VILLAGE OF CLINTON WILDFIRE RECOVERY PLAN

WILDFIRE RECOVERY STRATEGY

A document that identifies the Economic, Environmental and Social impacts and strategies to assist in the recovery process for the Village of Clinton, due to Highway closures, evacuation alerts and evacuation orders.

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The Village of Clinton
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Special Thanks to:
Mayor and Council
Brian Carmichael
All participating business and community members

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EXECUTIVE SUMMARY

This report was commissioned by the Village of Clinton Council as part of the recovery planning process for the community. The Village of Clinton contracted Daniela Dyck to write a report that examines the economic, social and environmental impact sustained by the community due to the Elephant Hill Wildfire.

Economic and social impacts research was conducted over a period of 5 months using a variety of strategies including surveys, private interviews, public information sessions, focus groups and business walks. The intent is to gather a wide range of data to clearly define the economic social and environmental impacts to the residents, businesses and environment of the Village of Clinton.

Economic impact research draws attention to the fact that the business community was largely impacted by highway closures and reduced traffic flow during the tourist season. The Village of Clinton did not experience any structural losses; however business interruption due to the highway closures, evacuation alerts and orders caused substantial revenue losses. Other impacted economic drivers for the Village include West Fraser Chasm Sawmills and the Clinton and District Community Forest, both of which sustained substantial fiber supply losses.

Social impact research reveals, the stress of being isolated due to highway closures north and south of Clinton was the most significant stressor overall. Alternately while on evacuation alerts and order, the largest stress contributor to working class residents was loss of wages due to shift losses. A further significant stressor was perceived inconsistent information updates.

The Environmental portion of this report was subcontracted to Iverson & MacKenzie Biological Consultant Ltd. in collaboration with R.W. Gray Consulting Ltd.

The expected outcome of the report is to develop recommendations to be forwarded to Emergency Management BC. The recommendations from all impacted communities will be complied and forwarded to the Province as a tool to lobby the Provincial government for strategy implementation support.

INTRODUCTION:

On the afternoon of July 7, 2017, two fires burning in the Southern Interior of British Columbia marked the beginning of BC's worst wildfire season in recorded history. The Gustafson Lake Fire prompted the closure of Highway 97 north of 100 Mile House. A second fire ignited on the Ashcroft Indian Reserve and was initially referred to as the Ashcroft Indian Reserve Fire; it was later renamed the Elephant Hill Wildfire. This caused the evacuation of Boston Flats Mobile Home Park, the Village of Cache Creek and Bonaparte Indian Reserve with a resulting Highway closure at the junction of Highways 97 and 99. These highway closures suspended regular traffic indefinitely flowing through the Village of Clinton.

The Village of Clinton was placed on evacuation alert under the recommendation of the BC Wildfire Management Branch effective July 14, 2017. The Village of Clinton remained on evacuation alert for 15 days. The evacuation alert was changed to an evacuation order on July 29, 2017 at 4:30 pm. Clinton's evacuation order was rescinded and downgraded to an alert order on August 15. The alert order remained in effect until it was rescinded on August 25, 2017.

The destructive Elephant Hill Wildfire that originated near Ashcroft travelled north threatening the communities of 16 Mile House, Scotty Creek, Loon Lake and Clinton. The wildfire continued on its destructive path eventually being contained near Highway 24 at the Inter-Lakes area. The Elephant Hill wildfire induced highway closures, evacuation order and alerts that impacted the Village of Clinton's access to the traveling public for 49 days during the summer of 2017. The fire severely impacted business revenues during Clinton's tourism season. Although traffic returned to relatively normal flow during the later part of the season, the statistics are not a true reflection of tourism traffic. Many travelers adapted their travel plans to completely avoid the "smoky" interior of British Columbia.

As the Village of Clinton, its residents and business community move from response to recovery, Council has taken the initiative to pursue recovery from a community perspective as opposed to being included in the Thompson Nicola Regional District's (TNRD) plan. The Village of Clinton Council believes that Clinton's Wildfire Recovery Plan should have a "local flavour". "The recovery managers hired in the other areas have no idea what Clinton is made of and what the people are like," states Mayor Rivett in an interview with Barbara Roden from the Ashcroft Journal. Therefore, Council's direction is to develop a Community Recovery Plan that is specific to the wildfire impacts within the municipal boundaries while considering strategies identified in the TNRD's Regional Recovery Plan.

The Recovery Managers' mandates were to research economic, social and environmental impacts to the community and provide a report to Council that includes recommendations for recovery strategies. The Recovery Manager also participated in biweekly Economic Wildfire Recovery Manager regional meetings and is a member of the Ashcroft Wellness Recovery Team. Aside from gathering information, statistical data and developing the recovery plan, the Recovery Manager assisted business and community members to access available supports as the community moved through the recovery process.

The Economic and Social portions of this Recovery Plan were researched and developed by the Recovery Manager. The Environmental portion of the Plan was contracted to Ken MacKenzie of Iverson & MacKenzie Biological Consulting with support from Bob Gray, Fire Ecologist.

VISION and PRINCIPLES

Village of Clinton VISION Statement:

"To maintain a safe and vibrant community that offers business and personal growth opportunities while promoting our heritage and embracing our healthy lifestyle."

The PRINCIPLES for the Village of Clinton's wildfire recovery as identified by the community are:

Community Focus – The Elephant Hill wildfire directly impacted the Village of Clinton and surrounding area for 49 days. It is evident that Clinton is not the only community affected by this disaster, however; Clinton's recovery efforts will be community driven. Regional District recovery strategies will be considered during the recovery process, and when appropriate, will be implemented.

Business Focus – The plan must reflect the needs as identified by the business community, ensuring recovery support and future sustainability. The Village of Clinton is a service hub to the outlying areas of Big Bar Lake, Jesmond and Chasm. The plan should ensure that the community continues to serve as a hub for the region and to grow the tourism industry.

Resident Focus – Disaster affects people in different ways, and every personal situation is unique. Infrastructure, buildings, economic opportunities are replaceable; individuals and families must be supported with compassion in the recovery process providing them with the tools to overcome the physical, social and economic hardships caused by the wildfire. Meaningful resident participation in the recovery process is vital to the community's resilience and sustainability.

Timely - Recovery strategies must be identified and implemented in a timely manner. Activities for assistance should be delivered through a coordinated effort with support agencies, these must be adaptable and evolve as the recovery process moves forward and new needs or gaps are identified.

Mitigation – The potential for future events of similar nature is highly probable, therefore the plan should include strategies that safeguard the community and negate potential future disasters from causing structural damage to the community.

STAKEHOLDERS:

The success of Clinton's Recovery Plan "will be dependent on all stakeholders and every level of government working collaboratively. This section describes the recovery roles and responsibilities of: individuals and families; local, provincial and federal governments; business; and not-for-profit organizations."

Individuals and Families – The individuals and families in the Village of Clinton have begun the steps to recovery by returning to their homes and have undertaken the daunting task of clean up. They have returned to their employment and placed children back in school. Post-evacuation life is returning to "normal".

Local Governments – The Village of Clinton is responsible for leading and planning the recovery within the Village boundary.

Businesses – Local businesses reopened after the evacuation order was rescinded and provide goods and services to residents. Businesses that carried Business Interruption Insurance are working with Insurance providers to resolve payment. Other businesses are applying for funding through the Red Cross's Phase 1 and 2 Small Business support funding stream.

Non-Profit – Local volunteer groups are returning to regular scheduled.

Red Cross/United Way – The Government of British Columbia announced a $100-million donation to the Canadian Red Cross to provide affected communities and residents with the resources needed to rebuild. The Canadian Red Cross continues to work towards ensuring that residents and business are able to transition to recovery, while the United Way continues to provide wellness recovery services.

Government of British Columbia – The Government of British Columbia continues to provide support to the Wildfire impacted areas in BC. Supports have been established through Emergency Management BC and the B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development's Wildfire Management Branch to ensure communities receive the necessary response and recovery services.

Federal Government – The Government of Canada will provide financial assistance to British Columbia through the Disaster Financial Assistance Arrangements (DFAA), administered by Public Safety Canada. The Government of Canada is providing an advance payment of $175 million through the DFAA to the province. This money will help with the costs associated with long-term recovery and rebuilding in affected communities.

GOVERNANCE, ROLES and RESPONSIBILITIES:

Although many organizations, government agencies and levels of governments may be involved in the recovery efforts, the local government has a broad and legal mandate for the recovery of their community. Therefore, the local government maintains the overall responsibility for coordinating the various recovery efforts in their jurisdiction including the services of other government agencies and non-government organizations. The local government is also in the best position to generate the cooperation needed for successful collaboration among the large array of government agencies, community organizations, business and citizens.

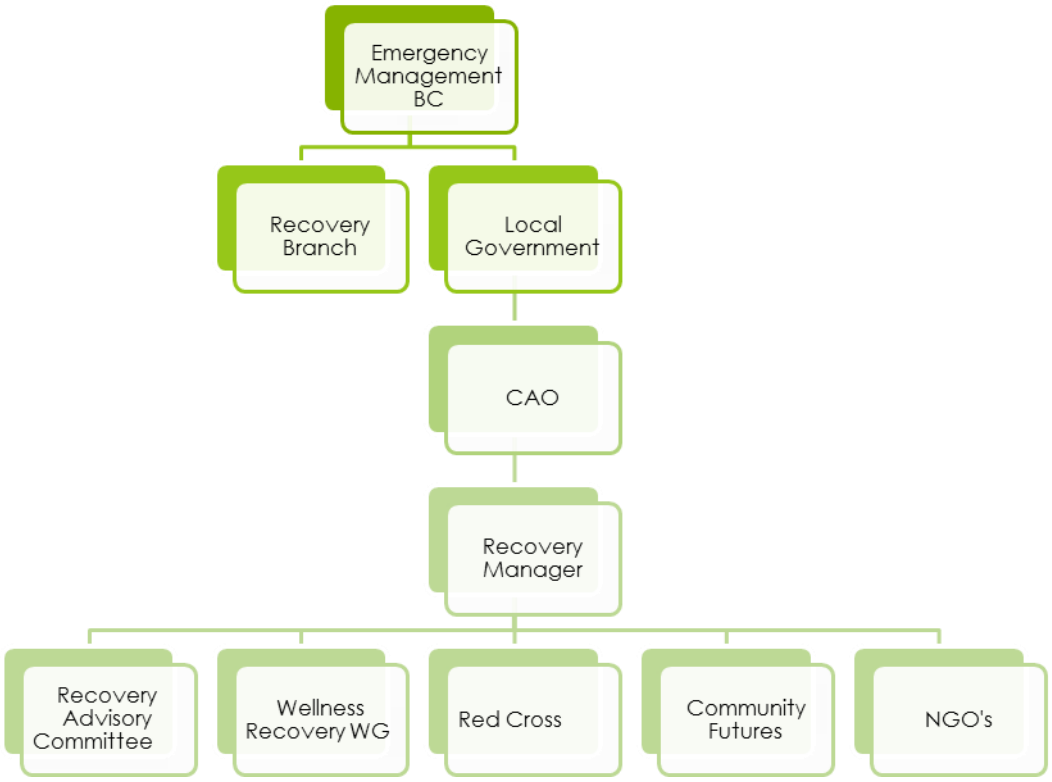


Figure 1: Recovery Organizational Chart for Village of Clinton

Emergency Management BC: Manages the Provinces Recovery Funding initiative.

Wildfire Recovery Branch: Support the Recovery Managers with resources and report back to EMBC with recovery recommendations.

Local Government: Sets Policy and oversees municipal recovery.

Chief Administrative Officer (CAO): Oversees the Recovery Manager, provides recovery updates to Council and reports to EMBC regarding recovery funds.

Recovery Manager (RM): Engages with the community to identify recovery needs and strategies; liaises with community groups and is a conduit to connect residents and business with available resources. The RM is responsible for all information gathering, coordinates public meetings related to recovery and develops the Recovery Plan.

Recovery Advisory Committee: Consists of a group of residents invited by the RM to assist and advise during the recovery process.

Wellness Recovery Working Group (WG): Consists of stakeholders and Mental Health representatives from Ashcroft to Clinton that are responsible for social supports for the area. The RM is an invited member to this Working Group.

Sun Country Community Futures: Is funded by the Province to provide business support services to Clinton's business community, and have implemented the Recovery Ambassador program to provide resources to small business.

Non-Government Organizations (NGO's): liaise with the RM to assist the community with recovery efforts when resources are available.

Red Cross: Continues to provide recovery support to the community.

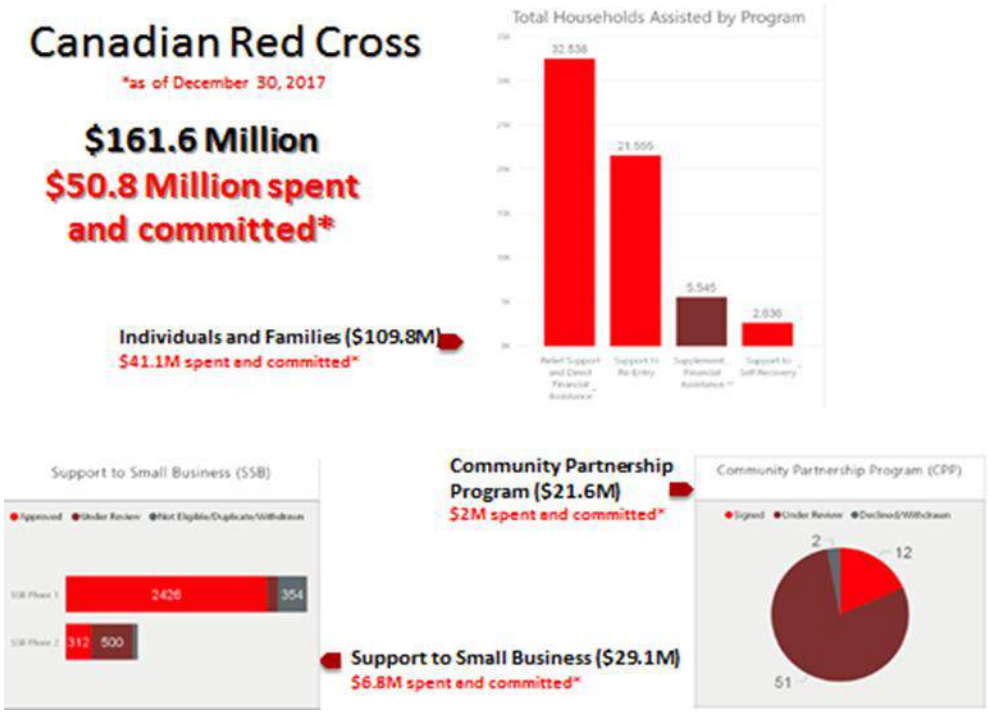


Figure 2: Source, Canadian Red Cross

BACKGROUND:

Mayor Jim Rivett's comments to Barbara Roden of the Ashcroft Journal, sums up the 2017 wildfire season in three simple words: "a year interrupted."
The summer of 2017 will be remembered as one of the worst wildfire seasons in British Columbia's history. It was unprecedented by measure of:

- The amount of land burned – over 1.2 million hectares,
- The total cost of fire suppression – over $568 million,
- The amount of people displaced – approximately 65,000 evacuated.

The fire season prompted a Provincial State of Emergency that was declared on July 7, 2017, and not rescinded until September 15, 2017 - lasting 70 days. This was the longest Provincial State of Emergency in the province's history, and the first to be declared since the 2003 firestorm.

At peak activity, over 4,700 personnel were engaged in fighting wildfires across B.C., including over 2,000 contract personnel from the forest industry and over 1,200 personnel from outside the province. This support came from across Canada, as well as from Australia, New Zealand, Mexico, and the United States. Ground personnel from the Canadian Armed Forces were also brought in to fight fires for the first time since 2003.

In response to this extraordinary fire season, some extraordinary measures were taken to help prevent human-caused wildfires. Off-road vehicle prohibitions were implemented in the Cariboo, Kamloops and Southeast fire centres and full backcountry closures were implemented in the Cariboo Fire Centre and Rocky Mountain Natural Resource District. Campfires were also banned across most areas of the province throughout the summer due to the incredibly high fire danger rating. Prohibitions like these are very rare in B.C. and are only implemented when absolutely necessary.

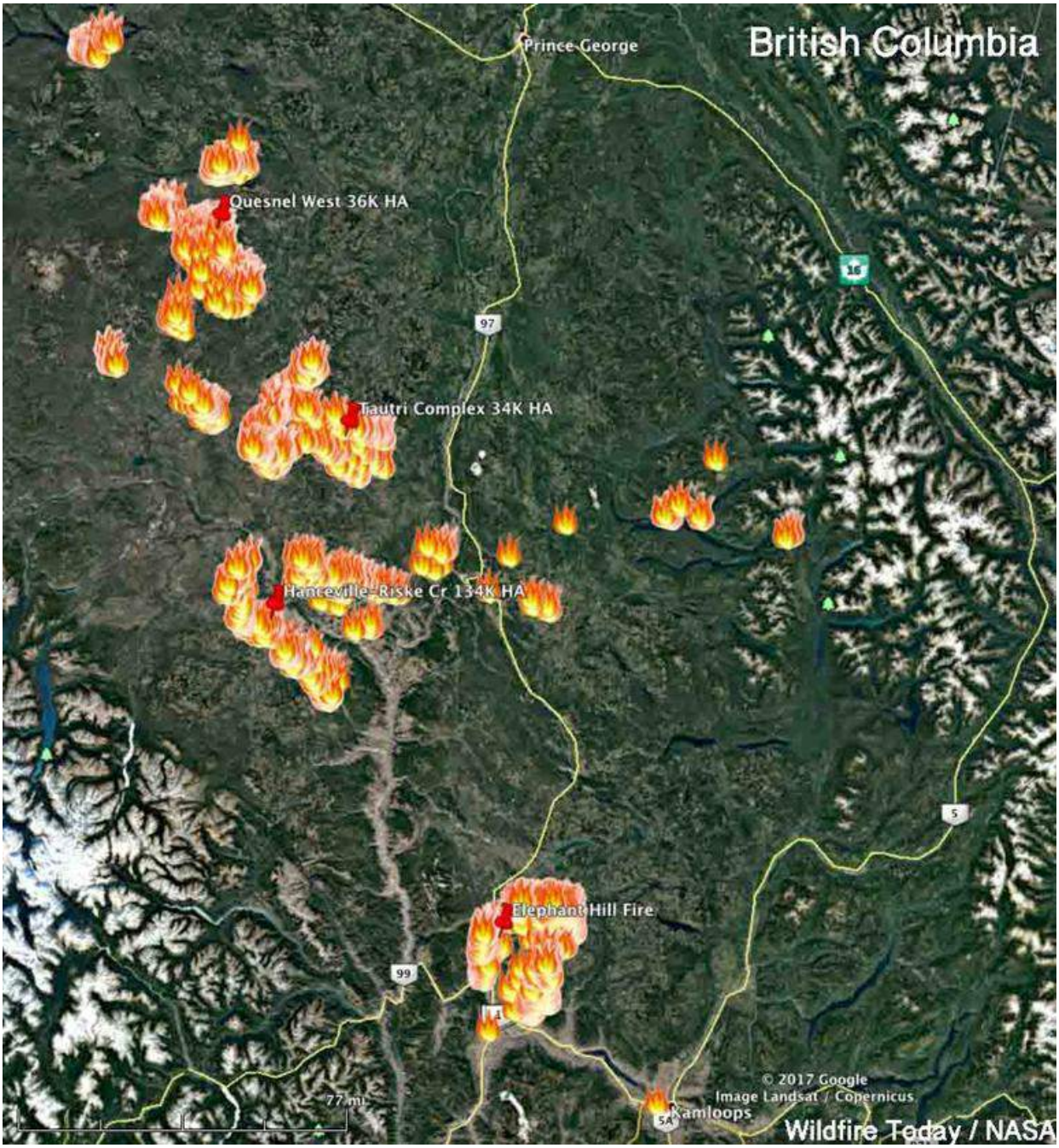
When the 2017 fire season was finally over, the B.C. government launched an independent review of this year's unprecedented wildfire and spring flooding seasons. The review team will examine all aspects of the Province's response to the floods and wildfires of 2017 and will also engage with British Columbians. The team will deliver a report with recommendations before April 30, 2018, that can be used to inform next year's spring freshet and wildfire seasons. (Branch 2017)[1]

"The Elephant Hill Wildfire consumed 191,865 hectares, covering an extensive area spanning from near Ashcroft (southern perimeter) to near Highway 24 (northern perimeter). The fire was discovered July 6, 2017, and subsequently prompted evacuation orders and evacuation alerts by the following day. Within the first 24 hours, the fire grew to over 1,000 hectares in size, burned through numerous properties on the Ashcroft Indian Reserve and Boston Flats mobile home park. The out of control wildfire prompted

[1] Province of BC Wildfire Service

the entire Village of Cache Creek to evacuate on July 7, 2017."[2] The Elephant Hill fire was officially 100% contained on September 29, 2017, eighty four days after it was discovered.

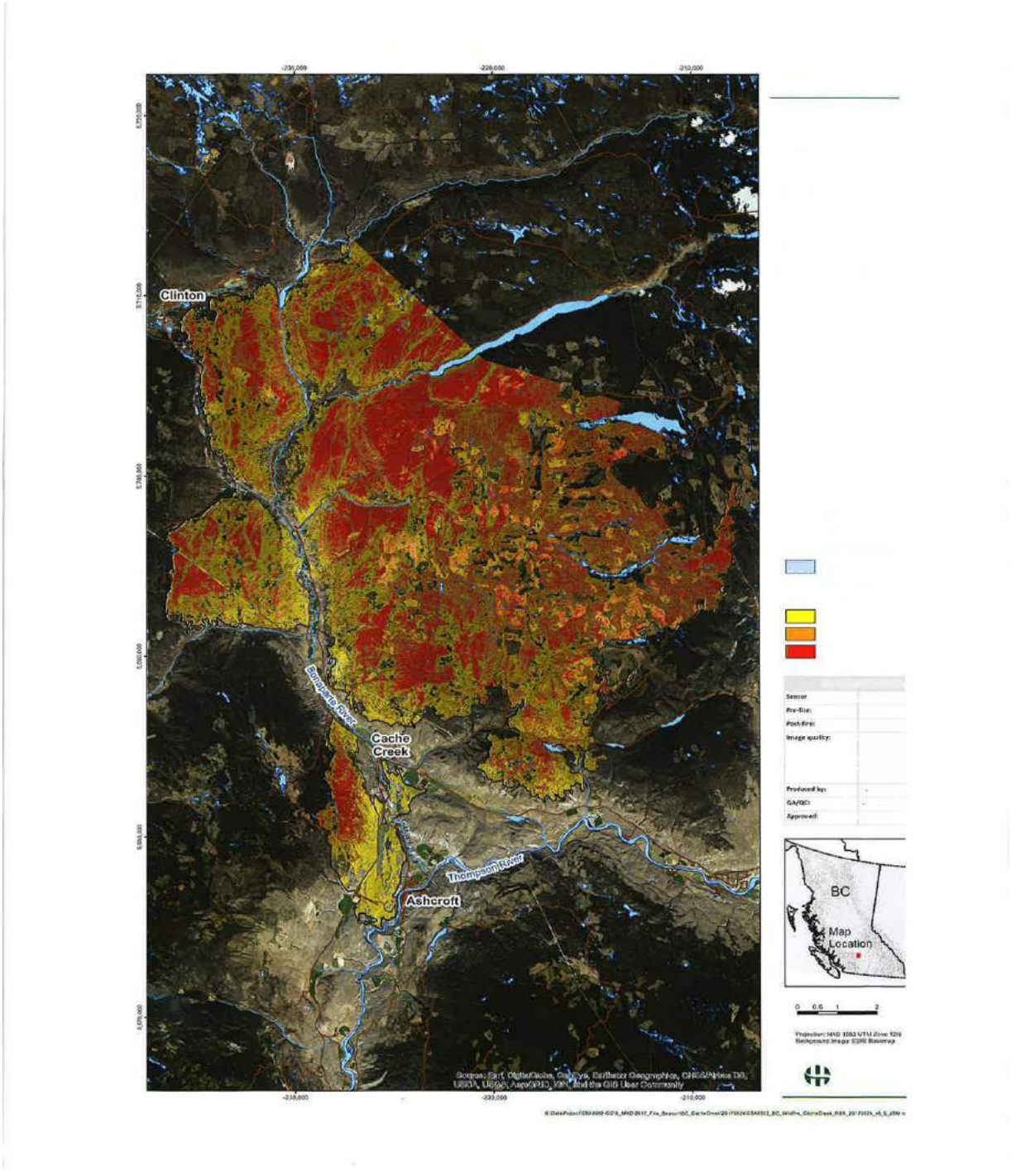
The image below shows the volume of fires burning in the Interior and Cariboo Region of British Columbia during August 2017.



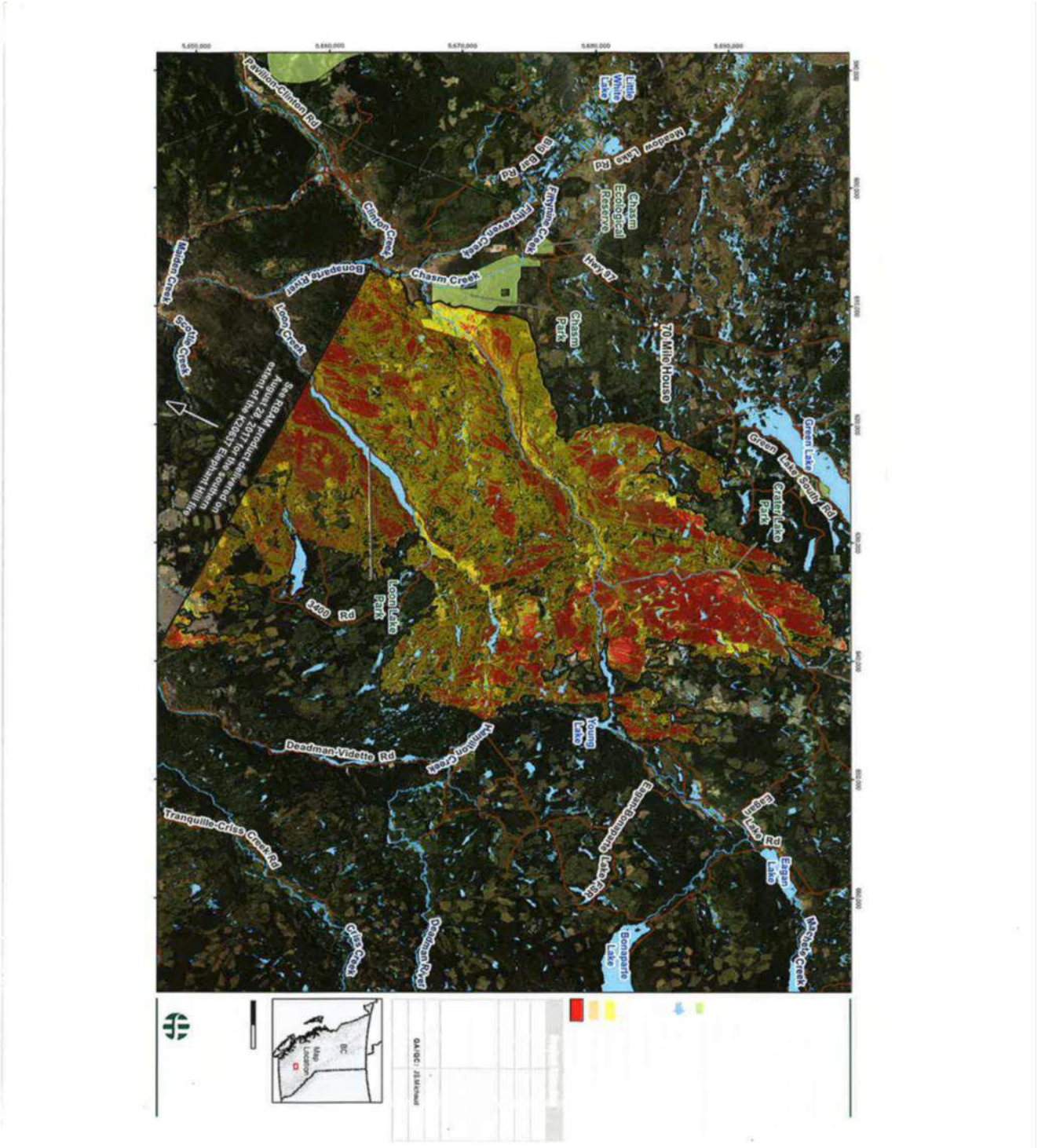
Source: http://wildfiretoday.com/wp-content/uploads/2017

[2] Province of BC Wildfire Service

The following two images are courtesy of the BC Wildfire Branch depicting the southern and northern perimeter map of the Elephant Hill wildfire showing the areas experiencing various degrees of fire intensity.



South Perimeter Map of the Elephant Hill Wildfire
Source – BC Wildfire Branch



North Perimeter Map of the Elephant Hill Wildfire
Source – BC Wildfire Branch

RECOMMENDATIONS:

ECONOMIC SHORT – MEDIUM TERM RECOMMENDATIONS:

1. **Implement Wildfire protection strategies within the Village of Clinton – bylaws or policies**. Best efforts should be made to develop Policy or Bylaws that protect and safeguard property in the Village boundary from urban interface wildfire.

2. **Develop a long term Economic Development Plan that mitigates wildfire impacts**. Best efforts should be made to develop a long term Economic Development Plan that addresses the impacts of wildfire and identifies strategies that mitigate impact.

3. **Improved high speed internet services** – tourists, entrepreneurs want quality internet service. Best efforts should be made to lobby for improved internet service provisions for the Village of Clinton.

4. **Develop a Business Association or Chamber of Commerce.** The business community realizes that consistent messaging and information flow during the alerts and recovery process could be less challenging if all businesses were able to access this information from one source. It was also determined that effective economic recovery will be dependent on the business community working together to attract tourism to the Village of Clinton.

5. **Develop a marketing strategy to promote business in Clinton**. Advertising is costly. Develop collective marketing material and consistent messaging to advertise Clinton businesses.

6. **Develop a Shop Local strategy.** Community support sustains business in the off season and builds community resilience. The business community sustainability hinges on community support.

7. **Beautify the downtown core to attract tourism**. Install signage outside of town to attract tourists to Clinton. Lobby BC Hydro and MOTI to allow banners to be hung on Hydro poles on Highway 97. Provide RV parking spaces.

8. **Provide support to Not for Profit Organizations:** Secure funding assistance to hire a temporary part time position to assist non-profits with applications for grant funding to make up shortfalls from wildfire impacts.

9. **Develop follow up Policy:** Develop a policy to follow up with businesses specifically in regards to Wildfire Recovery that measures success and struggles of the existing businesses and continues to identify gaps and needs.

ECONOMIC MEDIUM - LONG TERM RECOMMENDATIONS:

1. **Single point of contact to access all available resources after an event such as the wildfires.** Advocate the Province to develop a web-portal where business can access all available support programs.

2. **Improved Government assistance funding stream, with more cash flow provided to impacted businesses.** Advocate the Federal and Provincial government to revisit the parameters of the current business assistance funding stream and reassess maximum funding available to impacted businesses.

3. **Temporary reduction in Business Property taxes – similar to Tax Deferment Program**. Best efforts should be made to lobby the Provincial government to develop a Business Tax Deferment program for businesses affected by natural Disasters

SOCIAL SHORT AND MEDIUM TERM RECOMMENDATIONS:

1. **Community Emergency Planning and public education – provide information sessions regarding Emergency Operation processes**. Often, the biggest stressor is the unknown of what's happening. Best efforts should be made to develop a community evacuation plan that includes evacuation of shut-ins and vulnerable citizens. Once the plan is completed, multiple public information sessions should be offered to residents so that they can become familiar with the process. This should include a "child friendly" presentation to be facilitated at the school.

2. **Develop Community Communication Protocol for times of crisis**. Clear consistent messaging to update the public in a timely manner of the current situation. Clarify where residents can access this information and ensure that procedures are in place to post the information.

3. **Local Counseling Support – discreet with no physician referrals required**. Advocate that the Ministry of Health and IHA provide added Mental Health supports during and after times of crisis for residents of all ages from children to seniors. This should include private sessions and group sessions as well as provide an opportunity to support parents to assist children through recovery.

4. **Community Events – providing an opportunity to celebrate resilience**. Healing comes by sharing our stories. Provide an opportunity for residents to get together to celebrate resilience, share their experience and simply enjoy coming together over a meal and/or all-inclusive event.

ENVIRONMENTAL SHORT AND MEDIUM TERM RECOMMENDATIONS:

1. **Reforestation practices** – Areas to be reforested should be stocked at a lower density, particularly in the urban interface areas.

2. **Vegetation** – Develop vegetation on landscapes that reduce the risk to communities.

3. **Erosion Risk** – Planners need to be aware of downstream values and take into account the risk of erosion.

4. **Lobby the Provincial Government** – Ministry of Forests to expedite cutting permits for the salvageable fiber supply in the fire affected areas and maintain or increase Annual Allowable cuts while fiber is salvageable.

5. **Increase Forest Resilience** – consider utilizing forest management fuel reducing practices and ongoing management of those fuels such as prescribed burns and mechanical thinning when appropriate.

Source: kamloopsthisweek.com

ECONOMIC RECOVERY

PREAMBLE:

The story of economic recovery for the interior of British Columbia begins with the impacts of the Mountain Pine Beetle epidemic. The Mountain Pine Beetle (MPB) decimated much of the Pine forest in BC's interior and northern parts of the Province. To combat the MPB invasion, the annual allowable cut was significantly increased from 2008 – 2017; however, the un-salvaged fibre supply left in the forest is fueling the fires that we experienced during the 2017 wildfire season. The local economy was already under duress, and wildfire impacts are compounding the existing economic crisis. The question remains: "How de we move forward with recovery, when we haven't really begun to understand the full impact of the economic challenges we will be facing?"

SYNOPSIS:

What is Recovery?

The objective of the Village of Clinton Recovery Plan is to return the community to its pre-disaster state, while ensuring that the community is not socially, environmentally or economically disadvantaged by the wildfire event and that Clinton is well positioned for future growth. Restoring the community to pre fire status quo may no longer be sustainable, competitive or functional. This plan was developed to provide support to the community, identify community needs and make recommendations to the Province that will assist the community to implement these strategies in the recovery process.

The Disaster Recovery Process:

Clinton implemented a 3 tiered approach to Wildfire Recovery following the foundational components itemized in the Recovery Work Plan and Recovery Needs: A Guide for Community Wildfire Recovery Planning Document, developed by Emergency Management BC, Community Wildfire Recovery and Provincial Disaster Recovery Branches of the Ministry of Forest Land and Natural Resource Operations and Rural Development. The pillars that will compile the plan are as follows:

- Economic Recovery
- Social Recovery
- Environmental Recovery
- Infrastructure Recovery

Clinton did not sustain any structure or infrastructure losses; as such Infrastructure Recovery will not be a consideration in this document.

In order to develop strategies for recovery, the impact and need to each specific business in the Clinton area needed to be identified.

The Process:

- Business Walks – a one on one conversation was had with business owner able to participate. Specific questions were asked to determine the level of economic impact to each business.
- Business Survey – to capture information from business owners not able to participate in the Business Walks, business owners were invited to participate in an online survey to identify needs, gaps, and impact.
- Business owners meeting with the Cariboo Chilcotin Coast Tourism Association (CCCTA). CCCTA is Clinton's Destination Marketing Organization (DMO) under the umbrella of Destination BC.
- Public Meeting – the business community was invited to participate in a public meeting where survey results were shared and round table discussions were conducted asking 4 specific questions.
    1. Tourism Attraction: How can we stop traffic and keep tourism dollars in Clinton?
    2. Identify existing gaps, services, programs and supports in the recovery process.
    3. Identify existing gaps in the business community.
    4. If wildfires and floods become the "norm", how do we become sustainable and grow the local economy?

  These questions were specifically compiled from information gathered and comments made during the business walks and survey submissions.

- The Recovery Manager supported the business community as a liaison, connecting business owners with the appropriate resources to assist with the recovery process, provided wildfire and highway closure data and was available for private meetings during the recovery plan process.

Business Community Public Meeting with invited guests representing: Red Cross Small Business Support Program, Red Cross Community Partnership Program, Cariboo Chilcotin Coast Tourism Association, Community Futures Sun Country, MRFLRORD Wildfire Recovery Branch (100 Mile House).

Figure 3 identifies employment sector by industry. Of the businesses that completed the survey, approximately 22% are from the accommodation and food industry; 22% finance and insurance, 22% retail, 16% other, while manufacturing, agriculture/forestry and construction are 6% each. It should be noted that these results determine percentages from survey participants and are not a complete representation of the Industry Sector in Clinton.

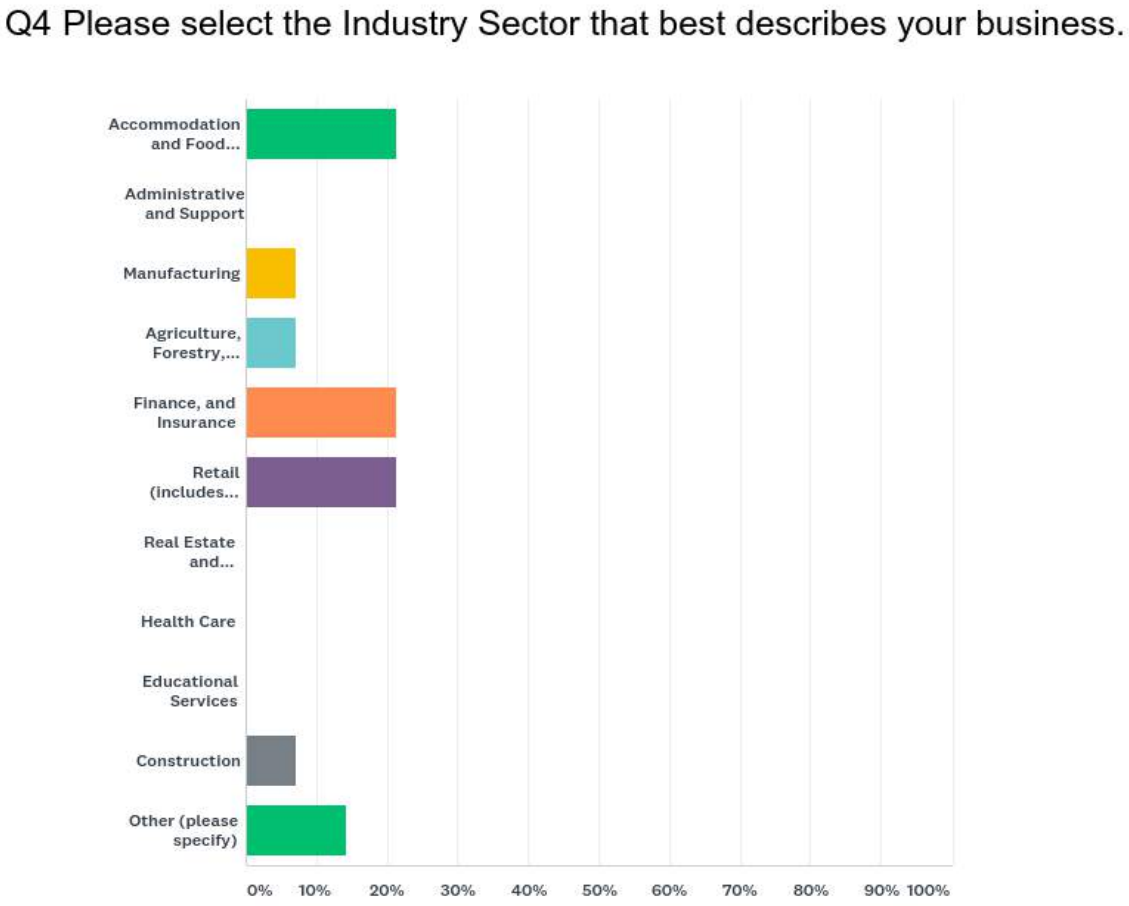


Figure 3: Source, Survey Monkey VOC Business Survey (above)

Figure 4, is an analysis of typical annual revenues. Clinton's industry sector, consists predominantly of small family operated businesses that are the primary income for the business owner. Most are owner operator ventures that may offer part time employment opportunities to residents. As noted in the graph below, approximately 33% indicated annual revenues of less than $100,000. Comparing Figure 4 to Figure 5, approximately 45% of businesses indicated a loss of less than $10,000, while 27% indicated a loss of $11,000 - $20,000. Comparing these numbers to average annual revenues, it is apparent that the average business participating in the survey lost approximately 10% of its annual revenues. Most of the businesses that participated in the survey were able to remain open and serving the firefighters and responders. It is therefore not a true reflection of the financial losses most businesses suffered.

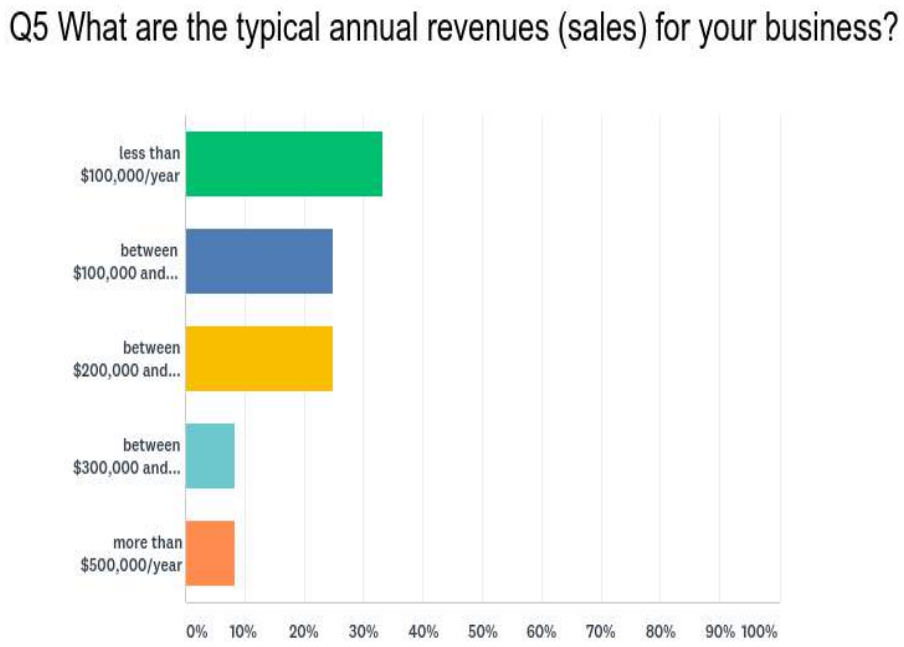


Figure 4: Source, Survey Monkey VOC Business Survey (above)

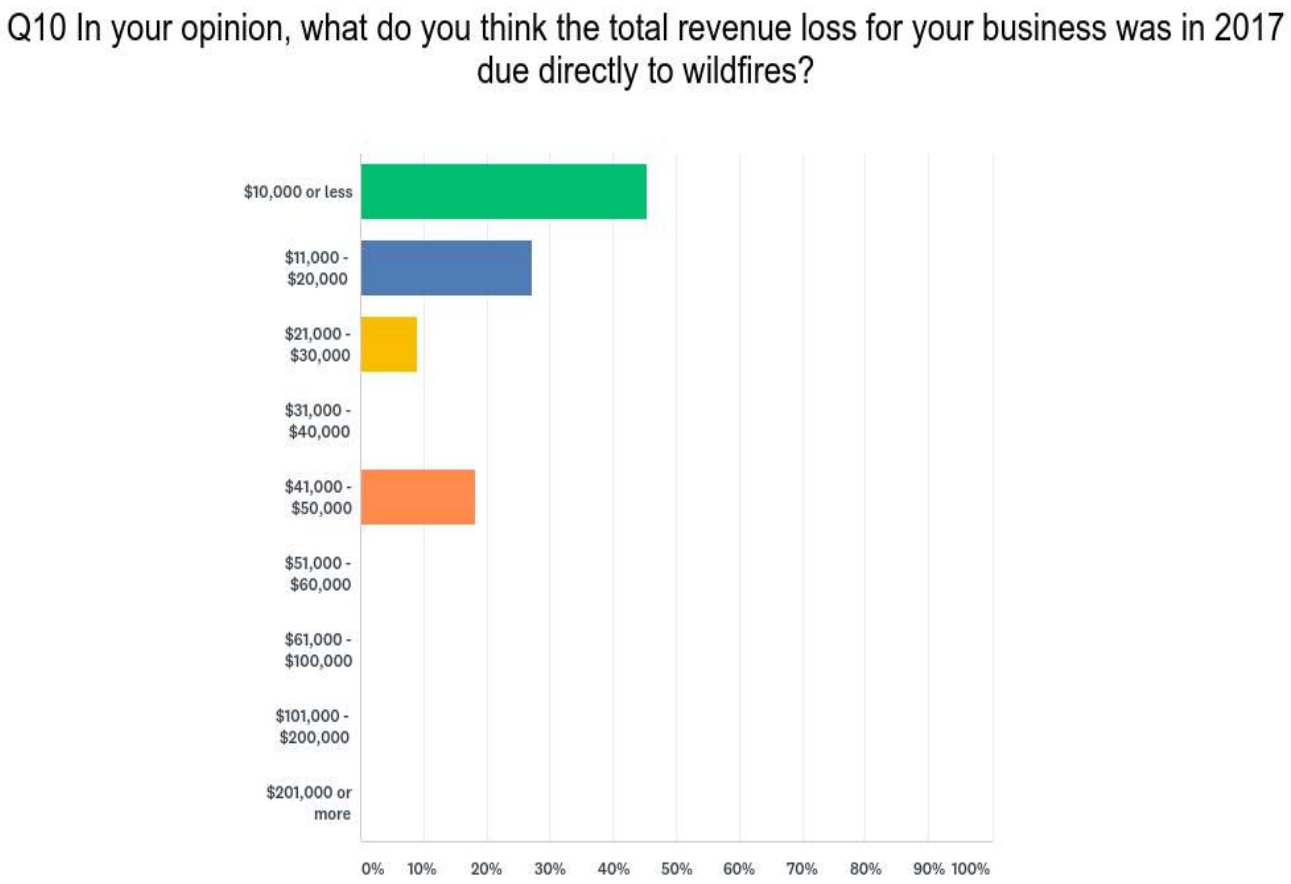


Figure 5: Source, Survey Monkey VOC Business Survey (above)

Figure 6, indicates business losses and to what those losses are attributed. Road closures are the most significant factor relating to revenue losses, with 60% of losses being attributed. Evacuation orders suggest approximately 33% while evacuation alerts indicate approximately 8% impact related to revenue losses.

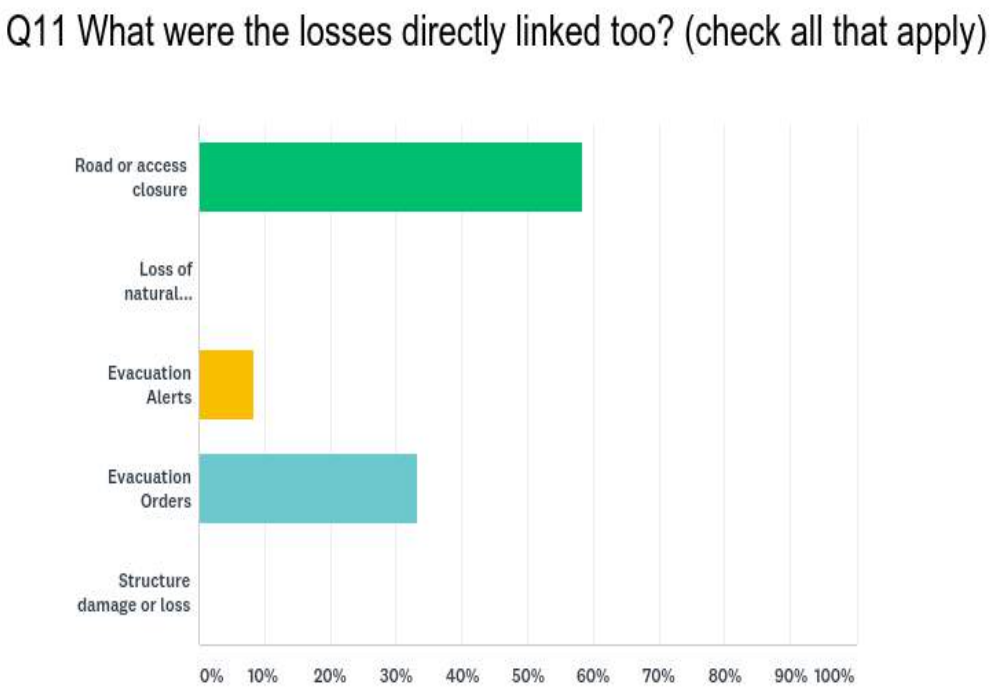


Figure 6: Source, Survey Monkey, VOC Business Survey (above)

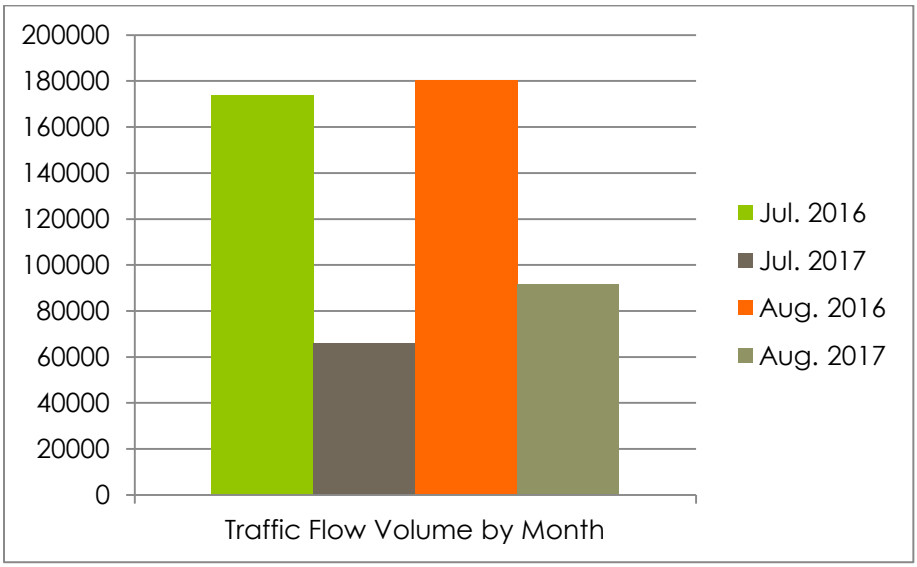


Figure 7: Source, MOTI Traffic Flow Data (above)

Figures 7, displays traffic flow statistics gathered from Route 97, at 57 Mile House, 16 km north of the Village of Clinton, MOTI counter P-28-1NS. Figure 7 compares the total number of vehicles traveling north and south bound in July and August 2016 with 2017. There were 173,559 north and south bound vehicles in July 2016, compared to 65,797 in July 2017. This is a reduction of 107,759 vehicles or 62%. For August, Clinton saw a decrease from 180,056 in 2016 to 91,636 in 2017. This is a reduction in traffic flow of 88,420 vehicles, or 51%

Highway closures were initiated south of Clinton at Cache Creek and north of 100 Mile on July 8, 2017. On July 22, 2017 the highway closure south of Clinton at Cache Creek was lifted and traffic began to flow, however traffic flow did not reach average daily rates until July 28, 2017. Clinton was evacuated July 29th due to directional wind changes bringing the Elephant Hill fire back towards Clinton.

Source: cfjctoday.com

Source: www.bclocalnews.com Highway 97 southbound near 16 Mile House

After the rescinding of evacuation orders, alerts and highway closures, traffic flow resumed normal patterns by August 17, 2017. Comparing September 2016 traffic flow measured at P-28-1NS with September 2017 traffic flow, it had returned to normal with a difference of 3318 less vehicles recorded during September 2017. That said, tourist traffic did not return to normal following the rescinded highway closures. The average traffic flow is reflective of evacuees returning home, responders travelling through and local traffic as life returns to normal. Although roads were open to the travelling public, air quality was still a factor as the Elephant Hill wildfire continued on its destructive path north of Clinton towards Highway 24's Interlakes area, where it was finally contained on September 29, 2017. The "shoulder season" was significantly diminished during the fall of 2017. Hunters and campers continued to avoid the area, thereby adding to the economic impact of the local tourism sector.

Figures 8-11 below show the daily traffic flow statistics referred to in the previous statement.

BC Ministry of Transportation and Infrastructure
Monthly Volume Calendar

Site Names: Clinton P-28-1NS - NY
County: N/A
Funct. Class:
Num. Days: 31
Location: Route 97, at 57 Mile, 16.0 km north of Clinton

	Roadway:	Pos Dir	Neg Dir
MADT:	5,554	2,788	2,765
MAWDT:	5,213	2,588	2,625
MAWET:	5,621	2,734	2,887

July 2016

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	-	-	-	-	-	1	2
Road	-	-	-	-	-	6,171	4,010
Neg Dir	-	-	-	-	-	2,570	2,044
Pos Dir	-	-	-	-	-	3,601	1,966
	3	4	5	6	7	8	9
	7,702	6,086	4,804	4,743	5,085	5,904	4,738
	4,713	3,315	2,490	2,554	2,659	2,846	2,372
	2,989	2,771	2,314	2,189	2,426	3,058	2,366
	10	11	12	13	14	15	16
	5,826	5,314	4,611	4,944	5,585	6,266	4,621
	2,809	2,457	2,287	2,584	2,977	2,970	2,256
	3,017	2,857	2,324	2,360	2,608	3,296	2,365
	17	18	19	20	21	22	23
	5,948	5,634	4,578	4,675	5,330	6,423	5,037
	3,176	2,741	2,297	2,374	2,846	3,192	2,476
	2,772	2,893	2,281	2,301	2,484	3,231	2,561
	24	25	26	27	28	29	30
	6,080	5,238	4,672	5,180	6,928	9,153	6,469
	3,124	2,447	2,274	2,572	3,130	3,832	2,863
	2,956	2,791	2,398	2,608	3,798	5,321	3,606
	31	-	-	-	-	-	-
	5,777	-	-	-	-	-	-
	3,039	-	-	-	-	-	-
	2,738	-	-	-	-	-	-
MADW	6,267	5,568	4,666	4,886	5,732	6,783	4,975
STDEV	811	386	100	227	823	1,338	915
DAYFAC	0.89	1.00	1.19	1.14	0.97	0.82	1.12

Values enclosed in ( ) are excluded from summarized values based on Notes detailed below.

From To Note Description

Figure 8: Source MOTI, Traffic Data website (above)

BC Ministry of Transportation and Infrastructure
Monthly Volume Calendar

Site Names: Clinton P-28-1NS - NY
County: N/A
Funct. Class:
Num. Days: 31
Location: Route 97, at 57 Mile, 16.0 km north of Clinton

	Roadway:	Pos Dir	Neg Dir
MADT:	2,133	1,126	1,007
MAWDT:	2,106	1,052	1,054
MAWET:	1,910	1,103	807

July 2017

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	-	-	-	-	-	-	1
Road	-	-	-	-	-	-	4,896
Neg Dir	-	-	-	-	-	-	2,034
Pos Dir	-	-	-	-	-	-	2,862
	2	3	4	5	6	7	8
	5,043	8,116	5,678	5,028	5,411	4,972	731
	2,532	4,933	3,009	2,700	2,814	2,616	316
	2,511	3,183	2,669	2,328	2,597	2,356	415
	9	10	11	12	13	14	15
	538	438	436	430	421	461	449
	237	169	144	183	194	199	216
	301	269	292	247	227	262	233
	16	17	18	19	20	21	22
	287	332	308	402	438	738	1,169
	152	153	154	210	181	350	387
	135	179	154	192	257	388	782
	23	24	25	26	27	28	29
	2,122	1,943	1,738	1,797	2,582	4,570	3,496
	586	627	678	752	992	1,708	1,429
	1,536	1,316	1,060	1,045	1,590	2,862	2,067
	30	31	-	-	-	-	-
	370	457	-	-	-	-	-
	183	184	-	-	-	-	-
	187	273	-	-	-	-	-
MADW	1,672	2,257	2,040	1,914	2,213	2,685	2,148
STDEV	2,029	3,342	2,510	2,176	2,361	2,417	1,951
DAYFAC	1.28	0.94	1.05	1.11	0.96	0.79	0.99

Values enclosed in ( ) are excluded from summarized values based on Notes detailed below.

From To Note Description

Figure 9: Source MOTI, Traffic Data website (above)

BC Ministry of Transportation and Infrastructure
Monthly Volume Calendar

Site Names: Clinton P-28-1NS - NY
County: N/A
Funct. Class:
Num. Days: 31
Location: Route 97, at 57 Mile, 16.0 km north of Clinton

	Roadway:	Pos Dir	Neg Dir
MADT:	5,835	2,817	3,018
MAWDT:	5,588	2,708	2,879
MAWET:	5,882	2,802	3,081

August 2016

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	-	1	2	3	4	5	6
Road	-	8,629	6,406	5,416	5,566	6,788	5,501
Neg Dir	-	5,071	3,494	2,801	2,952	3,590	2,820
Pos Dir	-	3,558	2,912	2,615	2,614	3,198	2,681
	7	8	9	10	11	12	13
	6,591	5,874	5,110	5,121	5,760	6,650	5,230
	3,433	2,904	2,498	2,290	2,847	3,328	2,596
	3,158	2,970	2,612	2,831	2,913	3,322	2,634
	14	15	16	17	18	19	20
	6,282	5,738	4,931	5,042	5,596	6,880	5,253
	3,343	2,830	2,568	2,614	2,904	3,495	2,685
	2,939	2,908	2,363	2,428	2,692	3,385	2,568
	21	22	23	24	25	26	27
	6,594	5,860	4,819	5,007	5,728	6,591	5,249
	3,532	2,903	2,425	2,652	2,927	3,367	2,792
	3,062	2,957	2,394	2,355	2,801	3,224	2,457
	28	29	30	31	-	-	-
	6,359	5,532	4,950	5,003	-	-	-
	3,444	2,814	2,577	2,604	-	-	-
	2,915	2,718	2,373	2,399	-	-	-
MADW	6,457	6,327	5,243	5,118	5,663	6,727	5,308
STDEV	160	1,294	658	173	96	131	129
DAYFAC	0.90	0.92	1.11	1.14	1.03	0.87	1.10

Values enclosed in ( ) are excluded from summarized values based on Notes detailed below.

From To Note Description

Figure 10: Source MOTI, Traffic Data website (above)

BC Ministry of Transportation and Infrastructure
Monthly Volume Calendar

Site Names: Clinton P-28-1NS - NY
County: N/A
Funct. Class:
Num. Days: 31
Location: Route 97, at 57 Mile, 16.0 km north of Clinton

	Roadway:	Pos Dir	Neg Dir
MADT:	2,954	1,447	1,507
MAWDT:	2,967	1,449	1,518
MAWET:	2,853	1,430	1,422

August 2017

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	-	-	1	2	3	4	5
Road	-	-	523	530	627	561	606
Neg Dir	-	-	226	251	321	274	291
Pos Dir	-	-	297	279	306	287	315
	6	7	8	9	10	11	12
	565	572	615	663	700	670	641
	285	345	300	337	358	316	324
	280	227	315	326	342	354	317
	13	14	15	16	17	18	19
	592	727	1,233	3,877	4,560	5,161	4,554
	301	376	648	2,018	2,389	2,778	2,313
	291	351	585	1,859	2,171	2,383	2,241
	20	21	22	23	24	25	26
	5,387	5,116	4,581	4,776	5,251	6,031	4,689
	2,570	2,434	2,222	2,410	2,719	3,167	2,395
	2,817	2,682	2,359	2,366	2,532	2,864	2,294
	27	28	29	30	31	-	-
	5,788	5,356	5,006	5,486	6,192	-	-
	2,900	2,737	2,588	2,924	3,285	-	-
	2,888	2,619	2,418	2,562	2,907	-	-
MADW	3,083	2,943	2,392	3,066	3,466	3,106	2,623
STDEV	2,897	2,651	2,215	2,326	2,623	2,898	2,309
DAYFAC	0.96	1.00	1.24	0.96	0.85	0.95	1.13

Values enclosed in ( ) are excluded from summarized values based on Notes detailed below.

From To Note Description

Figure 11: Source MOTI, Traffic Data website (above)

ECONOMIC IMPACT:

To determine economic impact, active engagement was required with Clinton's business community gathering and assessing data to fully understand the economic impacts of the Elephant Hill Wildfire. Impact studies were conducted with businesses on the highway corridor to assess revenue losses and other impacts affecting the sustainability of the business. Data gathered during these consultations assisted in identifying the strategies to be included in the recovery plan. Conversations were initiated to guide the business community in identifying strategies supported by business during the recovery process and specifically a business community public meeting where four explicit questions were addressed:

1. Identify existing gaps, services, programs and supports in the recovery process.
2. Identify existing gaps in the business community.
3. How can we attract tourism and stop traffic to keep cash flow in Clinton?
4. If wildfires become the "norm", how do we become sustainable and grow the local economy?

The questions presented to the business community were compiled from the data collected and comments made during the Business Economic Recovery Survey for the Village of Clinton.

The Clinton and District Community Forest and West Fraser Sawmills fiber supply was also heavily impacted during the fires. The Community Forest estimates a loss of approximately 15% of its fiber supply; this directly impacts the Village of Clinton as it is the sole shareholder of the corporation. Others affected by economic impacts in the Village are the non-profit groups. Many annual scheduled events were cancelled or postponed due to the wildfire. Other events and fundraisers had reduced attendance as people were not travelling to the fire affected area. Without scheduled annual fundraising events, many of these groups are not sustainable. Clinton's non-profit groups are primarily run by dedicated volunteers that are elderly and struggle with technology. Most fundraising efforts are traditional events such as bake sales, yard sales, raffles, dinners etc.; applying for funds such as Gaming Grants is overwhelming to many volunteers. Non-Profit volunteers are willing to learn the grant search and application process if support and direction can be provided.

The approach to building a successful economic recovery strategy is dependent on bringing the business community together and formulating a cohesive strategy for the community that includes consideration of the regional strategies being implemented in the Thompson Nicola Regional District.

Economic Effects

- Loss of businesses
- Loss of jobs
- Reduced cash flow within the community
- Adverse ripple effects in community investment

Impacts ripple throughout the community and surrounding area, affecting businesses, jobs, non-profits groups, volunteers, school children, development proposals, and the elderly, among others. Severe events may affect a local government's sources of income, including property taxes, and the entire community's ability to sustain economic viability. Clinton, as a community in the TNRD should be

cognisant of the recommendations made in the TNRD Economic Wildfire Recovery Plan. As the recovery process moves forward, it is apparent that communities developing recovery plans have similar recommendations to mitigate the impacts of the wildfire situation. Below are some of the TNRD recommendations that are similar to those in the Village of Clinton Wildfire Recovery Plan.

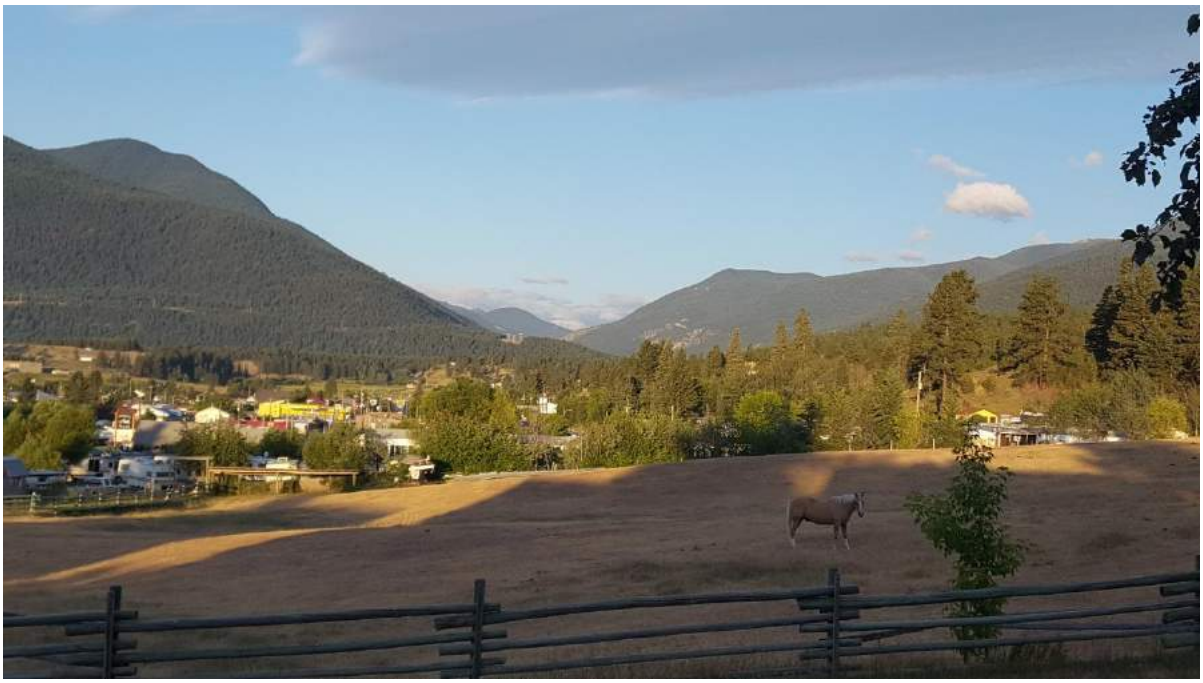
Thompson Nicola Regional District Short-Medium Recovery Recommendations:

1. *Investigate the idea of a one-on-one direct assistance program to help businesses recovery by providing services.*
2. *Continued promotion of the existing recovery programs in an easy to read and simplified format.*
3. *Special provision should be considered around variances, permitting and licensing to enable to rebuild and recover as soon as possible.*
4. *Investigate the idea of providing support to assist businesses with the creation of an emergency response and business continuity plan.*

Possible Medium-Long term Recovery Recommendations:

1. *Best efforts should be made to continually improve the wildfire-specific, integrated media and communication strategy or plan for the TNRD for the next fire season.*
2. *Work to continually improve existing programs which assist communities with preparedness efforts such as an Integrated Emergency Management Plan.*
3. *Take measures (such as geotechnical stability studies) to reduce further environmental driven economic impacts.*

For the complete TNRD Recovery Work Plan refer to: https://tnrd.civicweb.net/document/140893



Identified Gaps:

Gaps identified by the business community during the recovery process include:

- Communication from Local Government, Regional District and the Province leading up to, during, and after the Wildfire.
- Business preparedness/planning for such an unprecedented natural disaster event
- Community Emergency Planning initiative
- Long term Economic Development Plan
- Collaboration among business community
- Business Association or Chamber of Commerce
- Shop Local marketing campaign

The business community clearly indicated that recovery success would be dependent on Marketing the community for tourism attraction, business investment, the development of an ongoing "shop local" campaign and the establishment of a Chamber of Commerce or Business Association.

A disaster such as the Wildfires of 2017 can provide a community with unprecedented opportunities to bring together economic, social, quality of life, and environmental goals. After a disaster, community awareness about the value and need for mitigation is extraordinary. Usually the status quo is no longer an option; therefore, there can be greater openness to new ideas and a consideration of learning from people with different perspectives, often resulting in community resilience.

Strategies to Support Economic Recovery:

- Single point of contact to access all available resources after an event such as the wildfires
- Improved Government assistance funding stream, with more cash flow provided to impacted businesses
- Temporary reduction in Business Property taxes – similar to Tax Deferment Program
- Improved high speed internet services – tourists, entrepreneurs want quality internet service
- Implement Wildfire protection strategies within the Village of Clinton – bylaws or policies
- Develop a long term Economic Development Plan that mitigates wildfire impacts
- Develop a Business Association or Chamber of Commerce The business community realizes that consistent messaging and information flow during the alerts and recovery process could be less challenging if all businesses were able to access this information from one source. It was also determined that effective economic recovery will be dependent on the business community working together to attract revenue sources to the Village of Clinton.
- Develop a marketing strategy to promote business in Clinton – advertising is costly, develop collective marketing material
- Develop a Shop Local strategy – community support sustains business in the off season and builds community resilience

ECONOMIC RECOVERY SUPPORTS:

Red Cross
Phase 1 & 2 Small Business Support
Community Partnership Program
http://www.redcross.ca/how-we-help/current-emergency-responses/british-columbia-fires

Community Futures – Sun Country
Recovery Ambassadors
http://www.cfsun.ca/wildfire-recovery-program

SOCIAL RECOVERY:

PREAMBLE:

Everyone is affected differently by an event such as the Elephant Hill wildfire; impacts include loss of wages due to road closures, evacuations, etc., fear of being trapped due to road closures (perceived lack of escape routes), anxiety over lack of supplies in the community, health concerns, feelings of isolation and helplessness, anxiety, fear of future events. The recovery process for social impact varies with each individual, as we move through the recovery process we will gain a better understanding of required supports for the community.

SYNOPSIS:

Wildfire social recovery has gained increasing attention as British Columbia's wildfire season has escalated to what appear to be 'megafires'. Forest fires are nothing new to the residents of British Columbia's interior however, the magnitude of these fires has increased substantially in past years. Simultaneously, the social impacts to residents have increased significantly.

Definition of Disasters:

- Disasters are traumatic events which are dangerous, overwhelming, and usually sudden. (Figley, 1985)
- The American Psychiatric Association defines a traumatic event as a psychologically distressing event, outside the range of usual human experience that would be markedly distressing to almost anyone.

Within the context of the phases of a disaster, emotional recovery, happens when there is sensitivity to the changing social needs of survivors.

Several documents from the American Red Cross state "social needs change throughout the disaster cycle, particularly as social support deteriorates over time. It is important to anticipate what social needs of the public, emergency responders, support staff, and volunteers might emerge, before advancing to the next stage of the disaster. Particular consideration needs to be directed toward differential impacts of disasters based on gender, age, and other vulnerabilities."

SOCIAL IMPACT:

In regards to Social Impacts, the active engagement with community members consisted of gathering data to determine a base line for social impact. The approach used included one-on-one interviews and meetings with community groups. This method was chosen to protect the vulnerability of affected residents. After-effects considered include loss of wages due to road closures, evacuations alerts and orders, fear of being trapped due to road closures (perceived lack of escape routes), anxiety over lack of supplies in the community, health concerns, feelings of isolation and helplessness, withdrawing from social interactions, fear of leaving home and in severe cases, symptoms similar to PTSD. The recovery process for social impact varies with each individual, however; the completed document identifies strategies to guide residents through the social healing process and makes recommendations to mitigate future stressors in the event of another wildfire incident.

Social Effects

- Stress and psychological trauma
- Focus on the short term, foregoing long-term goals and opportunities
- Delay of programs that serve long-standing social needs
- Gaps in community; economic classes tend to widen

Disasters challenge virtually every community member, directly or indirectly, to a test of personal and economic survival. Specific social and financial conditions will influence community, family, and individual recovery.

Source: techdeezer.com

Wildfires can be particularly stressful, factors that influence the fires strength and direction can change at any moment. Communities that seem clear of danger, as Clinton was, are suddenly ordered to evacuate. Despite well-orchestrated and persistent fire-fighting by emergency services personnel, unanticipated sudden weather changes can lead to unpreventable destruction of property. It is common for people who have lived through these circumstances to experience strong emotions. Understanding normal responses to these abnormal events can aid residents in coping effectively with their feelings, thoughts and behaviors as they recover from the fire.

Figure 12 depicts the phases of emotional recovery. Clinton's Pre-disaster phase was elevated due to the highway closures and evacuation alerts leading up to the Elephant Hill Wildfire causing the Village of Clinton to be evacuated on July 29, 2018.

Four Phases of Emotional Recovery:

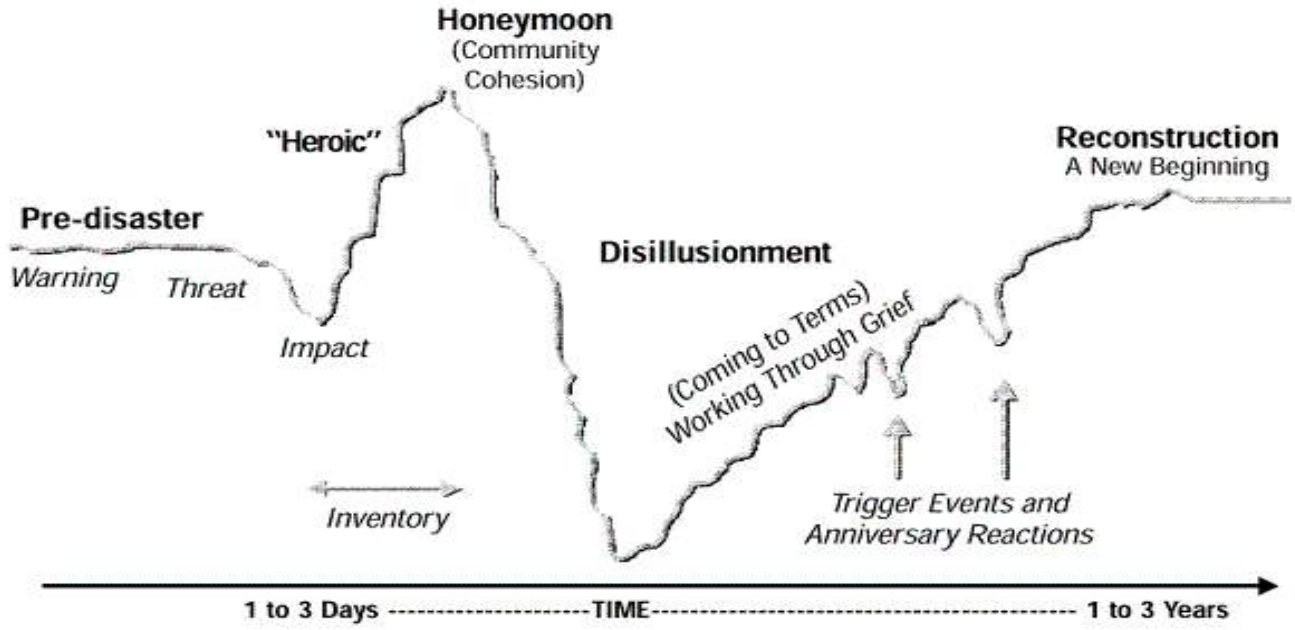


Figure 12: Source, American Red Cross, 1995

Following the impact of a disaster, emotional recovery goes through phases and emotional reactions are good indicators of the phase.[3] For example, during the Heroic phase there is numbness, shock, but elation when life is saved. During the honeymoon phase survivors are grateful, and the community pulls together to cope with the disaster.

Below are the Phases of a Disaster and common emotional experiences in the different phases:

[3] Ehrenreich 2001. Gauthamadas, 2005, CDCP documents – Knowledge and Training Resource Centre Module 4

1. Warning or threat phase
    a. Feelings of vulnerability, being unsafe and fear of future tragedies
    b. Perception of lack of control
    c. Post-disaster assessment: self blame or a sense of responsibility for what has occurred
2. Impact phase
    a. Constricted, stunned, shock responses, panic or hysteria, confusion, disbelief
    b. Focus on the survival and physical well-being of themselves and loved ones
    c. Survivors will experience anxiety until they are reunited with loved ones
3. Rescue or Heroic Phase
    a. Survival, rescuing others, promoting priorities, evacuation
    b. Altruism is prominent among survivors and emergency responders
    c. Post-impact disorientation; post trauma reactions
    d. Activity level is high, productivity is low
4. Remedy Phase
    a. Governmental support
    b. Volunteer assistance
    c. Community support
    d. Survivors may experience a short-lived sense that the help they receive will make them whole again
5. Inventory phase
    a. Recognition of the limits of available disaster assistance
    b. Physical exhaustion due to demands and pressures
    c. Stress of relocation or living in a 'damaged home'
    d. Unrealistic optimism initially experienced give way to discouragement and fatigue
6. Disillusionment Phase
    a. Pull out of assistance agencies and volunteer groups
    b. Create feelings of being abandoned and neglected
    c. Assessment of losses and limitations
    d. Health problems and exacerbation of existing ones
    e. Divisiveness and hostility among community members undermine community efforts
        i. depression and hopelessness may be prominent, as the reality of how life becomes more apparent
        ii. Enormous drain of reserves: physical, financial emotional - takes its toll
    f. Adults physical reactions may include: headaches, HBP, ulcers, gastrointestinal problems, sleep disorders
    g. Emotional reactions: fluctuate between emotional numbness and expressions of intense anxiety
    h. Common emotional reactions:

i. Anxiety and depression

ii. Anger and frustration – may be displaced to relief workers when anger about the disaster seems "less rational"

7. Reconstruction and Recovery Phase
    a. Survivors assume responsibility for rebuilding their lives
    b. Recognition of losses
    c. Opportunity to recognize personal strengths and re-examine one's life.[4]
8. Reconstruction phase
    a. Gradually becomes apparent as intense emotions are replaced by a sense of acceptance
    b. Increasing independence
    c. Emotional investment in relationships and activities of daily life
9. Recovery phase
    a. People come to see meaning, personal growth and opportunity from their disaster experience despite their losses and pain
    b. While disasters may bring profound life changing losses, they also bring the opportunity to recognize personal strengths and to re-examine life priorities

Social recovery research was conducted on a smaller and more personal scale. This methodology was chosen to shield residents from further emotional stress. Meetings were attended with various non-profit service groups to gauge the level of impact and 30 residents completed a confidential survey that provided information regarding their social well-being. This data was compiled and is provided in the Figures below.

How does stress manifest itself during forest fires? Whether you're on evacuation alert or have to evacuate, you're afraid. The uncertainty itself and not knowing is often what people highlight as the most stressful experience. People often have more symptoms of anxiety. They may not sleep well. Children often regress so you'll see behaviours consistent with when they were younger. Some people have pretty effective coping mechanisms; some don't. Some cope by being very optimistic and moving into action quickly. Some cope by retreating, withdrawing and avoiding things. All of the behaviours listed above manifested in various participants throughout the interview process.

What we know about stress and effective coping, in the disaster context, is there is no one way to manage and no one manifestation of it. What we do know about effective coping is the sooner people can get into having some sense of control over their lives by doing things, the better for them.

Figure 13, Mental Health Support Services: At any time during and after Clinton's evacuation and alert orders, do you feel you would have benefitted from Mental Health Support Services?

[4] Knowledge and Training Resource Centre Module 4

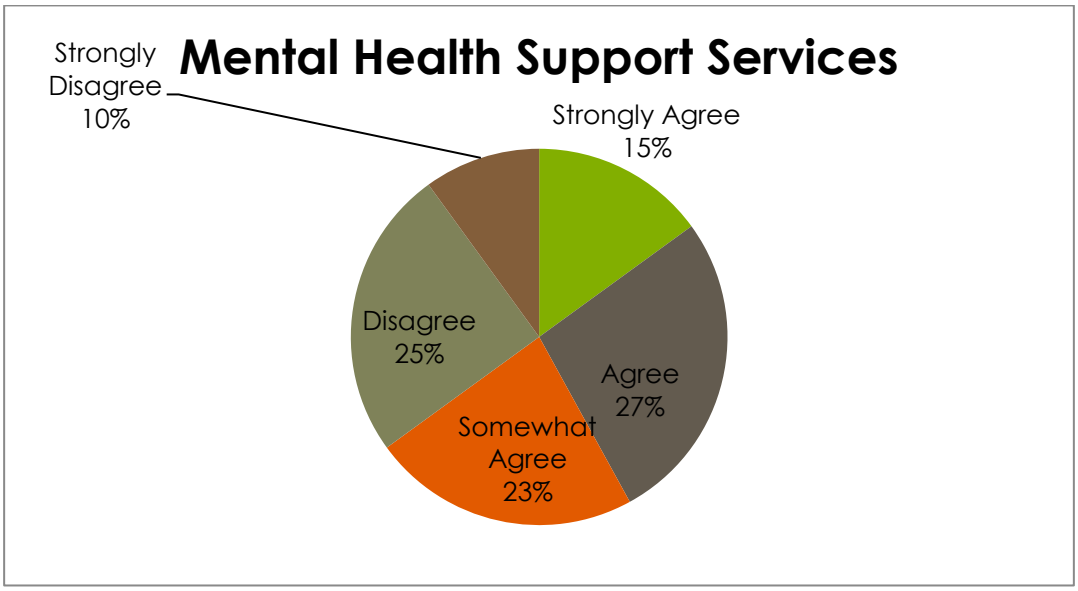


Figure 13, Social Survey

One of the most difficult things to admit is the need for Mental Health support services. Often one believes that this is a sign of weakness and exposes our vulnerability. Clearly, figure 13 shows that 65% of survey participants believe that they would have benefitted from some sort of Mental Health support during and after the evacuations and alerts. Comparing Figure 13 to Figure 14 sadly shows the overwhelming reversal of percentage. 66% state that they would not seek Mental Health support services if they were accessible. The stigma associated with Mental Health supports often causes those that need support to struggle through their day to day lives. What is the risk if some of these mental health issues are not dealt with? "When anything like that is unacknowledged or not managed well, it will manifest itself in behaviours or an inability to concentrate, feeling like you can't function. You might have a chronic health condition that is worsened. Unaddressed, these things will both exacerbate pre-existing conditions and can contribute to overall loss in the way we would normally see ourselves functioning."[5]

Figure 14, Access Services: If Mental Health Support Services were discreetly available; would you have accessed these supports?

[5] Ian Bailey Interview with Dr. Robin Cox Aug. 27, 2015

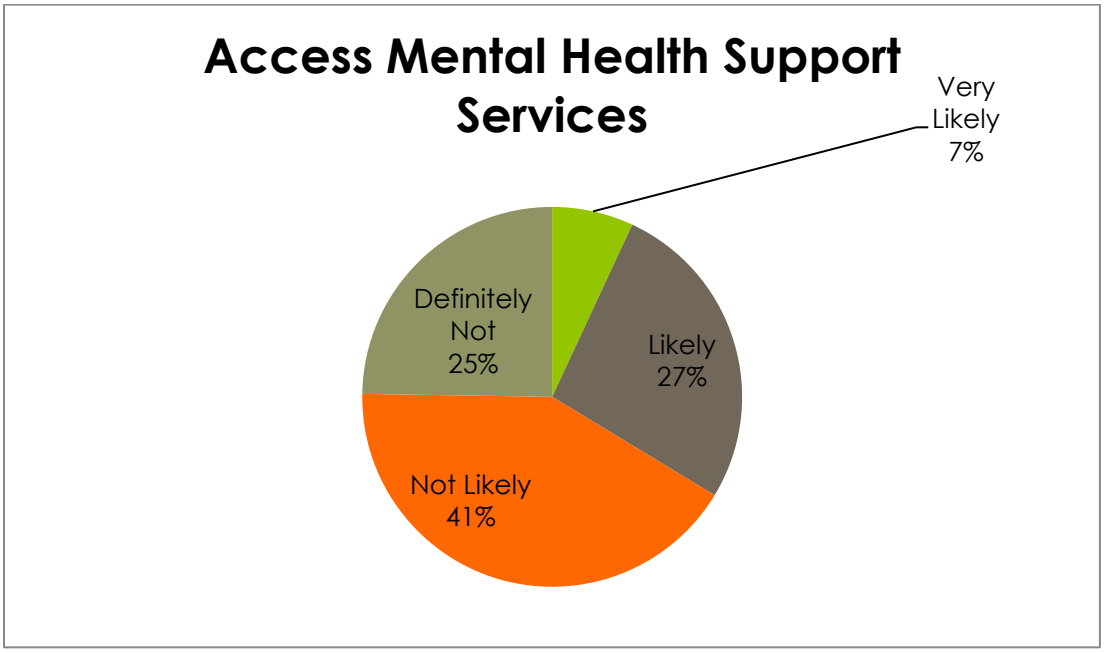


Figure 14, Social Survey

When do you know you need professional help? "In terms of psychological support, there's no one right answer. If you are feeling overwhelmed and you don't have other supports to reach out to like informal family or friends, it can help to reach out to professionals."[6]

Figure 15, Financial Stressors: Was income interruption a key factor in your stress levels during the evacuation and alerts?

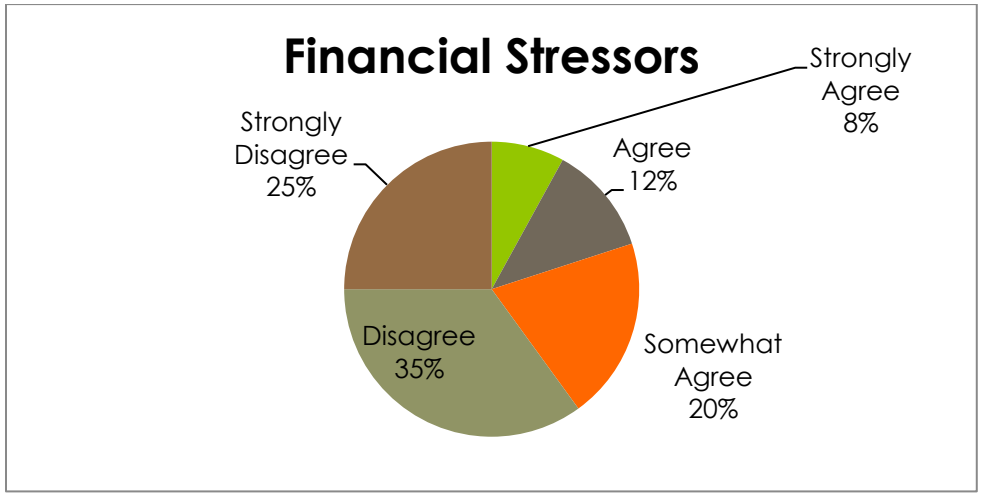


Figure 15, Social Survey

[6] Ian Bailey Interview with Dr. Robin Cox Aug. 27, 2015

Social impacts are not strictly emotional; many factors contribute to our emotional stability. The highway closures, alerts and evacuation orders all contributed to residents not being able to go to work. Clinton's demographic is ageing and, as such, most residents are on fixed incomes. Residents on pensions did not experience an interruption in income. Statistics Canada shows Clinton's 2015 median income as $40,832 compared to TNRD area E as $52,352. The median income of households in BC is $76,770. Clearly Clinton's median income is significantly reduced from the Provincial average. Of those residents not on a fixed income, losing shifts at work could become a significant impact and emotional stressor. West Fraser Chasm Sawmill, Clinton's major employer states that 21 full shifts were lost during the 2017 fire season; some employees displayed signs of higher than usual stress levels and anxiety. Other industries that experienced shift losses include: retail, antique and gift shops, grocery stores, gas stations, restaurants and motels.

There's an assumption that if people haven't directly lost anything, they're not impacted. But it becomes clear quickly, and research supports this, that that's not true. If a community is impacted, you have lost something. The community is changed and that's an adjustment. The social network you built up in a community can change as a result of fire. And there's the loss of a sense of safety.

The residents of Clinton are well into the recovery process as the anniversary dates associated with the Elephant Hill Wildfire approach. Some residents may have "triggers" and feel anxious about potential future events. Preparedness is the best mitigation; it is common to fear what one can't control. If the community has a plan and is prepared to manage a future crisis, their citizens will have a lower base state of arousal. Educating the public is the most effective method to reduce the effects of "triggers".

Helpful Coping Strategies:

- mobilize a support system -- reach out and connect with others, especially those who may have shared the stressful event
- talk about the traumatic experience with empathic listeners
- cry
- hard exercise like jogging, aerobics, bicycling, walking
- relaxation exercise like yoga, stretching, massage
- humor
- prayer and/or meditation; listening to relaxing guided imagery; progressive deep muscle relaxation
- hot baths
- music and art
- maintain balanced diet and sleep cycle as much as possible
- avoid over-using stimulants like caffeine, sugar, or nicotine
- commitment to something personally meaningful and important every day
- hug those you love, pets included

- eat warm turkey, boiled onions, baked potatoes, cream-based soups -- these are tryptophan activators, which help you feel tired but good (like after Thanksgiving dinner)
- proactive responses toward personal and community safety -- organize or do something socially active
- write about your experience -- in detail, just for yourself or to share with others

People are usually surprised that reactions to trauma can last longer than they expected. It may take weeks, months, and in some cases, many years to fully regain equilibrium. Many people will get through this period with the help and support of family and friends, but sometimes friends and family may push people to "get over it" before they're ready. Let them know that such responses are not helpful for you right now, though you appreciate that they are trying to help. Many people find that individual, group, or family counseling are helpful. The key word is CONNECTION -- ask for help, support, understanding, and opportunities to talk.[7]

Finally, in ensuring that the social needs of all concerned are adequately addressed, there are some Guiding **Principles** when preparing for and responding to disasters that should be remembered. [8]

- No one who sees a disaster is untouched by it
- There are two types of disaster trauma: individual and community
- Most people pull together and function during and after a disaster, but their effectiveness is diminished
- Disaster stress and grief reactions are normal responses to an abnormal situation
- Many emotional reactions of disaster survivors stem from problems of living brought about by the disaster
- Disaster relief assistance may be confusing to disaster survivors: may feel frustration, anger and feelings of helplessness
- Most people do not see themselves needing social services after a disaster and will not seek such services
- Survivors may reject disaster assistance of all types
- Disaster social response assistance is more practical than psychological in nature; it must be tailored to the communities they serve
- Use active outreach approach to intervene successfully in disaster
- Survivors respond to active, genuine interest and concern
- Interventions must be appropriate to the phase of the disaster

[7] Ref: PAP PPT and http://www.bt.cdc.gov/mentalhealth/responders.asp; ACT Alliance, 2011, see also Appendix for other similar guidelines

[8] http://www.trauma-pages.com/s/t-facts.php

- Social support systems are crucial to recovery

Identified Social Recovery Gaps:

- Community planning and public education – provide information sessions regarding Emergency Operation processes including evacuation of shut ins and vulnerable citizens
- Community communication protocol for times of crisis – clear consistent messaging to inform public of the situation. Clarify where residents can access this information
- Local Counselling Support – discreet with no physician referrals required
- Community Events – providing an opportunity to celebrate resilience

SOCIAL SUPPORTS:

Community Wellness Manager – United Way
Krista Billy: 250-457-1761
Email: Krista@unitedwaytnc.ca

Clinton Health Center: 250-459-2080

Elizabeth Fry Society
Ashcroft: 250-453-9656

Mental Health – IHA
Ashcroft: BC Mental Health Services Adult – 250-453-1950
Ashcroft: BC Mental Health Services Youth – 250-453-2109

Faith Based Organizations – Clinton
Bethel Pentecostal Tabernacle – Pastor Nick Astle: 250-459-7707
Living Waters Christian Fellowship – Pastor Vicky Escobedo: 250-459-7916

Recovery Work Plan:

NEED	ACTIVITY	RESOURCES TO CONSIDER	TIMELINE / MILESTONES	PERSON RESPONSIBLE	FINANCIAL CONSIDERATIONS
Develop platform for consistent source of communication to provide support information	Create "recovery" tab on Village website & host recovery face book page	N/A	December 2017 – duration of recovery	Recovery Manager	No additional financial considerations required.
Gain understanding of full scope of wildfire impacts on businesses in Clinton	Impact assessment	-Survey -interviews / business walks -database for data - analysis	Interviews completed by January 9, 2018 present findings at public meeting	Recovery Manager	No additional financial considerations required.
Business Community Engagement. Identify impact and recovery needs, wants, strategies, goals and objectives.	Host Economic impact Public meeting invite business owners / public. Present survey results, round table discussions	-CFSUN -Red Cross -CCCTA -MFLNRO&RD -RD's -FN's	January 9, 2018	Recovery Manager	No additional financial considerations required.
Gain full scope understanding of social wildfire impacts to residents	Impact assessment	-Survey -interviews Database development -supports IHA, Efry, United Way	End of January	Recovery Manager	No additional financial considerations required
Community engagement session Social impact	Present survey results, round table discussion regarding support and community resilience	-IHA Mental Health recovery team -E-Fry -United Way -Finance Councillors	Early February	Recovery Manager	No additional financial considerations required
Gain understanding of fire impact to Heart Ridge	Environmental Assessment of Heart Ridge	Iverson MacKenzie Biologists Wildfire Ecologist Conservation	Early February	Recovery Manager & Consultant	$ 5,000.00
Gain understanding of Fibre supply impact to local TSA/AAC	Meet with WF Chief Forester and Area Manager to gather information consider impact to Chasm mill (teleconference)	Woodlot Manager MFLNRO	Early February	Recovery Manager	No additional financial considerations required
Community Engagement session for Environmental impact	Present Environmental and Fiber supply impact to community	Round table discussion to develop community strategies to rebuild and mitigate the environment	Mid February	Recovery Manager Foresters Biologist/Ecologist	No additional financial consideration required
Draft Environmental portion of Recovery Plan	Compile report		March	Biologist/Ecologist	$5,000.00
Public presentation	Present Environmental Assessment to Community		March	Recovery Manager	No additional financial consideration required
Compile draft plan Submit to CAO	Review with CAO		Extension granted by CAO and EMBC	Recovery Manager / CAO	No additional financial

					consideration required
Edit draft plan	Review with CAO		After CAO's review	Recovery Manager	No additional financial consideration required
Request final approval of plan from Council			At CAO's discretion	CAO	No additional financial consideration required
Submit Plan to Province			At CAO's discretion	CAO	No additional financial consideration required
Present plan to Public	Make plan available for public review		At CAO's discretion	Council	No additional financial consideration required

ENVIRONMENTAL RECOVERY:

In terms of wildfires, post disaster recovery efforts following a wildfire begin with assessing fire damage to trees, shrubs, soil and wildlife. Wildfire recovery strategies are dependent on the intensity of the fire (scale of low to high), which determines the extent of fire damage and effective forest restoration. Low intensity fires consist of minimal damage to small trees without burning all of the forest and the majority of leaves or needles remain on the trees. Meanwhile, wildfires burning at moderate intensity result in the majority of the leaves and ground cover being consumed by flames while the largest, most healthy trees remain intact. The most devastating wildfires burn at high intensity and destroy 50 to 100% of the forest, including all the ground cover. The Elephant Hill wildfire was ranked a category 5 and 6 fire multiple times throughout its duration, causing some areas to sustain severe fire impact. This would imply that the damage to the forest and the eco system it sustains is significant. A complete assessment of the forest surrounding Clinton was completed by Biologist Ken MacKenzie, of Iverson, MacKenzie Biological Consulting and Fire Ecologist Bob Gray, of R.W. Gray Consulting Ltd. The comprehensive analysis of the area between the Bonaparte River and Highway 97 at the Village of Clinton considers the condition of the affected land base, fiber supply, range land and grazing, wildlife, erosion and overall ecosystem impacts.

Physical Environmental Effects:

- Alteration of the landscape, such as in a landslide, major flood or wildfire
- Landscape destabilization, erosion
- Environmental contamination by chemicals or pollutants (fire retardant)

A well-managed community recovery effort mitigates both short- and long-term impacts and can allow impacted communities to introduce improvements that would not otherwise have been possible.

Preamble:

Clinton is situated at the southern point of the Cariboo Region. It is located 4 hours from Vancouver and is every outdoor enthusiast's paradise. The Elephant Hill Wildfire decimated much of the area between Hart Ridge and the Bonaparte River. This area has been a back roads camping, hunting, fishing, hiking, and RV hotspot for many years. That same area is within the Village of Clinton Community Forest boundary. When asked how much of the Community Forest was impacted by the Elephant Hill Wildfire, Steve Law, General Manager of the Community Forest states that approximately 15% of the Community Forest tenure was lost. The burnt fiber supply also impacts Clinton's largest employer, West Fraser Chasm Sawmills. Michael Siclari, General Manager of Chasm Sawmills states that the fiber supply loss is a significant impact to the Mill; not only did the Elephant Hill fire decimate West Frasers' fiber supply, other fires in the Cariboo were also a factor. When asked what Chasm Sawmills greatest challenge since the fires has been, Michael Siclari states that permitting to harvest salvageable fiber in the fire area has been difficult. At the time of the interview in March 2018, the Province had not yet approved one permit to harvest inside the fire areas. Lobbying the Provincial Government to fast track these logging permits is an initiative that the Village Council could undertake to assist the local mill and Community Forest to harvest salvageable fiber supply.

Providing education to the community in regards to understanding wildfire behaviour and mitigation strategies was an initiative undertaken by Council. The production "Era of Megafires" was presented to the public. This one-hour presentation provided a scientific explanation of the increasing frequency and severity of wildfires, including physical examples of interface wildfire behaviour, history of forest management practices and how forestry planning and fire protection has created this "perfect storm". The presentation also suggested best practices to mitigate future wildfire events and what residents can do to protect their homes from an interface fire.

From a community perspective the immediate concern is erosion and future flooding or mudslides along with the restoration of wildlife habitat and the natural environment. Looking forward the community's greatest concern is future wildfire events. It is heartbreaking to look out at the east side of Clinton and see the destruction that the fire has left. Mitigating future events like those of last summer is of the highest priority for all of Clinton's residents.

Public in Attendance at the Environmental Recovery meeting

Discussion Panel from Clinton's Environmental Assessment Public Meeting

Discussion Panel Left to right: Ken MacKenzie, Bob Gray, Michael Siclari West Fraser Chasm GM, Chad Swanson, West Fraser Chief Forester, Steve Law, Clinton Community Forest GM, Eleanor Bassett Zone Range Agrologist, Pat Byrne, MFLNRORD, Kane Copeley, MFLNRORD.

The following portion of the report has been sub-contracted by the Recovery Manager to Ken Mackenzie, of Iverson & MacKenzie Biological Consulting Ltd. and Robert W Gray, of R.W. Gray Consulting Ltd. The information and recommendations are based on the research conducted of the area between the Bonaparte River and Highway 97 at Clinton with a primary focus on Hart Ridge.

Ecological Consequences of Management Options of the 2017 Wildfire on Hart Ridge, Clinton, BC

prepared by Ken MacKenzie, R. P. Bio.

Iverson & MacKenzie Biological Consulting Ltd.

And

Robert W. Gray

R. W. Gray Consulting Ltd.

For

Daniela Dyck, Wildfire Recovery Manager

Village of Clinton, BC

HART RIDGE ECOLOGICAL ASSESSMENT REPORT

INTRODUCTION:

As part of the recovery planning for the area affected by the 2017 wildfires, Daniela Dyck, Wildfire Recovery Manager for the Village of Clinton hired Iverson & MacKenzie Biological Consulting Ltd. And R. W. Gray Consulting Ltd, to conduct an assessment of forest management options for the Hart Ridge area near the Village of Clinton. The assessment was to look at the ecological effects of a range of management options on the health of the ecosystems, including future fire risk, forest resiliency, wildlife habitat, fisheries, and recreation opportunities. The study area is defined as the entirety of Hart Ridge from Highway 97 on the west, the Bonaparte River to the east and Mound road on the north.

Ecological consequences were assessed by using existing datasets to map fuels and habitats that existed in the Hart Ridge area prior to the fire. Fuels were classified using forest density, moisture regime, and age class using fuel models from First Order Fire Effects Model (FOFEM), a program produced by the U.S. Forest Service to model tree mortality, fuel consumption, mineral soil exposure and soil heating.

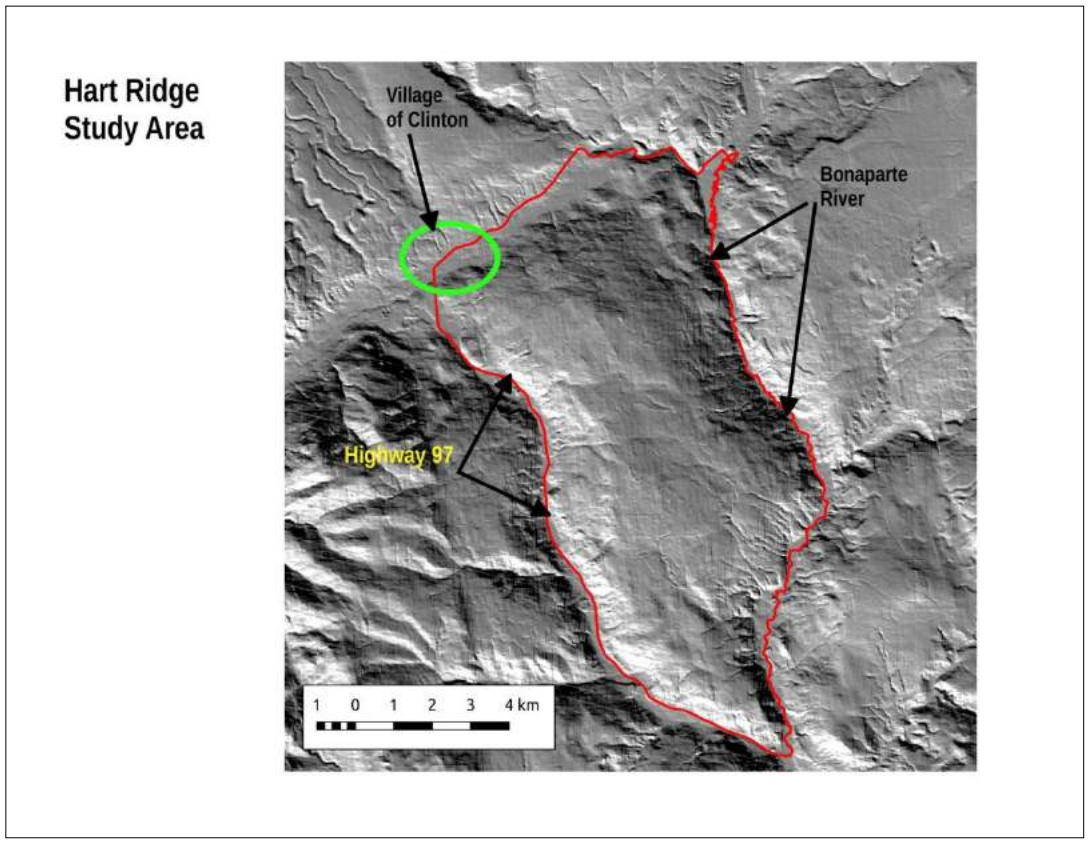


Figure 1: Chosen study area for the Hart Ridge Ecological Assessment.

From the modeled fuels data, we examined how the fires changed the fuels, fire severity and habitat values of selected species, and modeled the effects of various management options on the fuels, forest resiliency, and habitat supply for each selected wildlife species.

Study Area:

The study area is mostly forested (96%) with most forest dominated by Douglas-fir (8866 Ha, 91.7%) with a few patches of aspen, spruce, lodge pole pine, ponderosa pine and cottonwood. There is a small area of wetland mainly along the Bonaparte River in the eastern part of the study area (101 ha), and there are 218 km of streams mapped in the study area. Road density is quite high with 296 km of road mapped (3.1 km/km^2).

Most of the study area was burned during the summer of 2017 in the Elephant Hill fire. Only a thin strip along the highway and around the Village of Clinton itself, as well as an area near the southern end of the study area along the Bonaparte River remains un-scorched. Within the fire perimeter a small amount of the forest did not burn, about 1/3 of the area burned with low severity, about ¼ in high severity and almost 40% in moderate severity. Fire and burn severity definition are given below.

Fire Severity Definitions:

Low – canopy unburned, trunks partially burned, understory lightly or patchily burned, in the 2017 fires in the Cariboo the average volume killed in Low Severity fires was 14%.

Medium – tree burned and dead, scorched needles remain, understory burned, in the 2017 fires in the Cariboo the average volume killed in Medium Severity fires was 27%.

High - Tree blackened and dead, needles consumed, understory burned, in the 2017 fires in the Cariboo the average volume killed in High Severity fires was 85%.

Burn Severity Definitions:

Low – litter scorched or consumed, fermentation and humus (duff) layers intact, mineral soil unchanged

Moderate – litter consumed, forest floor (fermentation and humus) layers consumed or deeply charred, mineral soil unchanged

High – forest floor consumed, ash often thick, mineral soil has altered structure and porosity

Historical Fire Regimes:

Many of the interior ecosystems are classified as fire-maintained. In these ecosystems, frequent, low-severity fires maintain the nature and features over much of the landscape. The effects of these frequent fires include reducing the accumulation of medium and large fuels on the forest floor, reducing the density of smaller understory trees thereby limiting recruitment of stems into the over story, killing lower branches on large trees thereby 'lifting' the tree canopy, and top-killing shrubs so that, as they re-

sprout from surviving roots, they are shorter and less woody than they would develop in the absence of fire. Forests that developed in these forests during frequent fire regimes were composed of few large stems with lowest live branches well above the ground, relatively open canopies, and well developed and diverse herb layers. In the absence of fires, these forests tend to have increased tree densities, more ladder fuels, lower vegetation diversity and greater fuel loads.

The study area has two bio-geo-climatic variants. Both variants are interior Douglas-fir (IDF) one is the Cariboo variant of the dry-cool Interior Douglas-fir (IDFdk3) and the other is the very dry, warm Interior Douglas-fir (IDFxw). A very small area in the very dry, hot Ponderosa-Pine Bio-geo-climatic zone (PPxh2) is found at the extreme south end of the study area. All of these ecosystems are considered to be fire-maintained with historical fire intervals ranging from 5 to 20 years.

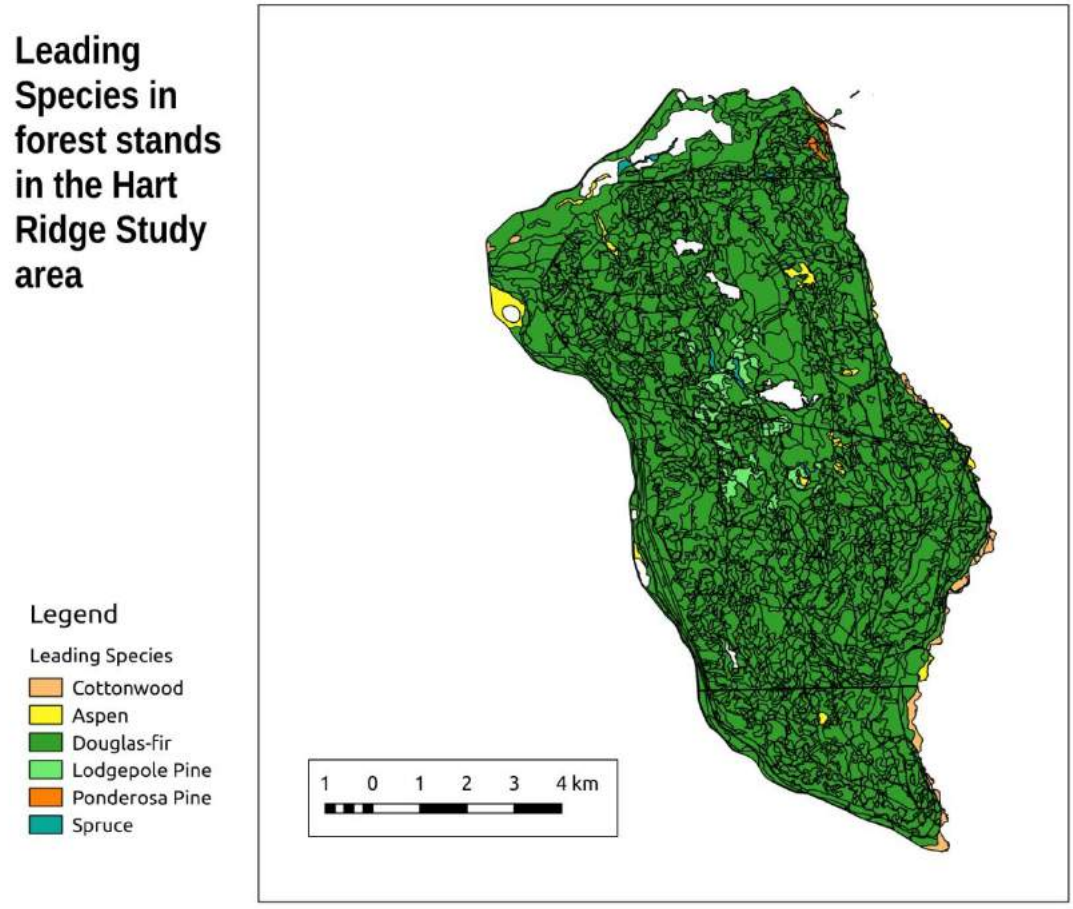
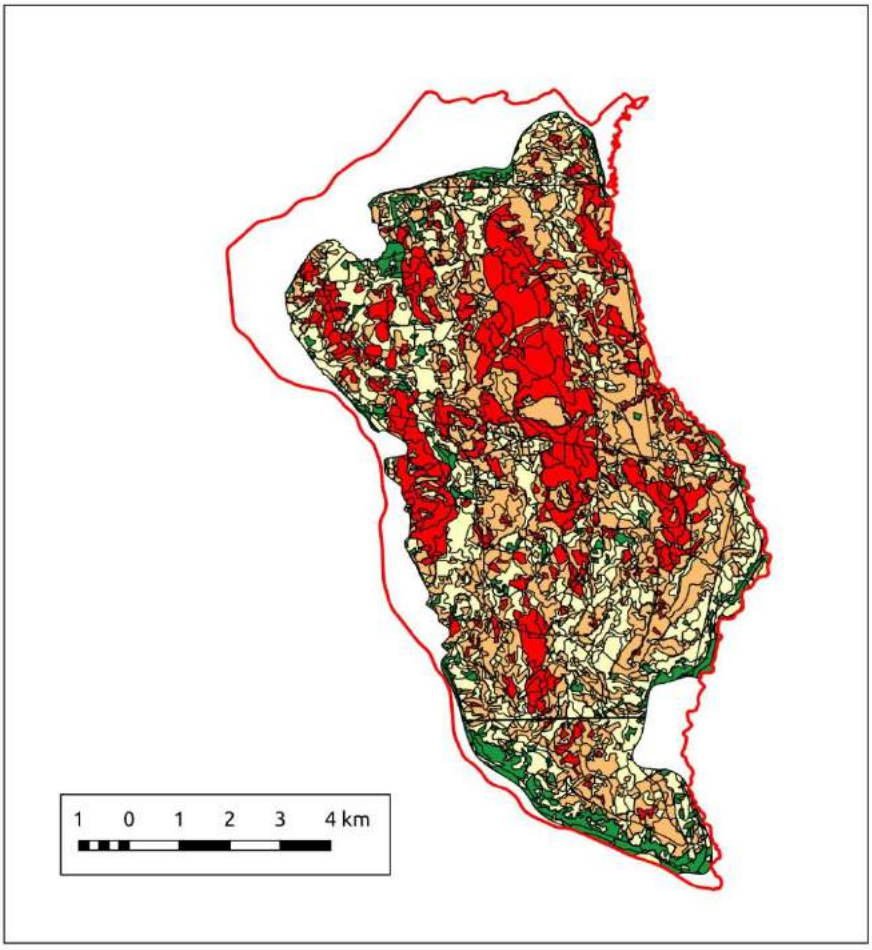


Figure 2: Forested area within the Hart Ridge study area by leading species.

Burn Severity of 2017 fires in the Hart Ridge Study Area



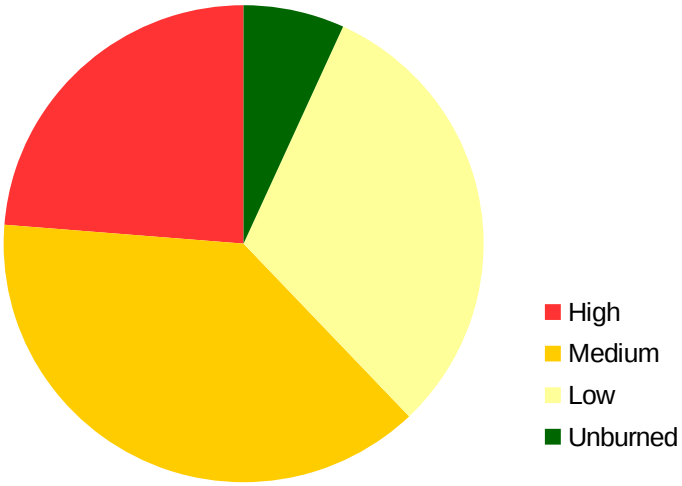


Figure 3: Area burned by fire severity rating in the Hart Ridge Study area, Elephant Hill fire summer 2017.

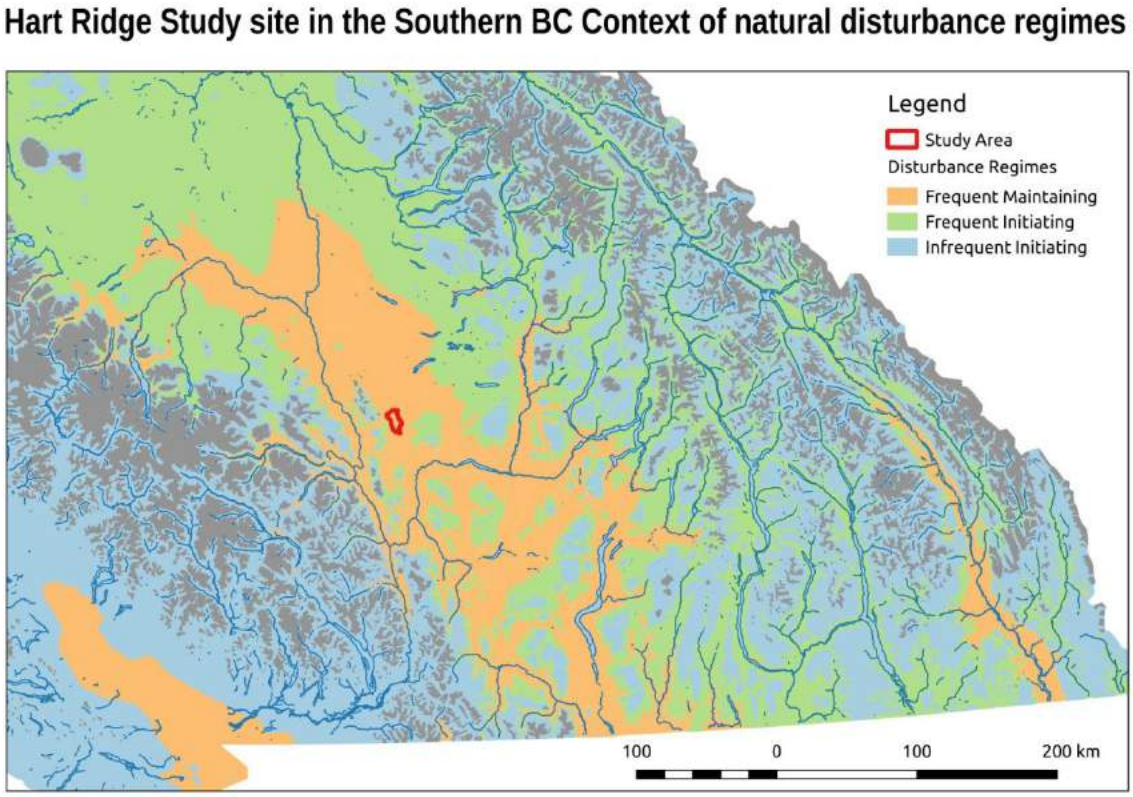


Figure4: Hart Ridge study area in context of fire maintained ecosystems in southern British Columbia.

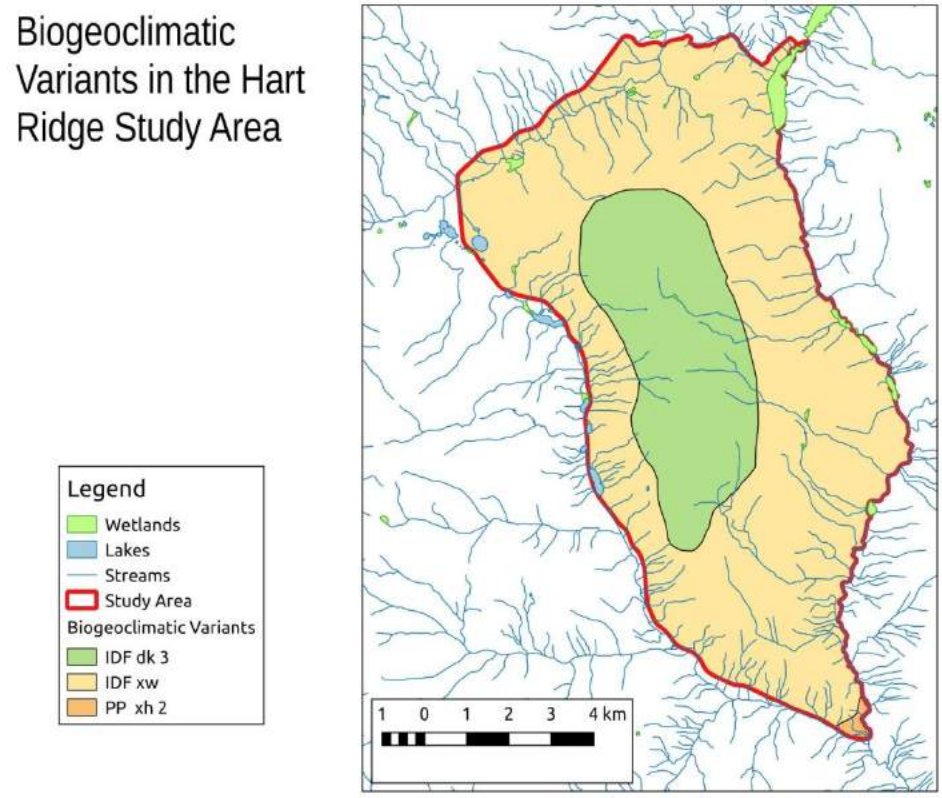


Figure 5: Bio-geo-climatic Variants in the Hart Ridge Study Area

CLIMATE OUTLOOK:

With models of climate change, British Columbia's central interior region will experience more of what we experienced in 2017 and worse;

- Some models suggest wetter winters, which leads to abundant herbaceous growth,
- Higher temperatures over longer periods of the spring and summer (i.e., longer fire seasons),
- Higher incidence of stationary "blocking" high pressure systems,
- Increased incidence of strong wind events,
- Increased lightning – latest research suggests for every 1°C increase in temperature there will be a corresponding 12% increase in lightning activity,
- consequences of these changed conditions means more fires escaping initial attack and becoming large project fires
- fires will be more sever due to drier fuels

ASSESSMENT APPROACH:

To assess the ecological implications of the fires and the range of management actions that could occur, we analyzed fuel loads, probable fire severity, and wildlife habitat supply for red and blue-listed species that are found in the ecosystems of the study area in southern British Columbia under three management scenarios. The analysis was done under the assumptions that the entire study area was managed under that treatment.

Post-Wildfire Management Scenarios:

We ran three management scenarios to examine what effect these scenarios had on fuel loads, forest resiliency (tree survival), and soil heating. These scenarios we used are the extremes of three possible management types that will likely be implemented across the study area. The first scenario modeled the effects of taking no forest management actions following the fires. Tree's killed by the fire would be left to fall to the forest floor and no re-vegetation or tree planting would occur.

The second scenario modeled was that forest salvage would remove all fire killed stems. This scenario modeled normal forest operations including planting trees in harvested areas where needed, and seeding or other re-vegetation where needed to reduce the risk of surface erosion.

The third and final scenario modeled was to apply fuels treatments to remaining stands in addition to salvage harvest operations. This scenario modeled thinning treatments, combined with prescribed burns and fire fuels management including targeted grazing and other methods.

Forest Structure Groups:

For the fuel load and forest resiliency modeling, the forested areas in the study area were grouped into three classes used in the models. These classes are quite broad, but capture the fuel and overstory characteristics sufficiently to model fire effects.

- Immature Douglas-fir (plantations)
- Low-density (< 700 stems/hectare) Douglas-fir
- High-density (> 700 sph) Douglas-fir

Outputs:

Outputs from the models were:

- Future surface fuel loading
- Survival of the over story – forest resiliency
- Soil heating (burn severity)

Wildlife Habitat Supply:

To examine the effect of management options on wildlife species, a list of red and blue listed vertebrate species found in the Interior Douglas-fir (IDF) bio-geo-climatic zone in the Kamloops and 100 Mile House Forest Districts was obtained from BC Ecosystem Explorer (a100.gov.bc.ca/pub/eswp/). This list contained 13 species (Table 1). The list was further refined by eliminating those species that area are not expected to occur in the study area, and those whose habitats are not forests or whose habitat preferences are not affected by forest conditions. Species eliminated from the list for these reasons included all reptile, amphibian and mammal species found on the list. The number of species included in the assessment was three, Lewis's woodpecker, Flammulated Owl and Olive-sided Flycatcher.

For these three species, we developed habitat ratings tables for all forested habitats. We modeled the habitats present in the study area before the fire, as well as under the three management scenarios, placing the habitats into one of 4 habitat classes. The supply of each habitat class was calculated and compared to that of other management scenarios. This approach is appropriate for the species being modeled, as they are highly mobile species and less limited by habitat adjacency patterns than less mobile species.

Table 1: Red- and Blue-listed vertebrate species of the Interior Douglas-fir forests in Central British Columbia

English Name	Scientific Name	Used in Analysis?
Great Blue Heron, Herodias Subspecies	Ardea herodias herodias	No – nest in a wide range of treed habitats
Swainson's Hawk	Buteo swainsoni	No – open habitat species, unlikely to occur in study area
Canyon Wren	Catherpes mexicanus	No – rocky open habitats, not affected by forest cover changes
North American Racer	Coluber constrictor	No – unlikely to occur in study area, prefers open rocky habitats
Olive-sided Flycatcher	Contopus cooperi	Yes – nests in habitats with standing dead trees
Townsend's Big-eared Bat	Corynorhinus townsendii	No – not clear what effect fire has on species habitat quality
Western Rattlesnake	Crotalus oreganus	No – unlikely to occur in study area, prefers open rocky habitats
Spotted Bat	Euderma maculatum	no- unlikely to occur in study area
Wolverine, Luscus Subspecies	Gulo gulo luscus	No – unlikely to occur in study area
Barn Swallow	Hirundo rustica	No – use anthropogenic structures, cliffs or caves for nesting, forage in open habitats
Western Screech-owl, Macfarlanei Subspecies	Megascops kennicottii macfarlanei	No – prefers moist and riparian forests, unlikely to occur in area
Lewis's Woodpecker	Melanerpes lewis	Yes – uses burned areas for nesting and foraging
Western Small-footed Myotis	Myotis ciliolabrum	No – species uses rocky habitats and riparian areas
Fringed Myotis	Myotis thysanodes	No – unlikely to occur in study area
Bighorn Sheep	Ovis canadensis	No – prefers open grassy habitats
Fisher	Pekania pennanti	No – unlikely to occur in study area
Flammulated Owl	Psiloscops flammeolus	Yes – uses open Douglas-fir forests, nests in tree cavities
Great Basin Spadefoot	Spea intermontana	No – unlikely to occur in study area, ephemeral wetlands and loose soils determine habitat
American Badger	Taxidea taxus	No – unlikely to occur in study area, habitat most affected

		by soil texture
Sharp-tailed Grouse, Columbianus Subspecies	Tympanuchus phasianellus columbianus	No – prefers open habitats with few/no standing trees or snags
Grizzly Bear	Ursus arctos	No – unlikely to occur in study area

Lewis's Woodpecker:

Lewis's woodpecker is a blue-listed species in British Columbia, found throughout dry forests and woodlands in the southern parts of the province. This species is semi-colonial with as many as 31 pairs nesting within a single burn and cooperative behaviors between adjacent pairs. The Lewis woodpecker migrates south from British Columbia for the winter period into pine-oak forests in western USA or Mexico.

The Lewis woodpecker may nest in dry forests or woodlands and is often associated with burns or partially logged areas, survival rates may be higher in burned areas than non-burned areas. Provincial range follows that of Ponderosa Pine but they also nest in Douglas-fir, cottonwood or aspen trees. Habitat features include open tree canopy, brushy understory with berry bushes, dead or decayed trees for nest cavities and perch sites, these features seem to be more important in determining nest success than cavity or nest tree characteristics. Suitability of burned forests varies with pre-burn species composition, burn intensity, density and characteristics of residual snags but suitability of the site for nesting seems to persist well after predators re-colonize the burned forest and snags begin to fall. Often, the Lewis woodpecker will move in to a burn 5-15 years following the fire once some snags have fallen and brush develops. Diet consists of insects in summer and fruit and nuts in fall and winter. The Lewis woodpecker Does not bore for insects but catches them from the air.

Habitat Definitions:

- moderate to low crown closure Douglas-fir or Ponderosa Pine forests (Crown Closure Class 1 - 3)
- age 120 – moderate, 180 and greater high
- High severity fire may remove most suitable nest trees, long term recovery all habitats required
- moderate severity fire removes most of understory and can result in habitat improvement, old forests with Crown Closure Class 4 and 5 become moderate

Table 2: Lewis' woodpecker habitat suitability ratings in unburned and burned stands in Hart Ridge- no management scenario.

		Crown Closure (%)		
Age Class	Burn Severity	<20	20-40	>40
<120 year	Unburned	low	low	nil
	Low	low	low	nil
	Medium	low	low	low
	High	low	low	low
120-180 years	Unburned	mod	low	nil
	Low	mod	low	nil
	Medium	mod	mod	low
	High	low	low	mod
	Unburned	high	mod	low
	Low	high	mod	low
	Medium	mod	high	low
	High	low	low	mod

Table 3: Lewis' woodpecker habitat suitability ratings in unburned and burned stands in Hart Ridge - salvage scenario.

		Crown Closure (%)		
Age Class	Burn Severity	<20	20-40	>40
<120 year	Unburned	low	low	nil
	Low	low	low	nil
	Medium	low	low	low
	High	low	low	low
120-180 years	Unburned	mod	low	nil
	Low	low	low	nil
	Medium	low	low	low
	High	low	low	low
180 years	Unburned	mod	mod	low
	Low	mod	low	low
	Medium	mod	mod	mod
	High	low	low	mod

Table 4: Lewis's woodpecker habitat suitability in burned and unburned stands in Hart Ridge - Fire Resilience Scenario

		Crown Closure (%)		
Age Class	Burn Severity	<20	20-40	>40
<120 year	Unburned	low	low	low
	Low	low	low	low
	Medium	low	low	low
	High	low	low	low
120-180 years	Unburned	mod	mod	low
	Low	mod	mod	mod
	Medium	mod	mod	mod
	High	low	mod	mod
180 years	Unburned	high	high	high
	Low	high	high	high
	Medium	mod	high	high
	High	low	mod	high

Olive-sided Flycatcher:

The Olive-sided flycatcher is a recently blue-listed species in British Columbia based upon substantial and long-term population declines. This species returns to breeding areas and nests later than most songbird species in British Columbia due to having the longest migration distance of all British Columbian flycatcher species. The Olive-sided Flycatcher prefers coniferous forests for nesting, but occasionally found in mixed stands. Most nesting sites have standing dead trees that are used for perching and singing posts and are often near water bodies. Nests are located on a horizontal conifer branch. The Olive-sided flycatcher is most abundant in partially harvested stands or burns, but burned sites may have greater nesting success than unburned but thinned stands. Nest losses and foraging success may be higher in burned stands than unburned, but use of these unburned stands is lower than the burned stands.

Habitat Definitions:

Mature and old forest suitable, age 120 and greater

relatively flat slopes

low density stands preferred, live stems less than 700 sph

dead stems greater than 100 sph

high burn severity results in low habitat suitability

moderate severity can give good habitat suitability

low severity can give good suitability provided stand density is low

Table 5: Olive-sided flycatcher habitat suitability in burned and unburned stands in the Hart Ridge study area - No management scenario.

		Stand Density (sph)			
		<700		>700	
Age Class	Burn Severity	<100 dead sph	>100 dead sph	<100 dead sph	>100 dead sph
<120 year	Unburned	low	mod	low	low
	Low	mod	mod	low	mod
	Medium	mod	mod	mod	mod
	High	mod	mod	mod	mod
>120 years	Unburned	mod	high	mod	high
	Low	mod	high	mod	high
	Medium	high	high	high	high
	High	high	high	high	high

Table 6: Olive-sided flycatcher habitat suitability in burned and unburned stands in the Hart Ridge study area - salvage scenario.

		Stand Density (sph)			
		<700		>700	
Age Class	Burn Severity	<100 dead sph	>100 dead sph	<100 dead sph	>100 dead sph
<120 year	Unburned	low	mod	low	low
	Low	low	low	low	low
	Medium	mod	mod	low	low
	High	mod	mod	low	low
>120 years	Unburned	mod	high	mod	high
	Low	mod	mod	low	mod
	Medium	mod	mod	mod	mod
	High	mod	mod	mod	mod

Table 7: Olive-sided flycatcher habitat suitability in burned and unburned stands in the Hart Ridge study area - resiliency scenario

		Stand Density (sph)			
		<700		>700	
Age Class	Burn Severity	<100 dead sph	>100 dead sph	<100 dead sph	>100 dead sph
<120 year	Unburned	low	low	low	low
	Low	low	low	low	low
	Medium	low	low	mod	low
	High	low	low	low	low
>120 years	Unburned	mod	mod	mod	mod
	Low	mod	mod	mod	mod
	Medium	mod	mod	mod	mod
	High	mod	mod	mod	mod

Flammulated Owl:

Flammulated owls are a blue-listed migratory species found in warm aspect conifer forests throughout southern British Columbia. This species nests in cavities, particularly those made by northern flickers. They select nest sites based upon stand and site conditions rather than on nest tree or cavity characteristics, and select for stands with old trees, with less than 50% crown closure. Preferred sites for nesting also have moderate slopes, between 16 and 33%. They also use sites with nearby grassland, or other open areas.

Habitat Definitions:

Leading Species Fd or Py

Age <120 low , 120<age>180 moderate, >180 high

Crown Closure Class 2,3,high, 4,5,6 moderate

Warm Aspects – 135 - 270

Habitats areas must have significant areas of moderate or steeper slopes (>15%)

Table 8: Flammulated Owl habitat suitability in unburned and burned stands in the Hart Ridge study area – no management scenario.

Age Class	Burn Severity	Crown Closure		
		<20	20-40	>40
<120 year	Unburned	low	nil	nil
	Low	low	low	nil
	Medium	low	low	low
	High	nil	nil	low
120-180 years	Unburned	mod	mod	low
	Low	mod	mod	low
	Medium	low	mod	mod
	High	low	low	mod
180 years	Unburned	high	high	mod
	Low	high	high	mod
	Medium	high	high	high
	High	mod	mod	high

Table 9: Flammulated Owl habitat suitability in unburned and burned stands in the Hart Ridge study area – salvage scenario.

Age Class	Burn Severity	Crown Closure		
		<20	20-40	>40
<120 year	Unburned	low	nil	nil
	Low	low	low	nil
	Medium	low	low	low
	High	nil	nil	low
120-180 years	Unburned	mod	mod	low
	Low	mod	mod	mod
	Medium	low	mod	mod
	High	low	low	mod
180 years	Unburned	mod	high	mod
	Low	mod	high	mod
	Medium	mod	high	high
	High	mod	mod	high

Table 10: Flammulated Owl habitat suitability in unburned and burned stands in the Hart Ridge study area – resiliency scenario.

Age Class	Burn Severity	Crown Closure		
		<20	20-40	>40
<120 year	Unburned	low	low	low
	Low	low	low	low
	Medium	low	low	low
	High	nil	nil	low
120-180 years	Unburned	mod	mod	mod
	Low	mod	mod	mod
	Medium	low	mod	mod
	High	low	low	mod
180 years	Unburned	high	high	high
	Low	high	high	high
	Medium	high	high	high
	High	mod	mod	mod

RESULTS:

Fuel loads were dominated by coarse fuels (>7.5 cm diameter). Coarse fuel loads generally decrease in wildfire killed stands with increasing re-burn fire severity.

Scenario 1 – No management

Immature stands showed generally decreasing large fuel loads with increasing severity as existing large fuels are consumed in the fire. Without large, live trees in the over story to be recruited into the fuels load after a fire no little new large fuels are added to offset the losses and total fuel load decreases. Large fuel volumes decrease from about 40 Mg/ha in unburned stands to about 25 Mg/ha in high severity burned stands.

Mature stands show a different pattern with increasing post-fire fuel loads with increasing fire severity. In low-density, mature stands the initial large fuel density increases from around 40 Mg/ha to over 120 Mg/ha. In high density mature stands, this increase is even larger with post-fire large woody fuel density exceeding 160 Mg/ha in high severity burns. These increases in woody debris come from the fire killed trees in the over story and mean that the severity of subsequent fires at these sites will be higher than that of the initial fire.

Soil heating is high for mature stands, and moderately high for immature stands. With the substantial increase in large fuel loads in post-fire conditions, this soil heating will be greater in mature stands if no management is carried out. Stand resiliency is low for all modeled stands with no post-fire management.

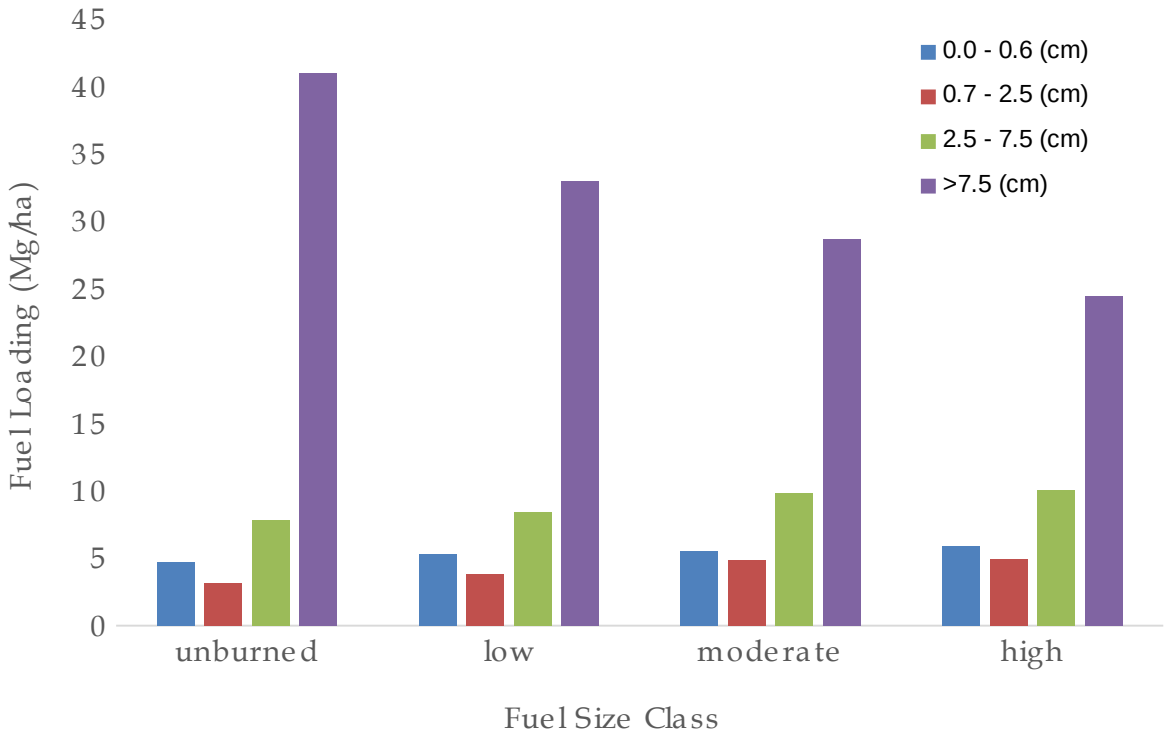


Figure 5: Post-fire fuel loading in immature stand in differing fire severity with no post-fir management.

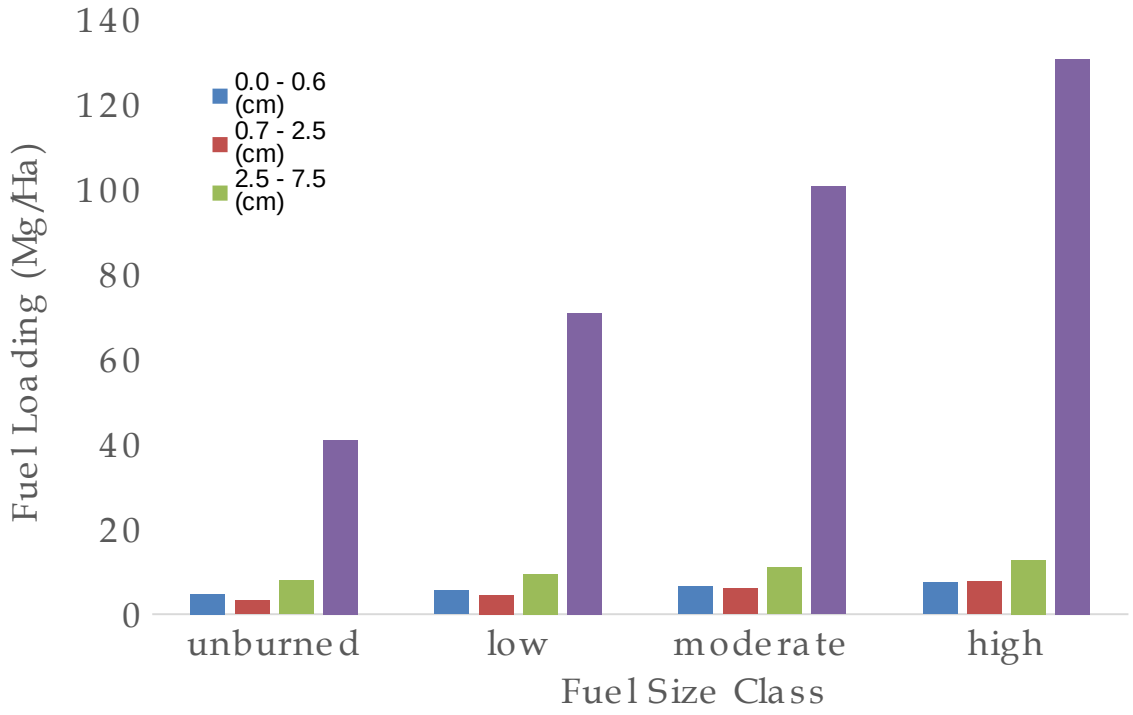


Figure 6: Post-fire fuel loads under different severity in mature, low-density Douglas Fir stand with no post-fire management.

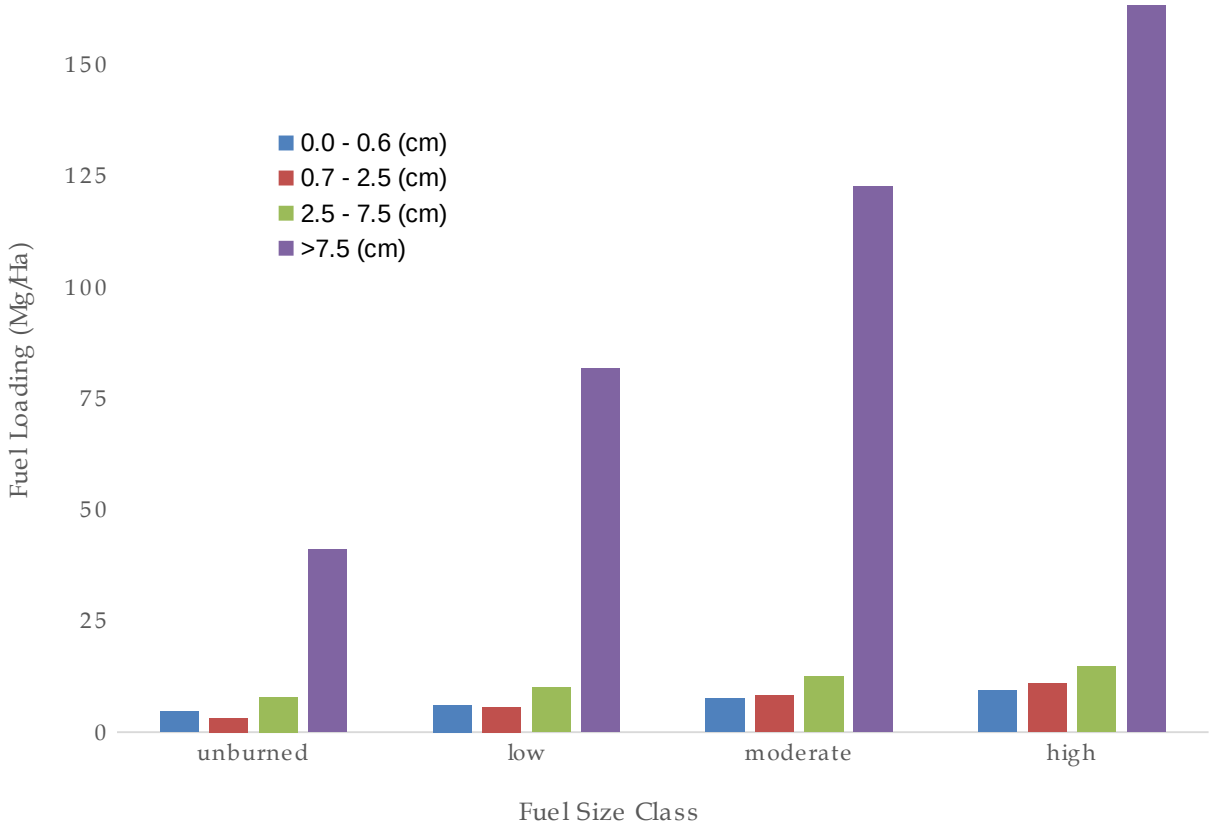


Figure 7: Post-fire fuel loads in mature, high-density Douglas-fir stands with no post-fire.

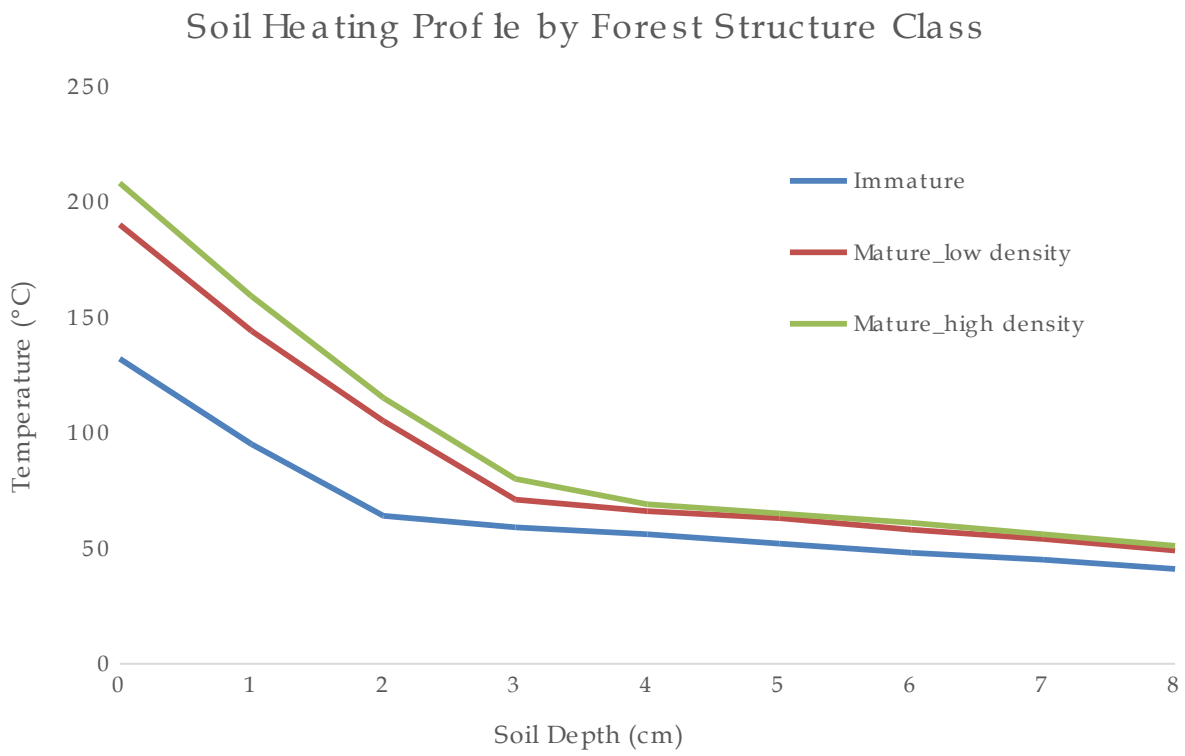


Figure 8: Soil heating profile by stand type in the Hart Ridge study area.

Scenario 2 – Timber Salvage:

Immature stands showed the same pattern of fuels in post-fire salvage as in the no management scenario, but mature stands have, as expected, little change in fuel load with changes in fire severity. The increasing fuel with increasing fire severity is removed when salvage logging is carried out.

Burn severity in the salvage treatment scenario, as modeled with soil heating profiles, is very similar to the no management scenario. This result is expected as the fuel loads differ little in the post fire stands from pre-fire conditions. All stands had low modeled resilience with the salvage treatment.

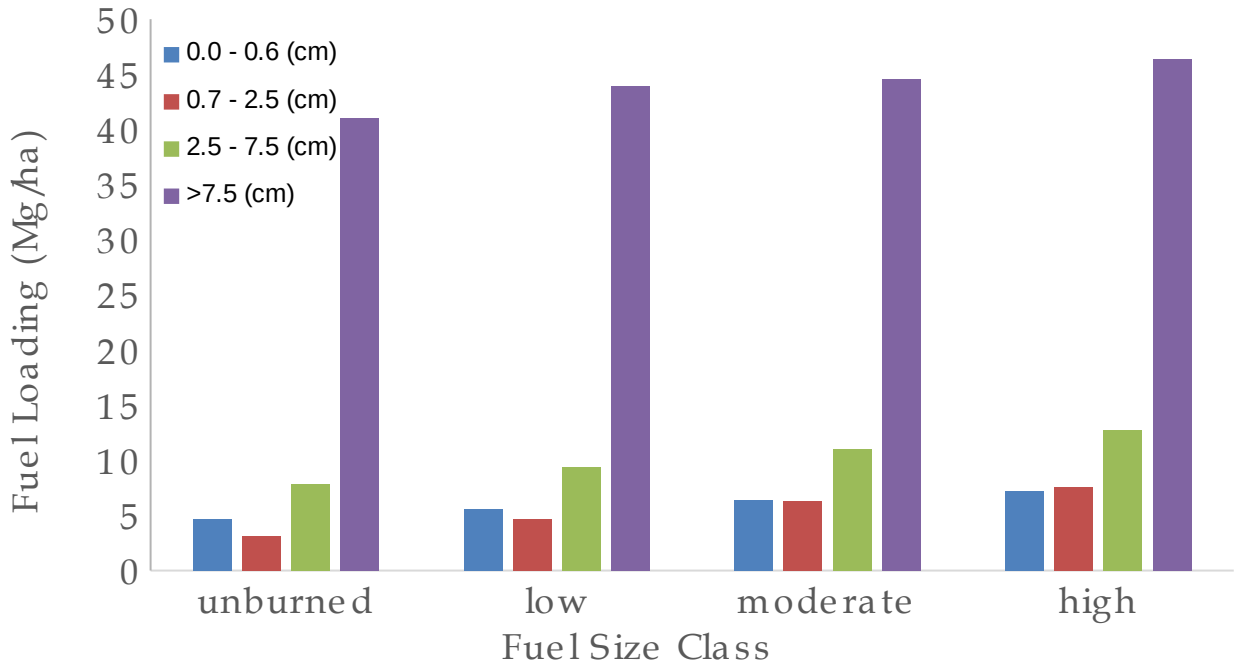


Figure 9: Post-fire fuel loads in mature, low-density Douglas-Fir stands, in stands with fire-damaged timber salvage treatment by fire severity.

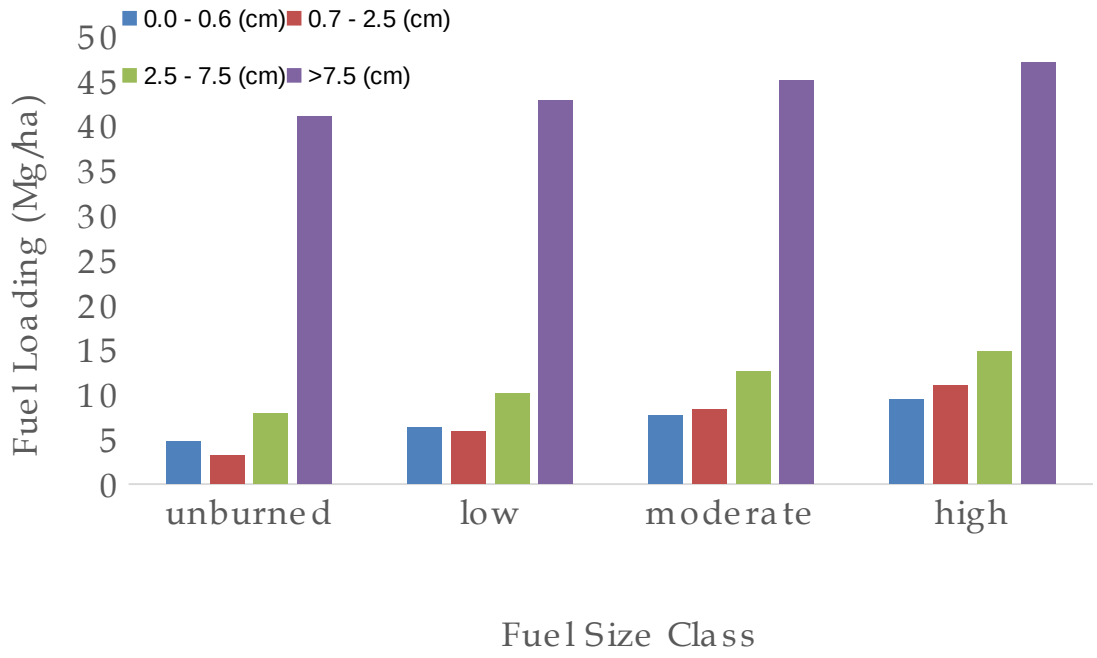


Figure10: Fuel loading over time in mature, high-density stands of Douglas-fir with post-fire timber salvage by fire-severity.

Scenario 3 – Fuels Treatment:

Fuel loads in all size classes are reduced in all forest types and the level of reduction depends upon the type and aggressiveness of the treatment. With moderate levels of fuels reductions, stands resilience in all forest types is improved (Table 11). Mature, low density stands become highly resilient and probably would survive most subsequent wildfires with little change in structure. Other stands are somewhat less resilient, primarily due to the denser trees and more continuous tree canopies that could carry fire in some conditions.

Table 11: Future forest resiliency resulting from Fuels Treatments by forest structure and age classes.

Forest structure	slope (%)	Fuel model	Resilience (L/M/H)
immature	20	TL1	moderate
immature	40	TL1	moderate
immature	60	TL1	moderate
mature - low density_Fd	20	TU1	high
mature - low density_Fd	40	TU1	high
mature - low density_Fd	60	TU1	high
mature - high density_Fd	20	TU1	moderate
mature - high density_Fd	40	TU1	moderate
mature - high density_Fd	60	TU1	moderate

WILDLIFE HABITAT SUPPLY:

Lewis's Woodpecker:

Little high suitability habitat existed in the study area prior to the fires. Few open stands with high densities of snags occurred pre-fire but some of the stands in the area provide moderate habitat. Following fire, and without any management, a small amount of high suitability habitat is created. Salvage treatments change little but the stands that do not provide any Lewis's woodpecker habitat

decreased substantially as the dead trees created in once dense stands are thinned. Most of these thinned stands were modeled at low suitability since the density suitable nest trees is likely low. Resilience treatments further reduce the stands that provide no habitat, and increase the moderate and high habitat stands. These result from thinning of live stands, making those stands that had low severity fire, where most of the stems survived the fire, and would remain too dense to be highly suitable for Lewis's woodpeckers, until thinned during fuels treatments.

Salvage logging improves Lewis's woodpecker habitat quality, and further fuels treatments further improve that habitat.

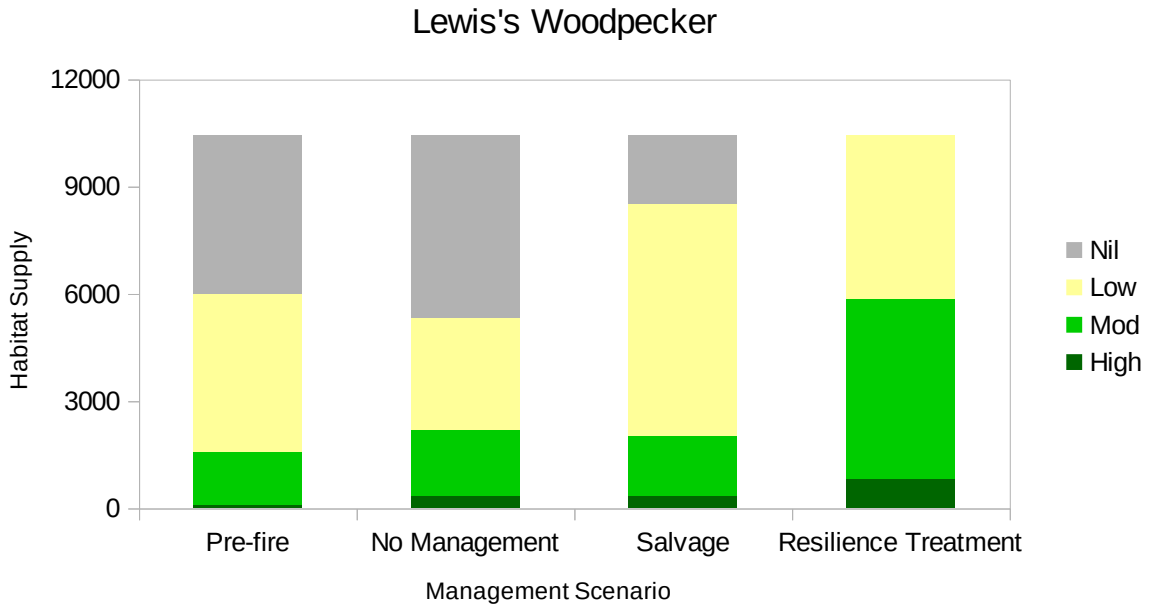


Figure 11: Lewis's woodpecker habitat supply in the Hart Ridge study area under pre-fire and three management scenario conditions.

Olive-sided Flycatcher:

Habitat suitability for Olive-sided flycatcher is generally low or moderate across the study area. In the no-management scenario, a substantial amount of high-suitability habitat is created mostly replacing low-suitability habitat. Once salvage or resilience treatments are applied, the high suitability habitat is largely eliminated, and most of the study area becomes low-suitability (salvage treatment) or moderate-suitability (resilience).

Post-fire landscapes with no management create the largest habitat supply for olive-sided flycatchers.

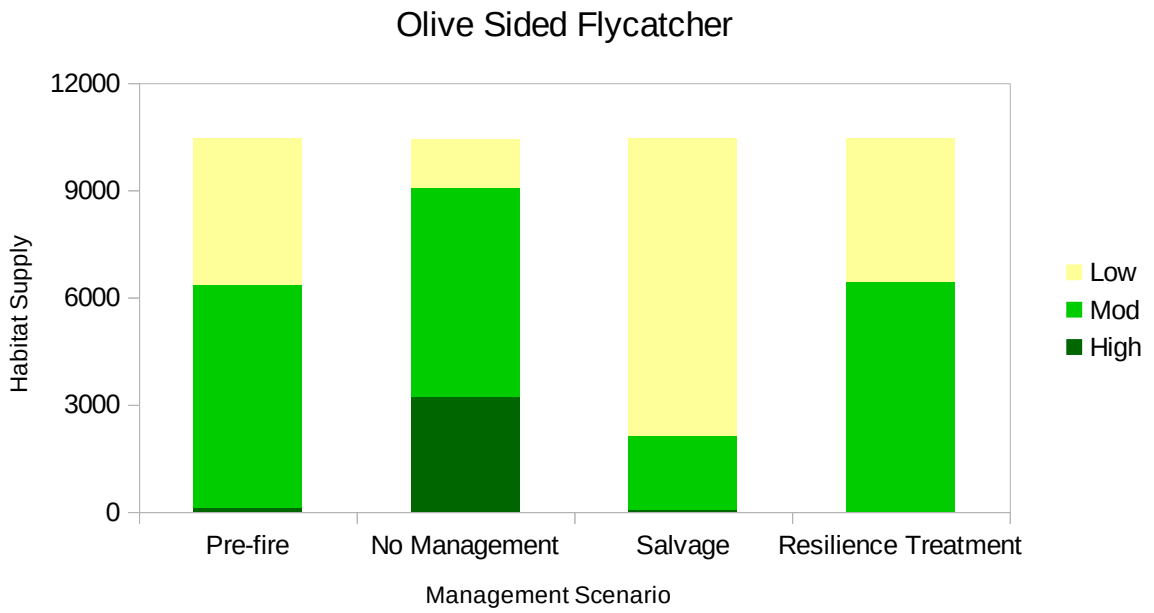


Figure 12: Olive-sided flycatcher habitat supply in the Hart Ridge area under pre-fire and three post-fire management scenarios.

Flammulated Owl:

Flammulated owl habitat supply is split between nil-, low- and moderate suitability in pre-fire conditions, with a small amount of high suitability. Many of the stands on warm aspects are too dense to provide high-suitability habitat. After fire, the proportion of high-suitability habitat remains largely unchanged, but the proportion of moderate-suitability habitat increases, as the low and moderately burned stands become less dense and more suitable for flammulated owls. Salvage treatment did not change the supply of high- and moderate-suitability habitat, but increased the low-suitability habitat while decreasing those stands that had no habitat quality for flammulated owls. Resiliency treatment further decreased the area of unsuitable stands and increased the low- and moderate-suitability habitat supply.

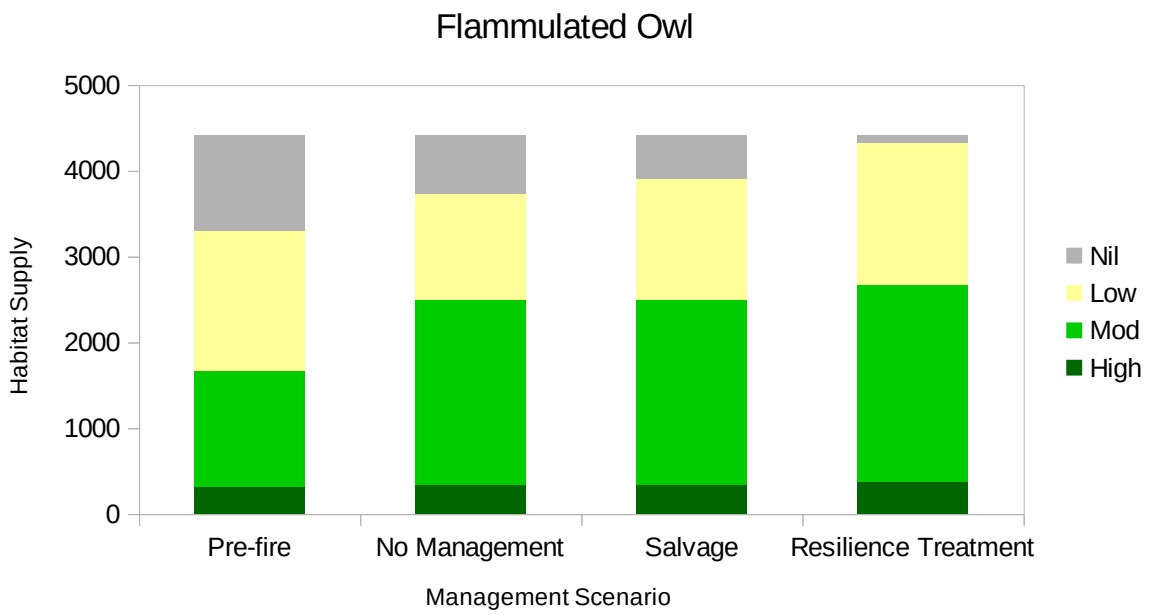


Figure 13: Flammulated owl habitat supply in the Hart Ridge study are under pre-fire and three post-fire management scenarios.

Recreation:

Recreation trails are planned in concept for the Hart Ridge area, but locations have yet been decided. These trails should be located where possible to maximize exposure to existing forest cover. This will help to protect trail from erosion, allow a more enjoyable hiking experience during hot weather, and give a more aesthetic experience. Sections of trail that are not located within forested areas can have planting in adjacent areas to develop tree cover. Any poorly vegetated areas traversed by trails should be seeded with low growing vegetation to both protect from erosion risk, but also keep the fine fuels to a minimum.

Fisheries:

Main risk to fisheries is in the Bonaparte River. Although a number of streams are mapped occurring in the study area, none of them are fish-bearing. Many of these streams flow into the Bonaparte, so sediments may be introduced into fish-bearing waters this way. Considerable areas were burned along the steep, erodible slopes above the Bonaparte. No road construction or tree salvage should occur on these slopes to minimize erosion risk into the Bonaparte. Revegetation on the slopes should be

encouraged, as they may be slow to revegetate naturally due to the erodible and unstable soils and dry conditions.

Invasive Plants:

A number of invasive plant species are known to occur in the study area (Table 12). Early detection and control of invasive species is important as many of them seedbank, or store seeds in the soil, which can then sprout after all plants are removed. The longer an infestation persists, the greater the number of seeds that can be in the seedbank. Control is especially critical along roadways as this is often where invasive plants first become established and they can be widely spread by vehicles along these routes. All field workers in the burn should be made aware of invasive species so that they can report any locations and take steps to prevent them from being spread during work in the area.

Table 12: Invasive plant species known to occur in or adjacent to the Hart Ridge study area and suggested control methods.

Invasive Plant Species	Suggested Management
Spotted and Diffuse knapweed	biocontrol
Dalmatian and yellow toadflax	biocontrol
baby's breath	chemical/mechanical
Hoary allysum	chemical/mechanical
Canada thistle	chemical/mechanical
Bull thistle	None – infestations are generally short-lived
Common tansy	chemical/mechanical
burdock	chemical/mechanical
blueweed	chemical/mechanical
Leafy spurge	chemical/mechanical
Scentless chamomille	chemical/mechanical
Sulphur cinquefoil	chemical/mechanical

GENERAL MANAGEMENT RECOMMENDATIONS:

Areas to be reforested should be stocked at a lower stocking density, particularly in interface areas. This lower stocking is more appropriate ecologically and will help reduce fire behavior and severity for future wildfires. Risk of wildfires and increased fire behaviors are likely given predicted climate changes, so developing vegetation on our landscapes that reduce the risk to communities and other values needs to start now.

Management for erosion must be done at the site during resource development or restoration. Planners and workers need be aware of downstream values and take into account erosion risk.

CONCLUSIONS:

Future Fire Risk and Severity:

The future risk of wildfires in the Hart Ridge area, and the severity of those wildfires, differs little between salvaged and un-salvaged stands. Further reducing fuels, and ongoing management of those fuels, is the only way to reduce fuels and thereby reduce future wildfire severity and increase forest resiliency. Increased resiliency comes with decreased fire severity and behavior, which also means that these lower severity fires are more easily controlled and the risk to communities and other values is reduced.

Wildlife Habitats:

The three at-risk species for which habitat was assessed, differ somewhat in their response to the effects of the fires on habitat and on potential management responses. Lewis's woodpecker habitat is most favorable with resiliency treatments, Olive-sided flycatcher habitat is best with no post-fire management and Flammulated owl habitat differs little under any of the three management scenarios. A range of treatments, with some habitats left unmanaged, while other areas with fuels reduction treatments is probably the most appropriate for managing habitat for all species found in the study area.

The reduced tree density that has occurred in moderate and low fire severity burns has reduced stocking to a more sustainable and resilient level. The stem killed, to give those lower densities pose a risk to the sites in future fires; these dead stems should be removed to improve site resiliency. The resulting stands generally have good habitat values for species at risk, and are closer to historical stand structures.

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