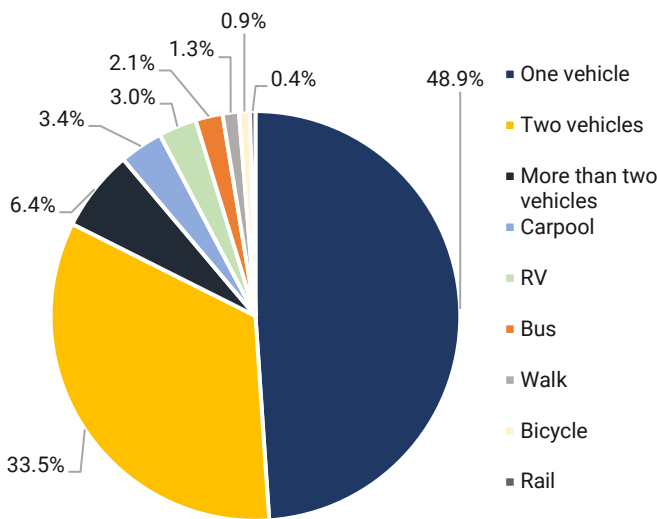


Figure 4. Evacuation mode choice – Nelson (n=233)

Consistent with the number of people using a personal vehicle to evacuate, we found that many of the respondents would make 1 to 3 vehicle trips prior to evacuating for purposes such as gathering supplies, picking up family members, or checking on neighbours.

Survey respondents from Nelson further indicated their evacuation destination locations. We present the most selected destination cities in **Table 3**. We found that many respondents selected Castlegar as a preferred evacuation destination (14.3%). This may be due to its geographical proximity to Nelson. Vancouver was the next most selected evacuation destination city (9.4%) followed by Calgary (8.9%).

Table 3. Destination cities selected by respondents from Nelson (n=203)

<i>Destination City</i>	<i>%</i>
Castlegar	14.3%
Vancouver	9.4%
Calgary	8.9%
Nelson	6.4%
Kelowna	5.4%
Balfour	2.5%
Cranbrook	2.5%
Rossland	2.5%
Salmo	2.5%
Canmore	2.0%
<i>Additional Cities (Direction relative to Nelson)</i>	
West (e.g., Victoria, Penticton, Surrey)	8.4%
East (e.g., Medicine Hat, Toronto, London)	5.9%
Northwest (e.g., Salmon Arm, Lacombe)	3.4%
North (e.g., Grand Prairie, Nakusp, Inuvik)	3.0%
Northeast (e.g., Edmonton, Camrose, Elnora)	3.0%
South (Ymir, Blewett, Bonnington)	1.5%
Southwest (e.g., Grand Forks, Osoyoos)	1.5%
Southeast (Creston)	0.5%
<i>Cities outside Canada</i>	
Cities in the United States	4.4%
Cities in other countries	1.5%

Using all the selected destinations, we sought to understand whether respondents from Nelson would evacuate to locations within the city, within the county, within the province (out of county), or outside the province. These results are summarized in Figure 6. We found that more respondents would evacuate outside the county but stay within the province of British Columbia (37.9%). This was followed by those who would evacuate to locations outside the province of British Columbia (29.6%).

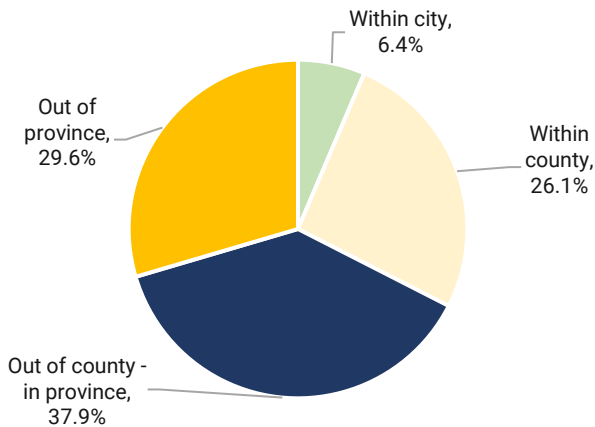


Figure 6. Direction of destination choice – Nelson (n=203)

In addition to destination locations, survey respondents further indicated what types of roads they would spend the most time on during an evacuation scenario. The results are summarized in Figure 7. We found that around half of the evacuees from Nelson would spend most of their time on highways (50%) followed by major roads (20%). This information, coupled with the respondents' destination choices, can help evacuation planners anticipate traffic flow and allocate resources efficiently to ensure that different types of transportation infrastructure are prepared to handle the expected volume of evacuees.

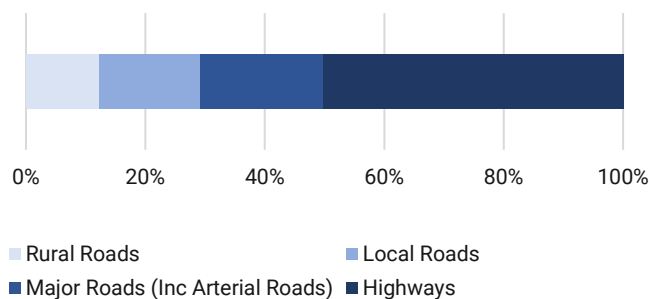


Figure 7. Types of roads evacuees will use (n=205)

Finally, respondents were asked about the type of shelter at their final evacuation destination. We noted a preference for private accommodations with many choosing to stay at a family residence (43%), a friend's residence (20%), a personal second residence (9%), a hotel/motel (9%), or an RV (8%). On the other hand, 7% selected a public shelter, 3% chose a community center, and 1% selected a short-term rental (e.g., Airbnb). The

preference for more private accommodation may be motivated by factors such as familiarity, comfort, or cost savings.

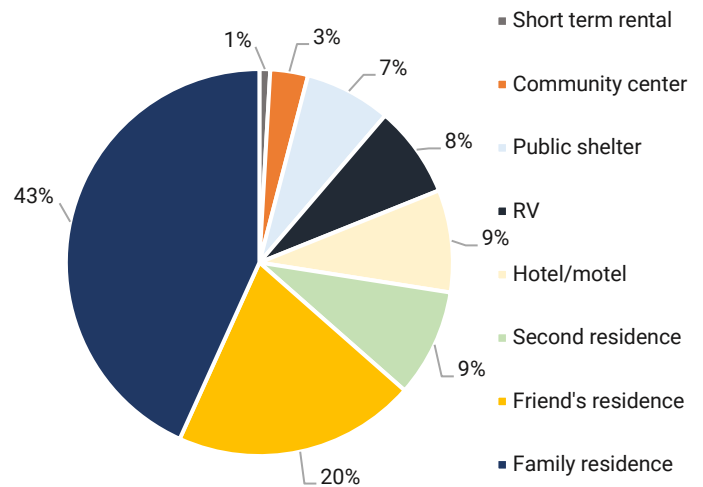


Figure 8. Shelter type at destination – Nelson (n=222)

RECOMMENDATIONS

1. Only 32% reported being very/mostly prepared. Community preparedness programs could help increase this number and reduce evacuation delays.
2. Respondents primarily expected to receive evacuation information from government texts, social media, and smartphone applications. Evacuation communication strategies should leverage these channels effectively.
3. Public transit should remain a viable option during wildfire events as 2.5% indicated this as their primary evacuation mode.
4. Many respondents from Nelson would evacuate to Castlegar, Vancouver, or Calgary. Moreover, a majority indicated highways as their primary evacuation route choice. Highways connecting Nelson to these cities should be prepared to receive increased traffic flow during evacuations. Measures such as contraflow may be considered to manage congestion.
5. Some respondents from Nelson would stay at public shelters and community centers at their final evacuation destinations. Enhancing these facilities in key host communities can ensure comfort and promote usage during emergencies.

COMMUNITY PROFILE: QUESNEL



Aerial of downtown Quesnel (City of Quesnel, with permission)

We received 187 respondents from Quesnel. Of these, 175 lived in the community full-time, 8 resided in Quesnel part-time, and 4 were visitors. Of the 187 respondents, 185 would evacuate once they received a mandatory evacuation order (98.9%). Moreover, 87% of the respondents would evacuate promptly. While most of the respondents would evacuate during an emergency, only 34% reported being very/mostly prepared. On the other hand, more than half indicated being somewhat/little prepared, and 14% reported not being prepared for an evacuation (Figure 10).

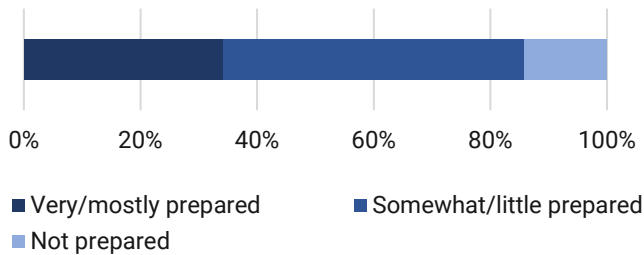


Figure 9. Preparedness levels – Quesnel (n=184)

In our survey, respondents from Quesnel further indicated from where they expected to receive mandatory evacuation orders. We summarize this information in **Table 4**. Similar to Nelson, many respondents from Quesnel expected to receive texts containing evacuation information from the government (82%). This was followed by government-run social media pages (72%), texts from family/friends (51%), and conversations with neighbours (51%).

Table 4. Evacuation information channels and sources (n=187) (select all that apply)

	<i>Family/friends</i>	<i>Neighbours</i>	<i>Government</i>
<i>Text</i>	51%	34%	82%
<i>Phone call</i>	50%	29%	45%
<i>Conversation</i>	50%	51%	32%
<i>Social media</i>	43%	22%	72%

When asked what other sources of information they expected to receive mandatory evacuation orders (**Table 5**), a majority of the respondents from Quesnel selected government-issued smart phone application alerts (76%) as well as official government websites (72%).

Table 5. Other evacuation information sources (n=187) (select all that apply)

	<i>Government</i>	<i>News outlet</i>
<i>Television</i>	61%	66%
<i>Radio</i>	58%	62%
<i>Website</i>	72%	53%
<i>Social media</i>	67%	53%
<i>Smartphone application</i>	76%	43%
<i>Billboard or road message sign</i>	57%	24%

When respondents were asked about how long it would take to leave their residences/accommodations after receiving a mandatory order, a majority reported at least one hour (54%) with 28% taking between 1 and 2 hours, and 26% taking 2 hours or longer. On the other hand, 26% would use between 30 minutes and an hour, and only 20% would take less than 30 minutes (Figure 11).

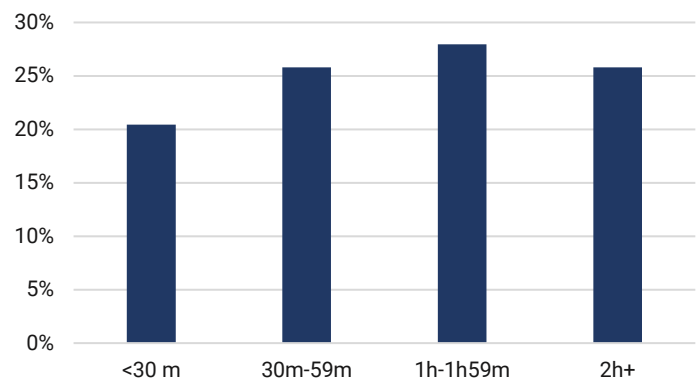


Figure 10. Preparation time – Quesnel (n=186)

We noted that a majority of the respondents from Quesnel would use a personal vehicle to evacuate during an emergency scenario (94.5%), with 44.3% taking two vehicles, 37.7% using one vehicle, 7.7% using more than

two vehicles, and 4.9% taking an RV. On the other hand, 2.2% would opt to take a bus and a similar number would carpool with non-household members. Only 1% reported using active transportation to evacuate. In addition, we found that a significant number of evacuees from Quesnel would tow items behind their vehicles (41%).

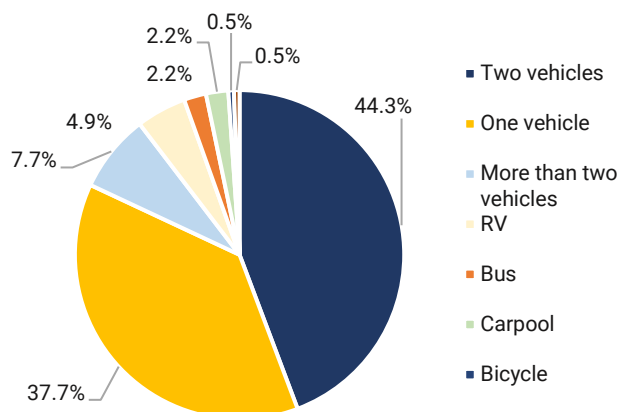


Figure 11. Evacuation transportation modes – Quesnel (n=183)

Many respondents from Quesnel would take at least one vehicle trip before an evacuation for activities such as gathering supplies, picking up family members, or checking in on their neighbours. We found that 83% of the respondents would take 1 to 3 trips, 5% would take 4 to 6 trips, and 2% would take more than 6 trips (Figure 12).

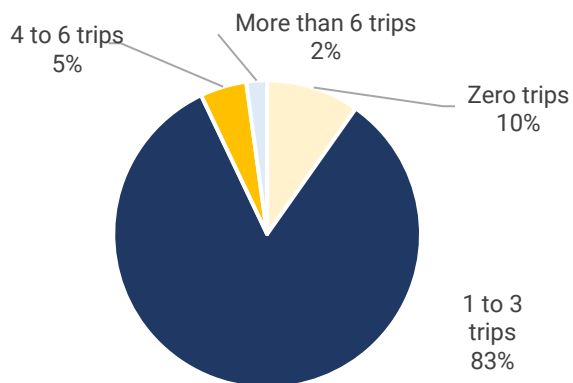


Figure 12. Number of vehicle trips before evacuating – Quesnel (n=184)

The survey further asked respondents from Quesnel to indicate their evacuation destination locations. We present a summary of the most selected destination cities in Table 6. We noted that a majority of the

respondents selected areas in Prince George (27.3%). 8.1% would evacuate to Kamloops whereas 5.6% would stay in Quesnel. In general, we found that most of the residents would stay in the province of British Columbia while a few indicated evacuating to cities such as Calgary (5%) or Edmonton (3.1%) in Alberta.

Table 6. Destination cities selected by respondents from Quesnel (n=161)

<i>Destination City</i>	<i>%</i>
Prince George	27.3%
Kamloops	8.1%
Quesnel	5.6%
Vancouver	5.6%
Calgary	5.0%
Williams Lake	3.7%
Edmonton	3.1%
Kelowna	3.1%
<i>Additional Cities (Direction relative to Quesnel)</i>	
South (e.g., Abbotsford, Penticton, Burnaby)	13.7%
Southeast (e.g., Salmon Arm, Vernon, Salmo)	10.6%
East (e.g., Toronto, Ottawa, Regina)	5.6%
Southwest (e.g., Vancouver Island, Campbell River)	2.5%
Northeast (Innisfail, Fairview)	1.9%
Northwest (Mackenzie, Vanderhoof)	1.2%
West (Terrace, Burns Lake)	1.2%
<i>Cities outside Canada</i>	
Cities in the United States	1.2%
Cities in other countries	0.6%

To gain a better understanding of the direction of evacuation destinations, we categorized the provided location information into 4: within city, within county, within province (out of county), and out of province. We found that a majority would evacuate outside their respective counties but stay within the province of British Columbia (68.9%). Results are summarized in Figure 13.

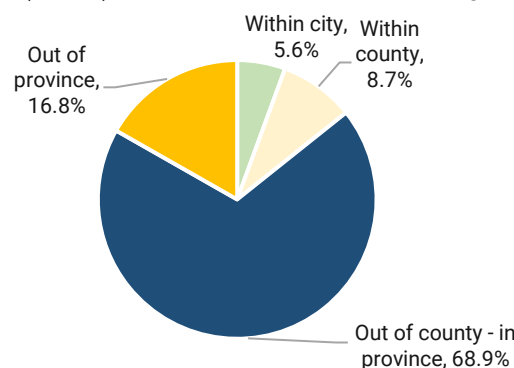


Figure 13. Direction of evacuation destination (n=161)

In addition to information on destination locations, respondents further indicated what types of roads they were likely to spend the most time on during their evacuation trip. Almost half of the respondents reported that they would spend most of their evacuation trips on highways (49%). This was followed by major roads (26%), local roads (15%), and rural roads (10%).

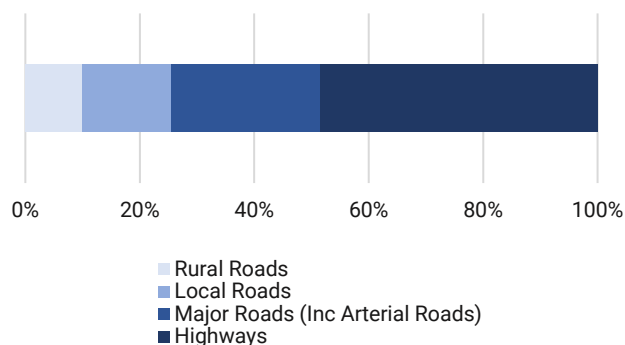


Figure 14. Types of roads evacuees will use – Quesnel (n=169).

Finally, respondents were asked to indicate the types of shelters they would stay in at their final evacuation destinations. Similar to the city of Nelson, we noted that a significant number of evacuees would choose more private accommodations. For example, 45% would stay at a family member’s residence, followed by an RV (18%), a friend’s residence (11%), or a hotel/motel (9%). On the other hand, we found that few would stay in government-provided accommodations (5% would stay at a community center and only 3% would stay at a public shelter).

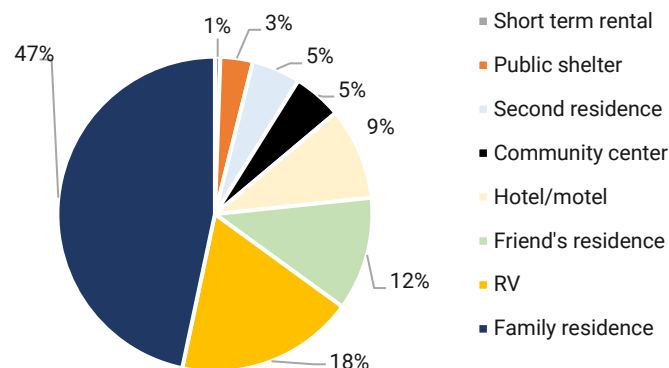


Figure 15. Types of shelters at the final destination – Quesnel (n=180).

RECOMMENDATIONS

1. Community preparedness programs could help increase evacuation preparedness among residents of Quesnel.
2. Government texts and social media were the most preferred sources of mandatory evacuation orders. As such, official information channels should be prioritized in evacuation communication strategies. Additionally, neighbourhood networks such as community leagues can be used to share evacuation information as respondents also expected to receive information through conversations with neighbours.
3. Over 90% of the respondents would use personal vehicles and 41% indicated that they would tow behind their vehicles. Roads (especially highways) should be prepared to handle high volumes of vehicles and towed items.
4. 27.3% of respondents from Quesnel would evacuate to Prince George. Given the anticipated high vehicle usage and towing rates during a wildfire evacuation, highways connecting Quesnel to Prince George should be well prepared. Strategies such as contraflow lanes and routing guidance could address capacity challenges and mitigate potential congestion issues.
5. 8% of the respondents would use government-issued shelters and 1% would use short-term rentals. Emergency officials should ensure that these facilities are equipped with adequate resources (e.g., comfortable sleeping arrangements, sufficient privacy) to accommodate evacuees.

COMMUNITY PROFILE: SALMON ARM



Aerial of Salmon Arm from Mount Ida (Province of British Columbia, [CC BY-NC-ND 2.0](#))

Our survey received 322 responses from Salmon Arm. Of these, 276 lived in the community full-time, 23 resided in Salmon Arm part-time, and 23 were visitors. To understand wildfire evacuation behavior, respondents were first asked whether they would evacuate given a mandatory order. A significant majority reported that they would evacuate with 86% indicating that they would evacuate promptly. Respondents further reported their evacuation preparedness levels at the time they completed the survey. We found that more than half (58%) were somewhat/a little prepared, 34% were very/mostly prepared, and 9% were not at all prepared.

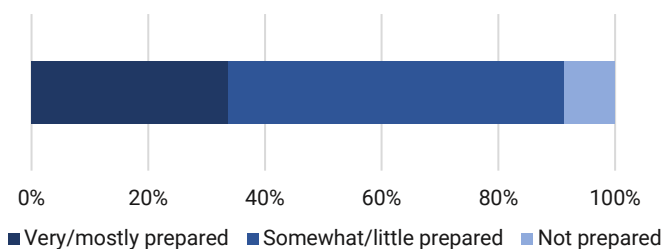


Figure 16. Preparedness levels – Salmon Arm (n=311)

In addition, respondents were asked to consider where they expected to receive information about a mandatory evacuation order. Similar to the pattern observed in Quesnel, survey participants from Salmon Arm primarily expected to receive information on mandatory evacuation orders from government-issued texts (73%). This was

followed by government-run social media platforms (66%), and conversations with neighbours (53%) (Table 7). Similarly, when it came to other sources of evacuation information (Table 8), many respondents from Salmon Arm looked to the government expecting to receive information through smartphone applications (74%) and websites (73%).

Table 7. Evacuation information channels and sources (n=322) (select all that apply)

	Family/friends	Neighbours	Government
Text	44%	45%	73%
Phone call	44%	38%	43%
Conversation	45%	53%	36%
Social media	43%	30%	66%

Table 8. Other evacuation information sources (n=322) (select all that apply)

	Government	News outlet
Television	65%	60%
Radio	55%	60%
Website	73%	44%
Social media	64%	49%
Smartphone application	74%	42%
Billboard or road message sign	59%	24%

Respondents then indicated approximately how long it would take them to prepare to leave their residences/accommodations after deciding to evacuate. We found that a larger proportion would use less than 30 minutes to prepare for an evacuation (34%), 25% would use 30 minutes to an hour, 23% would take 1 to 2 hours, and 18% would take 2 hours or longer to prepare for an evacuation (Figure 17).

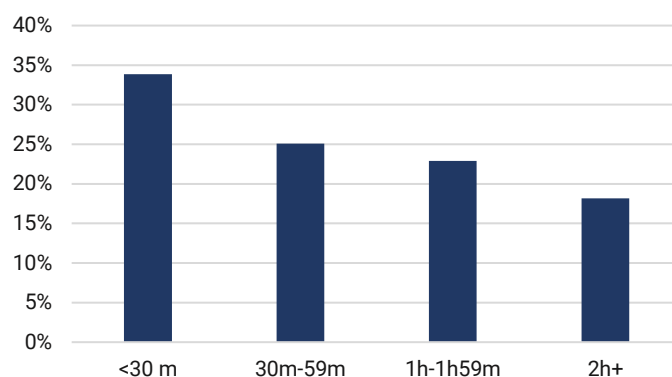


Figure 17. Evacuation prep time – Salmon Arm (n=319)

As Figure 18 indicates, a significant proportion of the respondents would use at least one personal vehicle/RV

to evacuate (93%). 2.6% would evacuate using a ride-sourcing/ride-hailing transportation mode (e.g., Uber, Lyft), 1.9% would carpool with non-household members, 1.6% would bike, and 1% would use public transit (bus/rail). In addition, 34% of the respondents from Salmon Arm reported that they would tow items behind their vehicles during their evacuation trip.

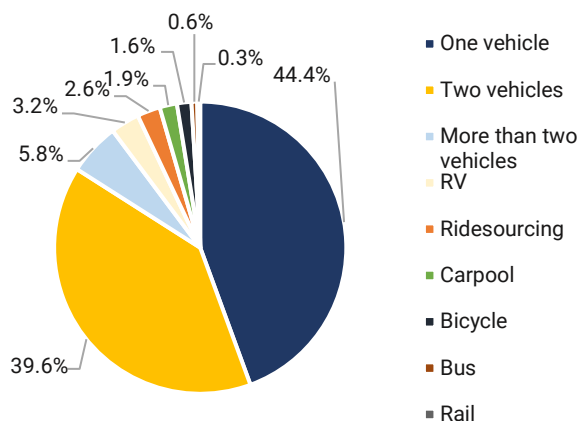


Figure 18. Evacuation transportation mode – Salmon Arm (n=313)

Survey respondents were asked to consider how many vehicle trips they would take before their final evacuation trip (reasons could include gathering supplies, picking up family members, or checking on neighbours). A large majority would take 1 to 3 trips (84%). 6% would take 4 to 6 trips and 1% would require more than 6 trips. On the other hand, 9% would not take any vehicle trips prior to their evacuation.

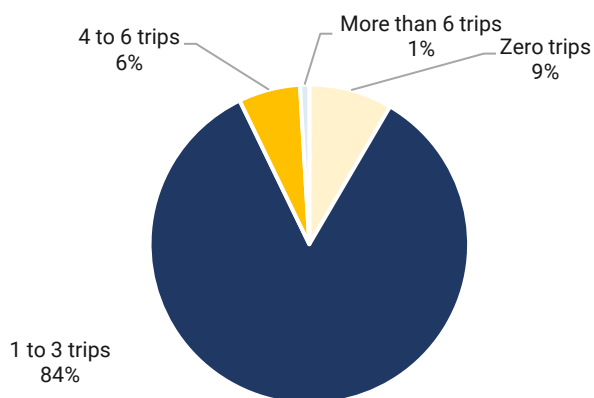


Figure 19. Vehicle trips prior to evacuating – Salmon Arm (n=320).

Survey respondents from Salmon Arm were further asked to provide the approximate location of their evacuation destination. Locations are presented in **Table 9**. We found that respondents equally favored Kamloops and Vancouver as destination cities (12.4% each). These were followed by Vernon (10%) and Kelowna (8.9%).

Table 9. Destination cities selected by respondents from Salmon Arm (n=291) (select all that apply)

<i>Destination City</i>	%
Kamloops	12.4%
Vancouver	12.4%
Vernon	10.0%
Kelowna	8.9%
Calgary	6.2%
Salmon Arm	5.5%
Victoria	4.5%
Surrey	3.4%
Sicamous	2.7%
Enderby	2.1%
<i>Additional Cities (Direction Relative to Salmon Arm)</i>	
Southwest (e.g., Chilliwack, Squamish, Nanaimo)	13.4%
East (e.g., Revelstoke, Canmore, Airdrie)	6.2%
North (e.g., Prince George, Tappen, Fort St. John)	3.1%
South (e.g., Penticton, West Kelowna, Castlegar)	3.1%
West (Parksville, Pritchard, Sorrento)	2.4%
Northeast (e.g., Edmonton, Spruce Grove, Wetaskiwin)	2.1%
Southeast (Lethbridge, Nakusp)	0.7%
Northwest (Williams Lake)	0.7%
<i>Cities outside Canada</i>	
Cities in the United States	0.3%

Using the provided location information, we further sought to understand the direction of evacuation destinations. As such, we categorized the destinations as follows: within city, within county, out of county (within the province), and out of province. We found that a majority of the respondents would evacuate out of their respective counties but stay within the province (74.6%). On the other hand, 7.9% would stay within the county, 12.0% would evacuate out of the province, and only 5.5% would stay within the city.

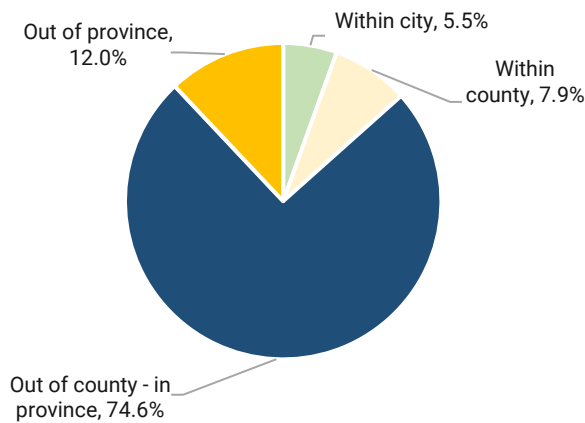


Figure 20. Direction of evacuation destinations – Salmon Arm (n=291)

Alongside information on their evacuation destinations, survey respondents in Salmon Arm also provided information on the types of roads they would use the most during an evacuation. Similar to the observed pattern in Nelson and Quesnel, we found that a higher proportion of evacuees from Salmon Arm would spend most of their travel time on highways (49%), followed by rural roads (25%), local roads (13%), and major roads (13%). This information could help evacuation planners and transportation agencies in Salmon Arm better anticipate traffic flow on specific road types based on the expected volume of evacuees.

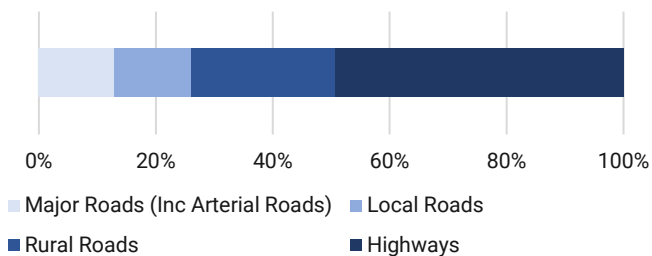


Figure 21. Types of roads evacuees will use (n=288)

Respondents were finally asked to consider the type of shelter they would stay in at their final evacuation destination. Almost half of the survey participants would stay at a family residence (46%). This was followed by more private accommodations such as a friend's residence (14%), an RV (13%), or a hotel/motel (9%). Government-provided shelters were selected by 10% of the respondents, with 7% selecting public shelters and 3% selecting community centers).

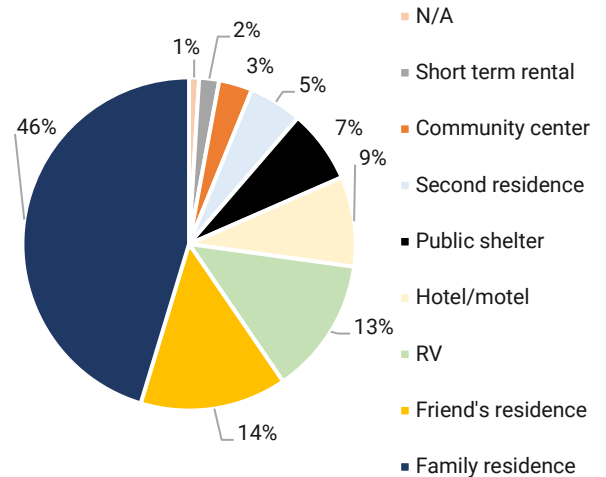


Figure 22. Shelter types at the final destination – Salmon Arm (n=309)

RECOMMENDATIONS

1. More than 90% of respondents would use at least one personal vehicle to evacuate. As such major routes, especially highways, should be prepared to handle high volumes of vehicles and towed items/trailers. Strategies could include contraflow lanes or staggered evacuation times to reduce congestion and improve traffic flow.
2. Compared to other communities, respondents from Salmon Arm showed a more diverse range of evacuation destination choices with a higher proportion evacuating to Kamloops, Vancouver, and Vernon. While highways were a primary route choice (49%), many would also use rural roads (25%). As such transportation agencies in these cities should develop traffic management evacuation plans to ensure that both highways and rural roads are prepared to handle high volumes of traffic during a wildfire evacuation.
3. Kamloops, Vancouver, and Vernon should be prepared to serve as host communities. Emergency management offices may consider collaborating with Airbnb and other short-term rental companies to increase sheltering options in these cities. Shelters should offer both comfort and sufficient privacy to promote usage.

COMMUNITY PROFILE: **WHITECOURT**



Aerial of residential neighbourhoods in Whitecourt (Town of Whitecourt, with permission)

We received 149 survey responses from Whitecourt. Of these, 142 lived in Whitecourt full-time, 2 respondents lived in the community part-time, and 5 were visitors. Out of the 149 respondents from Whitecourt, 148 would evacuate after receiving a mandatory order and only 1 respondent reported that they would not evacuate. Moreover, around 81% of the respondents would evacuate promptly. This suggests a high evacuation compliance among residents of Whitecourt. While we found that many from Whitecourt would evacuate, only 44% reported being very/mostly prepared for an evacuation. 43% were somewhat/a little prepared and 13% reported not being prepared for an evacuation at the time of survey completion.

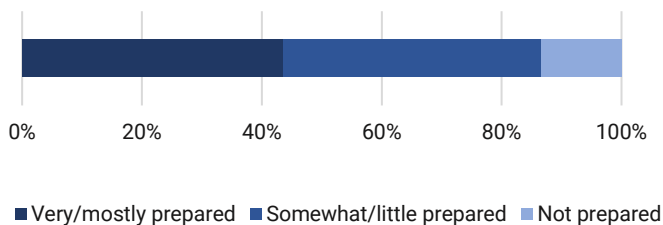


Figure 23. Preparedness levels – Whitecourt (n=149)

Survey respondents were asked where they expected to receive information on a mandatory evacuation order. We found that a significant majority expected to receive evacuation information through government-issued text messages (83%) followed by government-run social media pages (74%) (**Table 10**). Moreover, a large majority also expected to receive evacuation information from the government through smartphone applications (83%) (**Table 11**). This pattern may reveal a general trust in the

government among residents of Whitecourt. As such, government-run channels should be prioritized in evacuation communication strategies.

Table 10. Evacuation information channels and sources (n=149) (select all that apply)

	<i>Family/friends</i>	<i>Neighbours</i>	<i>Government</i>
<i>Text</i>	54%	32%	83%
<i>Phone call</i>	57%	25%	46%
<i>Conversation</i>	55%	51%	26%
<i>Social media</i>	44%	26%	74%

Table 11. Other evacuation information sources (n=149) (select all that apply)

	<i>Government</i>	<i>News outlet</i>
<i>Television</i>	72%	69%
<i>Radio</i>	62%	72%
<i>Website</i>	74%	59%
<i>Social media</i>	68%	58%
<i>Smartphone application</i>	83%	54%
<i>Billboard or road message sign</i>	57%	26%

When asked how long it would take to prepare to leave their residences after deciding to evacuate, 28% of respondents from Whitecourt would take between an hour and two hours, and an equal number (28%) would require more than two hours. On the other hand, 24% would use less than 30 minutes to prepare for an evacuation, while 20% would need 30 minutes to an hour (Figure 24).

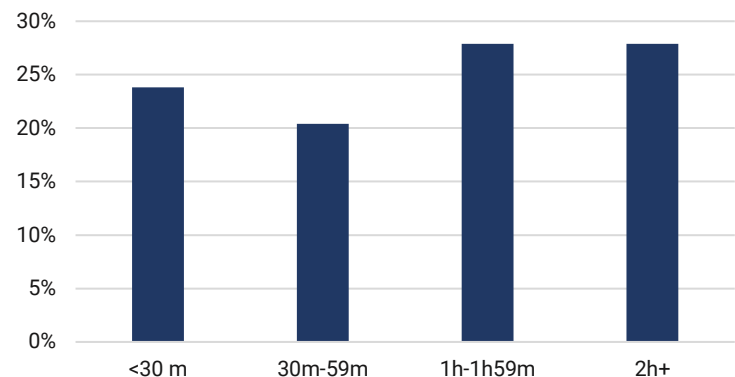


Figure 24. Evacuation prep time – Whitecourt (n=147)

Among the respondents in Whitecourt, a significant majority indicated that they would use at least one personal vehicle (including an RV) as the primary mode of evacuation (96.6%). The rest would either carpool with non-household members (2%) or use a ride-

sourcing/ride-hailing service such as Uber or Lyft (1.4%). No respondents from Whitecourt indicated that they would use public transit or active transportation modes for evacuation during a wildfire.

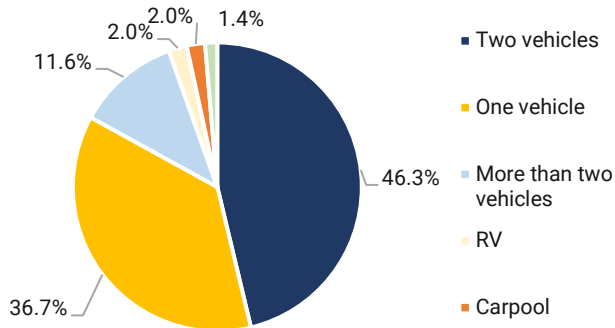


Figure 25. Evacuation transportation mode – Whitecourt (n=147)

In addition, close to half of the respondents would tow items behind their vehicles (42%). These could include boats, livestock trailers, or utility trailers. Our survey further asked respondents how many trips they would make prior to evacuating. These could include trips to gather supplies, pick up family members, or check on neighbours. A majority would take at least one trip, with 79% taking 1 to 3 trips, 7% taking 4 to 6 trips, and 5% taking more than 6 trips (Figure 26).

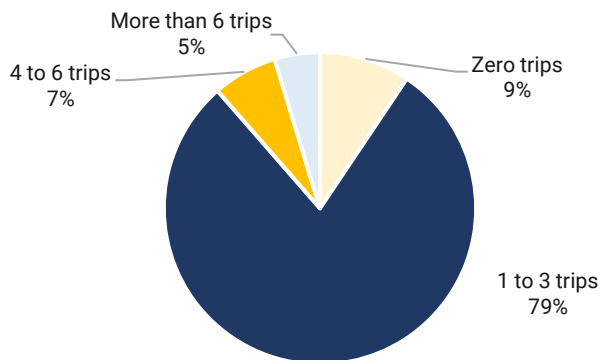


Figure 26. Number of vehicle trips before evacuating – Whitecourt (n=149)

Respondents from Whitecourt then provided their evacuation destination locations as postal codes, landmarks, neighbourhoods, or towns/cities. We present a summary of the selected cities in **Table 12**. Around half

of all the respondents from Whitecourt would evacuate to Edmonton (50.7%). This information could help evacuation planners ensure that the city of Edmonton is prepared to host a large number of evacuees from Whitecourt during a wildfire. Moreover, transportation agencies could use this information to prepare transportation infrastructure connecting Whitecourt to Edmonton to ensure efficient traffic flow during an emergency scenario. To better understand the directionality of evacuation, we categorized the provided evacuation destinations into 4: within city, within county, out of county (in province), and out of province. We present the results in Figure 27.

Table 12. Destination cities selected by respondents from Whitecourt (n=140) (select all that apply)

<i>Destination City</i>	<i>%</i>
Edmonton	50.7%
Calgary	3.6%
Red Deer	3.6%
St. Albert	2.9%
Rocky Mountain House	2.1%
Whitecourt	2.1%
<i>Additional Cities (Direction Relative to Whitecourt)</i>	
East (e.g., Boyle, Ottawa, Barrhead)	12.9%
Southeast (e.g., Spruce Grove, Stony Plain, Camrose)	7.9%
South (e.g., Lethbridge, Edson, Innisfail)	5.0%
Southwest (e.g., Chilliwack, Kamloops, Kelowna)	3.6%
North (La Crete, Slave Lake, Kinuso)	2.1%
Northwest (Fox Creek)	0.7%
<i>Cities outside Canada</i>	
Cities in the United States	2.9%

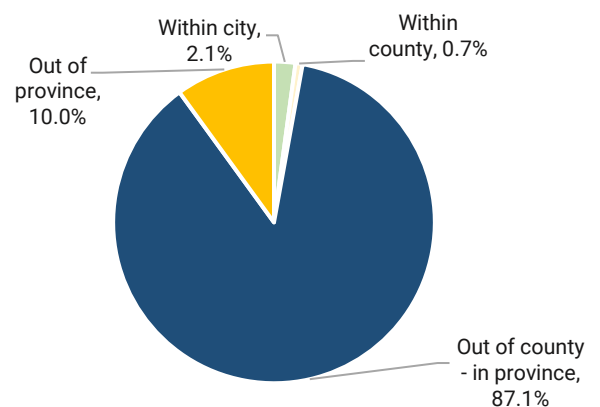


Figure 27. Direction of evacuation destinations – Whitecourt (n=140)

Consistent with the number of people evacuating to Edmonton and other cities in Alberta, we found that a majority of evacuees from Whitecourt would travel outside their respective counties but stay within the province (87.1%). In addition to destination choices, the survey asked respondents to consider what types of roads they were likely to spend most of their evacuation time on. More than half of the respondents from Whitecourt indicated that they would spend the majority of their time on highways (65%). This was followed by major roads (including arterial roads) (15%) and lastly, an equal number of respondents selected rural roads and local roads (10% each).

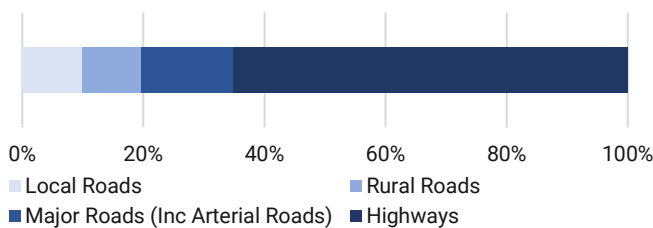


Figure 28. Types of roads evacuees will use the most – Whitecourt (n=132).

Finally, respondents provided information on the shelters they would stay in at their final destinations (Figure 29). We found that more than half of the respondents from Whitecourt would stay at a family member’s residence (52%). This was followed by more similarly private accommodations such as an RV (16%), a hotel/motel (15%), a friend’s residence (5%), or a second residence (4%). Some respondents reported that they would stay at government-provided shelters such as a public shelter (4%) and a community center (3%).

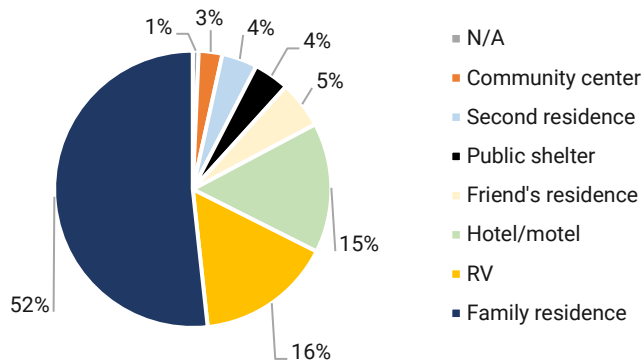


Figure 29. Types of shelter at destination – Whitecourt (n=145)

RECOMMENDATIONS

1. More than 50% of the respondents would require at least one hour to prepare to leave their residences during an evacuation with 28% requiring more than 2 hours. Community and individual preparedness programs may help reduce this time and ensure safety among residents.
2. Respondents primarily expected to receive evacuation information through government texts and social media. These channels should be prioritized in evacuation communication and official social media pages should be regularly updated with the latest evacuation information.
3. Evacuation traffic management strategies should account for the high number of people who would use at least one personal vehicle (96.6%) as well as the high number of towed items (42% would tow behind their vehicles).
4. More than half of the respondents from Whitecourt would evacuate to Edmonton. As such, routes connecting Whitecourt to Edmonton, particularly highways, should be prepared to handle high traffic volumes during evacuations. Strategies such as contraflow lanes and emergency shoulder usage may be considered. Edmonton should further be prepared to serve as a host community with adequate sheltering conditions in public shelters and community centers to accommodate the high number of evacuees.

COMMUNITY PROFILE: CANMORE



Downtown Canmore (Peter Miller, [CC BY-NC-ND 2.0](#))

Our survey received 563 responses from Canmore, Alberta. 510 respondents lived in Canmore on a full-time basis whereas 43 were part-time residents and 10 were visiting the community. Out of the 563 respondents, 559 would evacuate their residences and accommodations after receiving a mandatory evacuation order. Moreover, 88% of respondents from Canmore would evacuate their residences promptly. We found that more than half of the respondents were only somewhat/a little prepared for an evacuation at the time of completing the survey. On the other hand, 22% were very/mostly prepared and 16% were not prepared for evacuation at the time of survey completion (Figure 30).

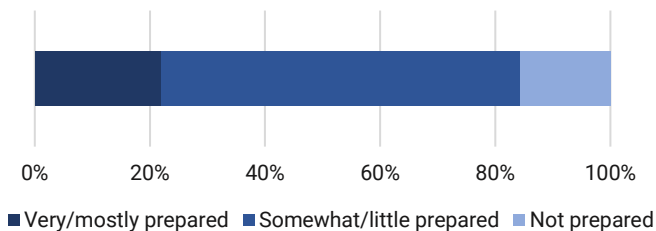


Figure 30. Preparedness levels – Canmore (n=554).

Survey respondents were asked to consider where they expected to receive information on a mandatory evacuation order. A significant majority (89%) expected to receive evacuation information from government-issued text messages. This was followed by government-run social media (69%), and then conversations with neighbours (59%). These results show both trust in official communication sources for emergency alerts and the importance of neighbourhood connections during

emergencies. A distribution of selected communication channels and sources is presented in **Table 13**.

Table 13. Evacuation information channels and sources (n=563) (select all that apply)

	<i>Family/friends</i>	<i>Neighbours</i>	<i>Government</i>
<i>Text</i>	47%	37%	89%
<i>Phone call</i>	50%	31%	44%
<i>Conversation</i>	46%	56%	28%
<i>Social media</i>	37%	27%	69%

Results in **Table 14** further show that respondents from Canmore generally look to the government to receive evacuation information through smartphone applications (74%), websites (73%), and television (65%).

Table 14. Other evacuation information sources (n=563) (select all that apply)

	<i>Government</i>	<i>News outlet</i>
<i>Television</i>	65%	60%
<i>Radio</i>	55%	60%
<i>Website</i>	73%	44%
<i>Social media</i>	64%	49%
<i>Smartphone application</i>	74%	42%
<i>Billboard or road message sign</i>	59%	24%

When asked how long it would take each respondent to prepare to leave their residences after receiving an evacuation order, responses were varied. We found that a higher proportion of the respondents from Canmore would take between 1 and 2 hours to leave their houses after an order (36%). This was followed by those who would take between 30 minutes and an hour (25%) and those who would require more than 2 hours (24%). On the other hand, only 15% would take less than 30 minutes to prepare and leave their residences/accommodations after an evacuation order.

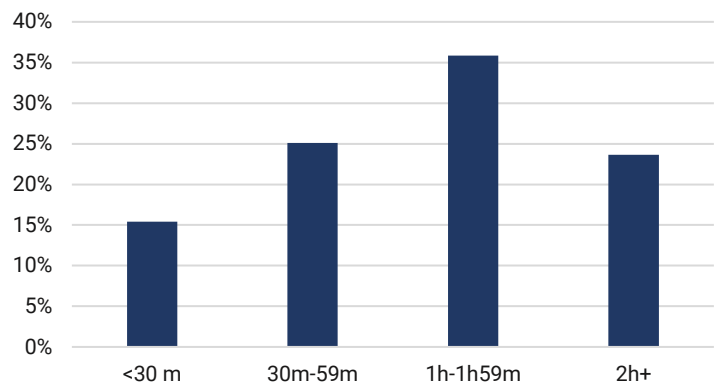


Figure 31. Evacuation prep time – Canmore (n=558)

Similar to other communities, a significant majority of respondents from Canmore would use at least one vehicle to evacuate (96.9%). 1.3% would use public transit and an equal number (1.3%) would either carpool with non-household members or use a ride-sourcing service such as Uber or Lyft. The remaining respondents (0.5%) would use active transportation modes (walking or biking). A breakdown of these results is presented in Figure 32. 15% of the respondents would tow items behind their vehicle.

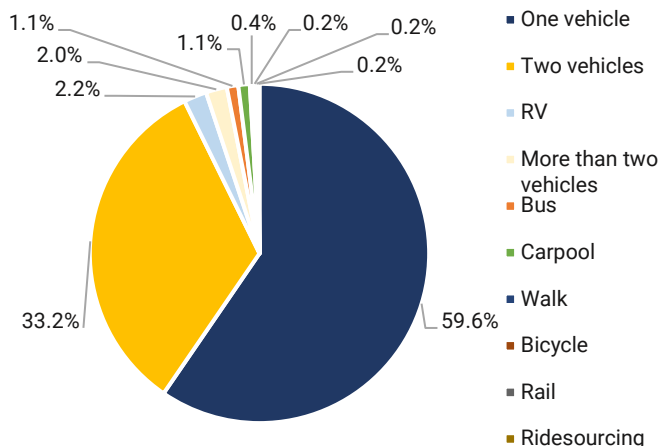


Figure 32. Transportation modes during an evacuation – Canmore (n=549)

The survey further asked respondents to consider how many vehicle trips they would need to make prior to evacuating. These may include trips to gather supplies, pick up family members, or check on neighbours. A majority of the respondents would make 1 to 3 trips (72%) whereas 21% would not make any vehicle trips before evacuating.

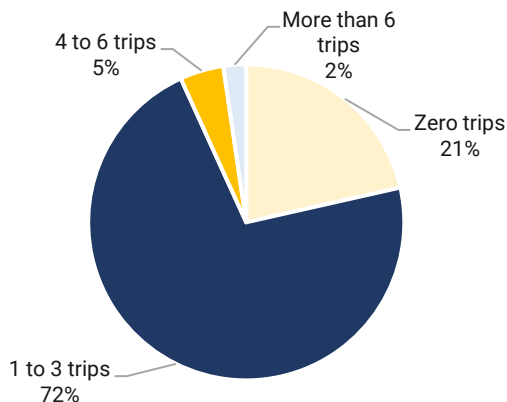


Figure 33. Number of vehicle trips prior to evacuating – Canmore (n=559)

Respondents from Canmore were then asked to provide their evacuation destination locations as postal codes, landmarks, neighbourhoods, or towns/cities. Using this information, we determined what specific cities the respondents would evacuate to. A summary of the results is presented in Table 15. We found that a significant majority of respondents from Canmore would evacuate to Calgary (66%). These results imply that transportation and evacuation planners should ensure that transportation infrastructure and resources connecting Canmore to Calgary are sufficiently prepared to handle large volumes of evacuees. Moreover, planners may consider ensuring that Calgary is adequately prepared to serve a host community during a wildfire.

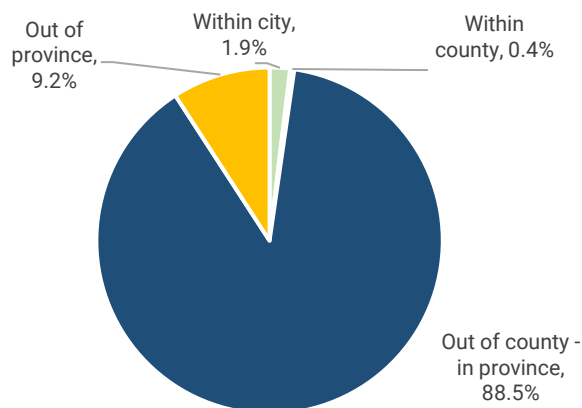


Figure 34. Direction of destination (n=524) – Canmore

To further understand the general directionality of evacuation during a wildfire event, we categorized the destination choices into 4: within city, within county, out of county (in province), and out of province (Figure 34). We found that a majority (88.5%) would stay within the province but travel outside their counties. On the other hand, only 0.4% would stay within the county.

Table 15. Destination cities selected by respondents from Canmore (n=524)

Destination City	%
Calgary	66.0%
Cochrane	6.1%
Edmonton	5.3%
Canmore	1.9%
Okotoks	1.1%
Saskatoon	1.0%
<i>Additional Cities (Direction Relative to Canmore)</i>	
West (e.g., Kamloops, Vancouver, Kelowna)	4.2%

Northeast (e.g., Camrose, Sherwood Park, Red Deer)	3.8%
North (e.g., Stony Plain, Whitecourt, St. Albert)	2.5%
Southeast (e.g., Lethbridge, Bragg Creek, Brooks)	2.5%
Southwest (e.g., Invermere, Nelson, Radium)	1.9%
East (e.g., Hamilton, Sherbrooke, Morley)	1.1%
South (Pincher Creek)	0.2%
Northwest (Fort St. John)	0.2%
<i>Cities outside Canada</i>	
Cities in the United States	2.1%

Respondents were thereafter asked what types of roads they would spend the most time on as they traveled to their selected evacuation destinations. We found that most of the respondents would spend the majority of their time on highways (77%) followed by local roads (9%), rural roads (8%), and major roads (including arterial roads) (6%).

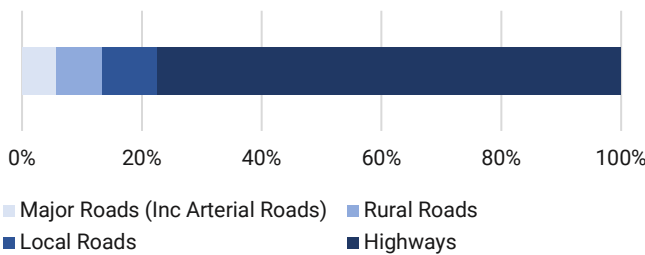


Figure 35. Types of roads evacuees will use the most – Canmore (n=513)

Finally, respondents were asked to consider what types of shelter they would stay in at their evacuation destinations. We found that a majority would stay in private accommodations with many staying at a family member’s residence (44%), followed by a friend’s residence (18%), a hotel/motel (13%), a second residence (10%), or an RV (6%). On the other hand, few would stay at government-provided shelters such as public shelters (4%) or community centers (3%). 1% of the respondents would stay at short-term rentals such as those provided by Airbnb.

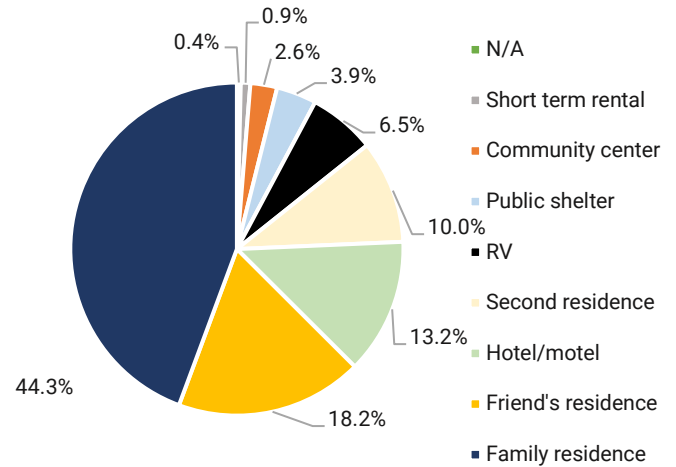


Figure 36. Shelter types at final destination – Canmore (n=539)

RECOMMENDATIONS

1. A significant majority (96.9%) would evacuate with at least one personal vehicle or an RV. As such, evacuation routes should be prepared to handle high volumes of vehicles.
2. Public transit should remain a viable option for those who would use it as their primary evacuation mode (1.3%).
3. More than half of the respondents from Canmore would evacuate to Calgary (66.0%) with many using highways as their primary route choice (77%). Highways connecting Canmore to Calgary should be prepared to handle high traffic volumes during wildfire evacuations. Strategies may include staggered evacuation times, creating evacuation zones based on wildfire intensity and risk, contraflow lanes, and emergency shoulder usage.
4. Calgary should further be prepared to serve as a host community for evacuees from Canmore. This may involve ensuring sufficient, comfortable, and private sheltering options. Moreover, emergency management agencies may consider partnering with short-term rental companies to subsidize the cost of temporary accommodation.

DISCUSSION

<p>Low preparedness levels</p>	<p>Our findings revealed low preparedness levels across all communities. In particular, Canmore stands out as having the lowest proportion of residents who were very/mostly prepared (22%). Nelson, Quesnel, and Salmon Arm reported moderate levels of preparedness (32-34%) with Whitecourt having a comparatively higher proportion of residents who were very/mostly prepared (44%). Nonetheless, low preparedness levels place these communities at risk of evacuation delays. Evacuation preparedness programs, public evacuation plans, public meetings, and town halls may be effective in increasing preparedness levels across communities.</p>
<p>Evacuation preparation time</p>	<p>While Whitecourt reported higher preparedness levels, it had the highest number of residents requiring more than 2 hours to prepare to leave their residences after deciding to evacuate (28%). 24% of respondents in Canmore would also require more than 2 hours to evacuate. Targeted interventions may be required in these communities to ensure that residents understand necessary actions to take during an evacuation. Wildfire evacuation checklists and evacuation drills may support residents and reduce evacuation delays.</p>
<p>High vehicle usage and towing rates</p>	<p>Across all 5 communities, residents primarily rely on personal vehicles for evacuation. Respondents from Canmore reported the highest vehicle usage with 59.6% using one vehicle, 33.2% using two vehicles, and 4.2% using more than two vehicles or an RV. Moreover, many respondents across the five communities indicated that they would tow items behind their vehicles during an evacuation. Towing rates were particularly high for Whitecourt (42%) and Quesnel (41%). Traffic management strategies should account for high vehicle usage and towing rates in these communities to mitigate congestion and traffic bottlenecks during evacuations.</p>
<p>Traffic flow and direction of evacuation</p>	<p>Our survey revealed that most evacuees would spend a majority of their evacuation time on highways. This trend was particularly prominent in Canmore (77%) and Whitecourt (65%) due to large local highways (Trans-Canada Highway and Highway 43, respectively). Moreover, a significant number of evacuees from these communities would evacuate to the same evacuation destinations. 66% of evacuees from Canmore would travel to Calgary, and 51% of those from Whitecourt would travel to Edmonton. Combined with high vehicle usage and towing rates in these communities, highways leading to Calgary and Edmonton may be prone to bottlenecks and heavy traffic congestion during a wildfire evacuation. Strategies such as contraflow lanes and emergency shoulder usage may be considered to help manage congestion. Moreover, rerouting traffic to other road types such as arterial and rural roads could ensure smoother evacuations.</p> <p>Respondents from Salmon Arm reported a slightly more balanced route choice, with 25% spending most of their evacuation time on rural roads. Moreover, evacuees from Salmon Arm would travel to a wider range of cities with many going to Kamloops, Vancouver, and Vernon. This distribution may help alleviate congestion on highways. Nonetheless, given a relatively high number of evacuees intending to tow items (32%), preparing rural road infrastructure could help manage traffic during evacuations.</p>

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Appendix

Table A1. Demographic Overview and Comparison with 2021 Census Data*

Category	Sample	Canada Census 2021 (Five Communities)
Median age	51 years	44.5 years
Visible minorities	5.5%	8.8%
Average household size	2.7	2.3
<i>Household income</i>	<i>(in 2022)</i>	<i>(in 2020)</i>
Under \$10,000	1.0%	1.2%
\$10,000 to \$19,999	3.8%	2.8%
\$20,000 to \$29,999	3.7%	7.9%
\$30,000 to \$39,999	8.3%	7.1%
\$40,000 to \$49,999	6.8%	7.7%
\$50,000 to \$59,999	5.7%	7.4%
\$60,000 to \$69,999	7.4%	7.1%
\$70,000 to \$79,999	6.3%	6.6%
\$80,000 to \$89,999	6.6%	6.1%
\$90,000 to \$99,999	7.4%	5.6%
\$100,000 and over	43.1%	40.4%
<i>Gender identity</i>		
Woman	56.8%	51.1%
Man	41.0%	48.9%
Employed (full-time/part-time)	62.2%	47.5%
Home ownership	80.7%	68.6%

* Canadian Census data combines all five communities together (Government of Canada, 2022).

Table A2. A summary of key evacuation logistics and choices by community

Scenario Prompt: In this part of the survey, you will answer questions regarding an evacuation. Consider a situation where a wildfire is burning a few kilometers from your residence. The current temperature is high, with strong winds, and low humidity.					
	Nelson <i>(n=236)</i>	Quesnel <i>(n=187)</i>	Salmon Arm <i>(n=322)</i>	Whitecourt <i>(n=149)</i>	Canmore <i>(n=563)</i>
% of sample (n=1457)	16.2%	12.8%	22.1%	10.2%	38.6%
Evacuation Choice	<i>(n=236)</i>	<i>(n=187)</i>	<i>(n=322)</i>	<i>(n=149)</i>	<i>(n=563)</i>
Will evacuate	98.3%	98.9%	96.9%	99.3%	99.3%
Will evacuate promptly	88.1%	87.2%	86.3%	81.2%	87.7%
Preparation time	<i>(n=231)</i>	<i>(n=186)</i>	<i>(n=319)</i>	<i>(n=147)</i>	<i>(n=558)</i>
<30 min	23.4%	20.4%	33.9%	23.8%	15.4%
30 min -59 min	27.7%	25.8%	25.1%	20.4%	25.1%
1 hour – 1.99 hour	29.4%	28.0%	22.9%	27.9%	35.8%
2 or more hours	19.5%	25.8%	18.2%	27.9%	23.7%
Mode choice	<i>(n=233)</i>	<i>(n=183)</i>	<i>(n=313)</i>	<i>(n=147)</i>	<i>(n=549)</i>
Personal vehicle (one or more vehicles, RV)	91.8%	94.5%	93.0%	96.6%	96.9%
Shared mobility (ride-source, carpool)	3.4%	2.2%	4.5%	3.4%	1.3%
Public transit (bus, train)	2.6%	2.2%	0.9%	0.0%	1.3%
Active modes (walk, bike)	2.1%	1.0%	1.6%	0.0%	0.5%
Within city evacuation	<i>(n=203)</i>	<i>(n=161)</i>	<i>(n=291)</i>	<i>(n=140)</i>	<i>(n=524)</i>
Yes	6.4%	5.6%	5.5%	2.1%	1.9%
Route choice	<i>(n=205)</i>	<i>(n=169)</i>	<i>(n=288)</i>	<i>(n=132)</i>	<i>(n=513)</i>
Highways	50.2%	48.5%	49.3%	65.2%	77.4%
Major roads (including arterial roads)	20.5%	26.0%	12.8%	15.2%	5.7%
Local roads	17.1%	15.4%	13.2%	9.8%	9.2%
Rural roads	12.2%	10.1%	24.7%	9.8%	7.8%
Shelter type	<i>(n=222)</i>	<i>(n=180)</i>	<i>(n=309)</i>	<i>(n=145)</i>	<i>(n=539)</i>
Friend’s residence	19.1%	11.7%	14.2%	5.5%	18.2%
Family member’s residence	40.7%	46.7%	45.3%	51.7%	44.3%
Second residence	8.5%	5.0%	5.2%	4.1%	10.0%
Public shelter	6.8%	3.3%	7.1%	4.1%	3.9%
Community center	3.0%	5.0%	3.2%	2.8%	2.6%
Short-term rental	1.4%	0.6%	1.9%	0.0%	0.9%
Hotel/motel	8.1%	9.4%	8.7%	15.2%	13.2%
RV	7.2%	18.3%	13.3%	15.9%	6.5%