Wildfire Risk in Stswecem'c Xget'tem Territory:

Barriers and SXFN Solutions

Georgina Preston, MSc Student – UBC
A research partnership between:

Stswecem'c Xget'tem FIRST NATION

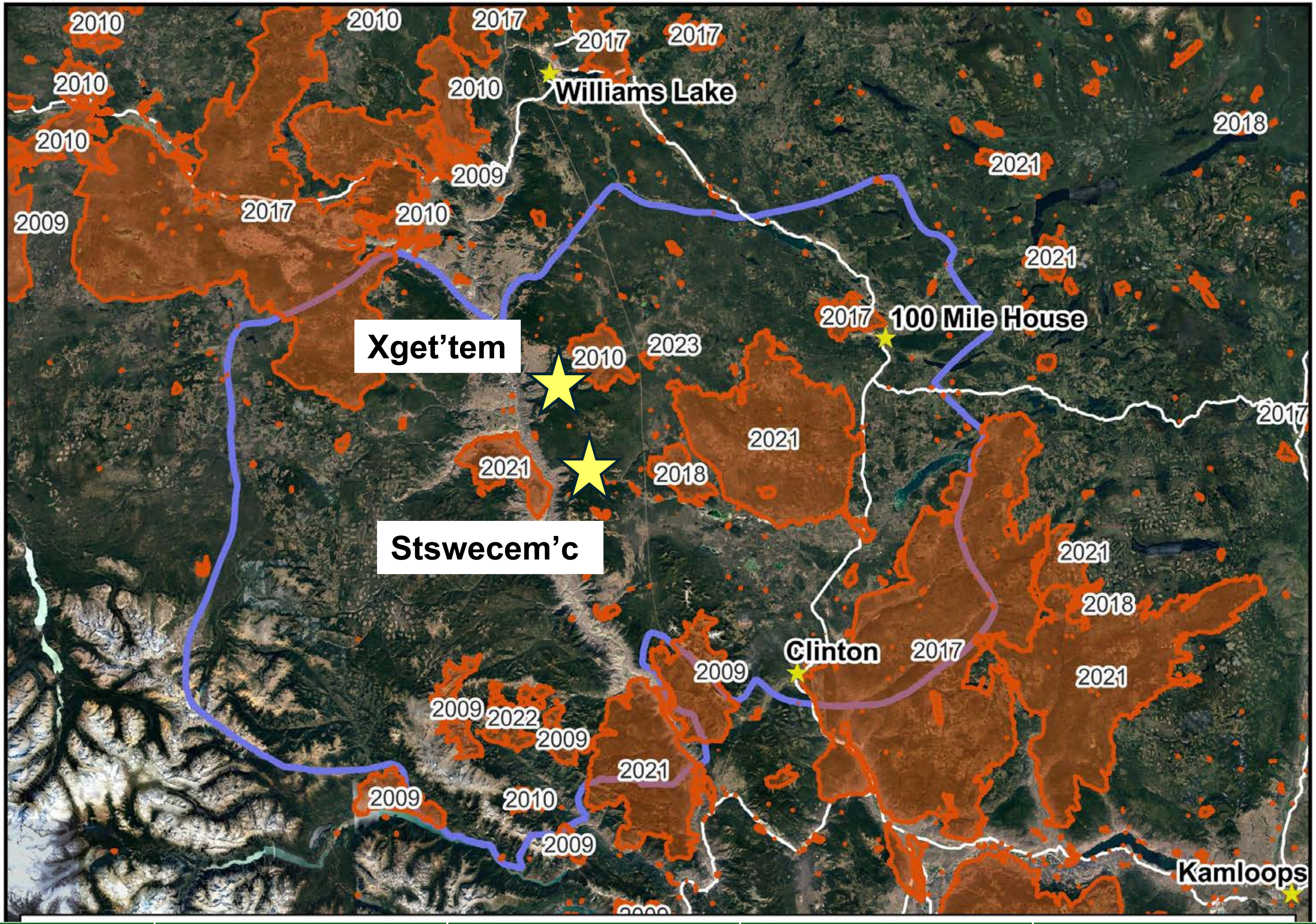
TREERINGLAB AT THE UNIVERSITY OF BRITISH COLUMBIA

Williams Lake Wildfire Roundtable Meeting

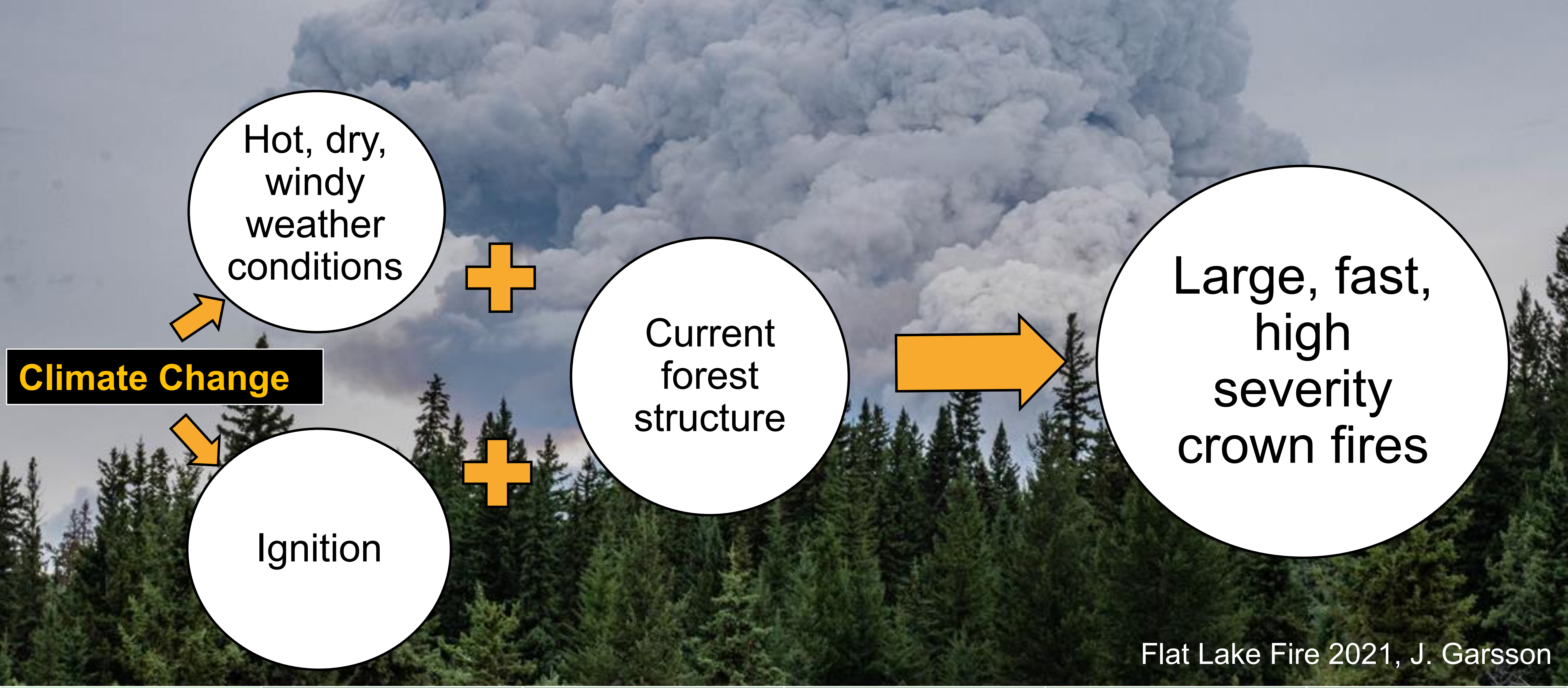
February 20, 2024

Fires in
SXFN Territory

20% burned
2007-2023

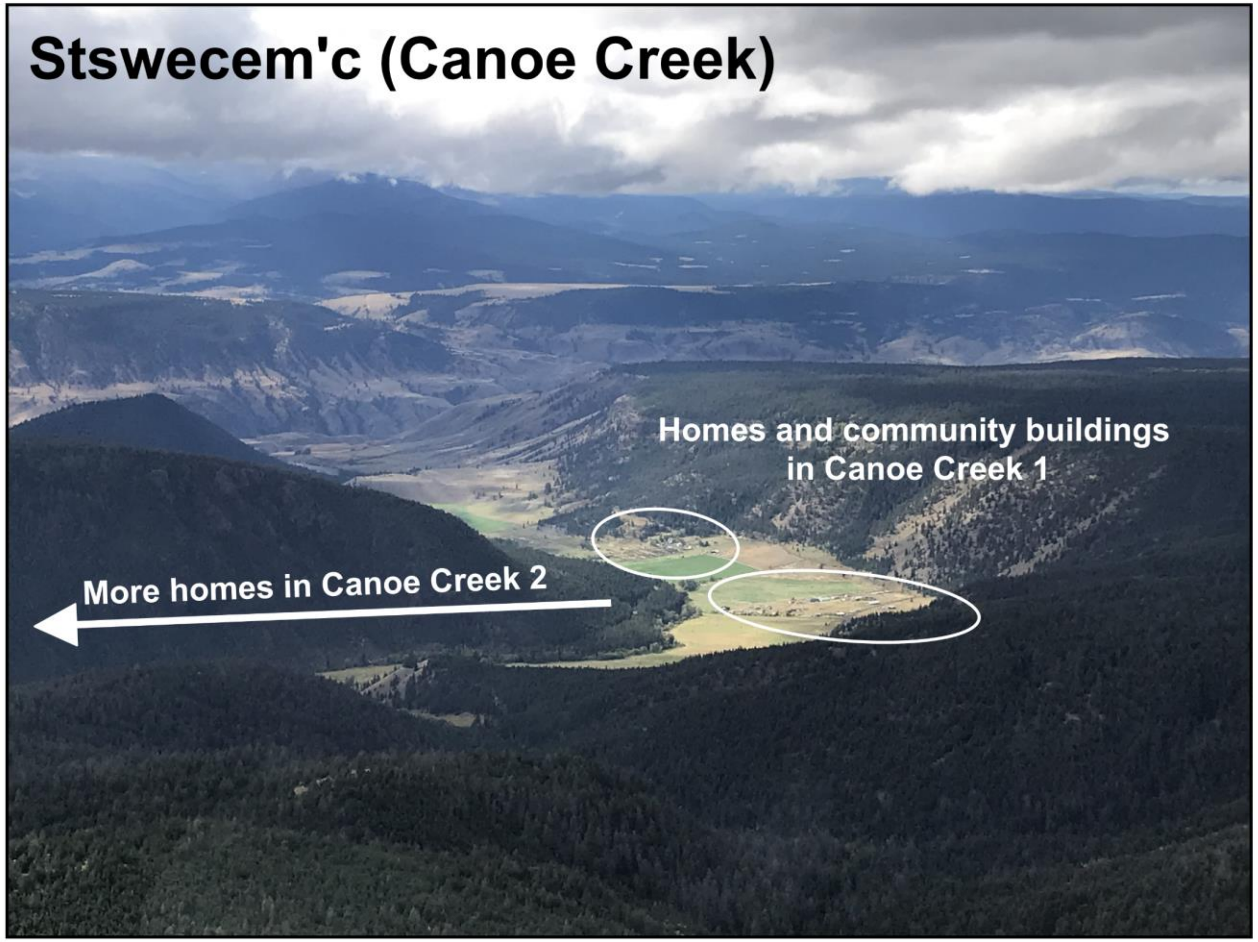


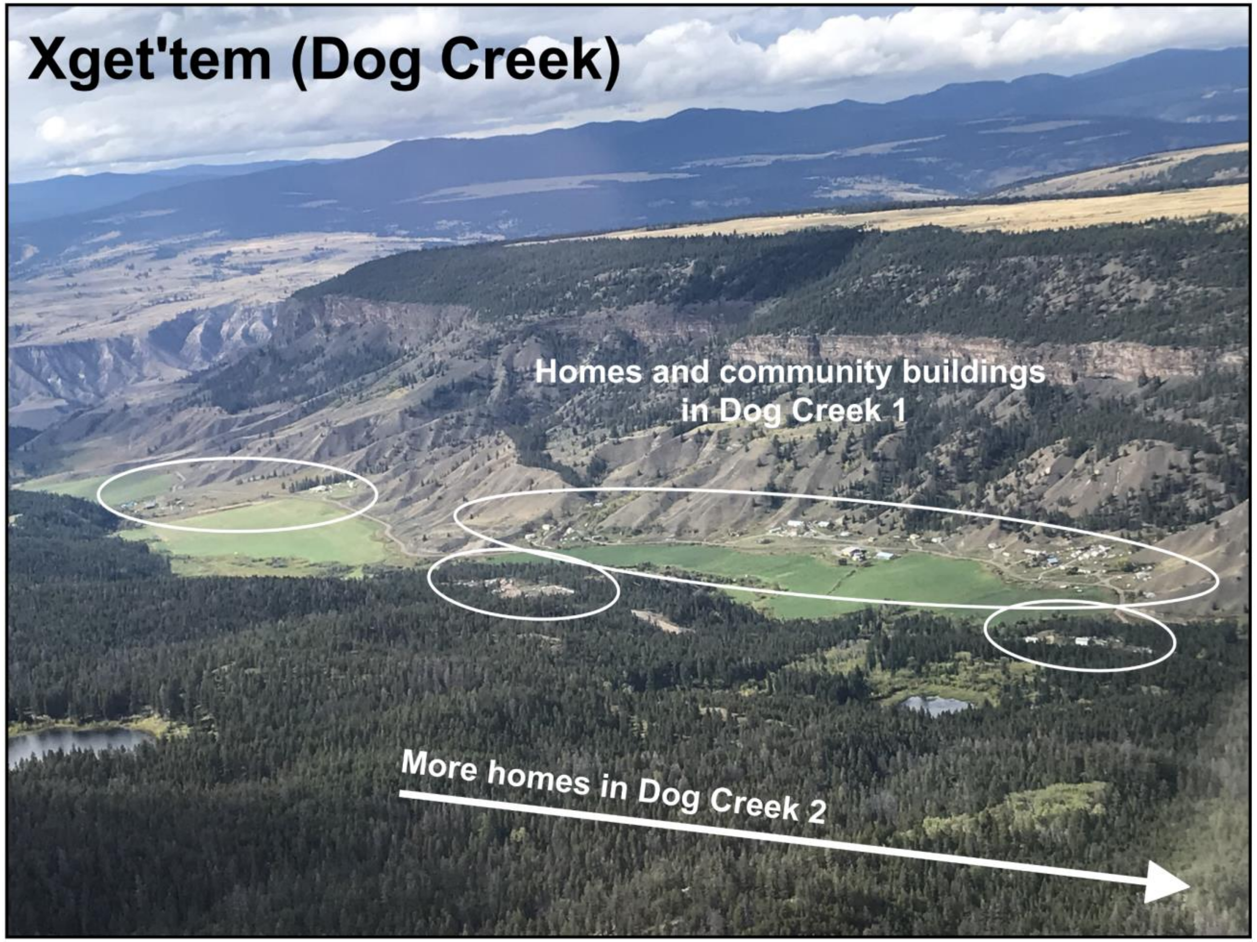
Contemporary Fire Behaviour

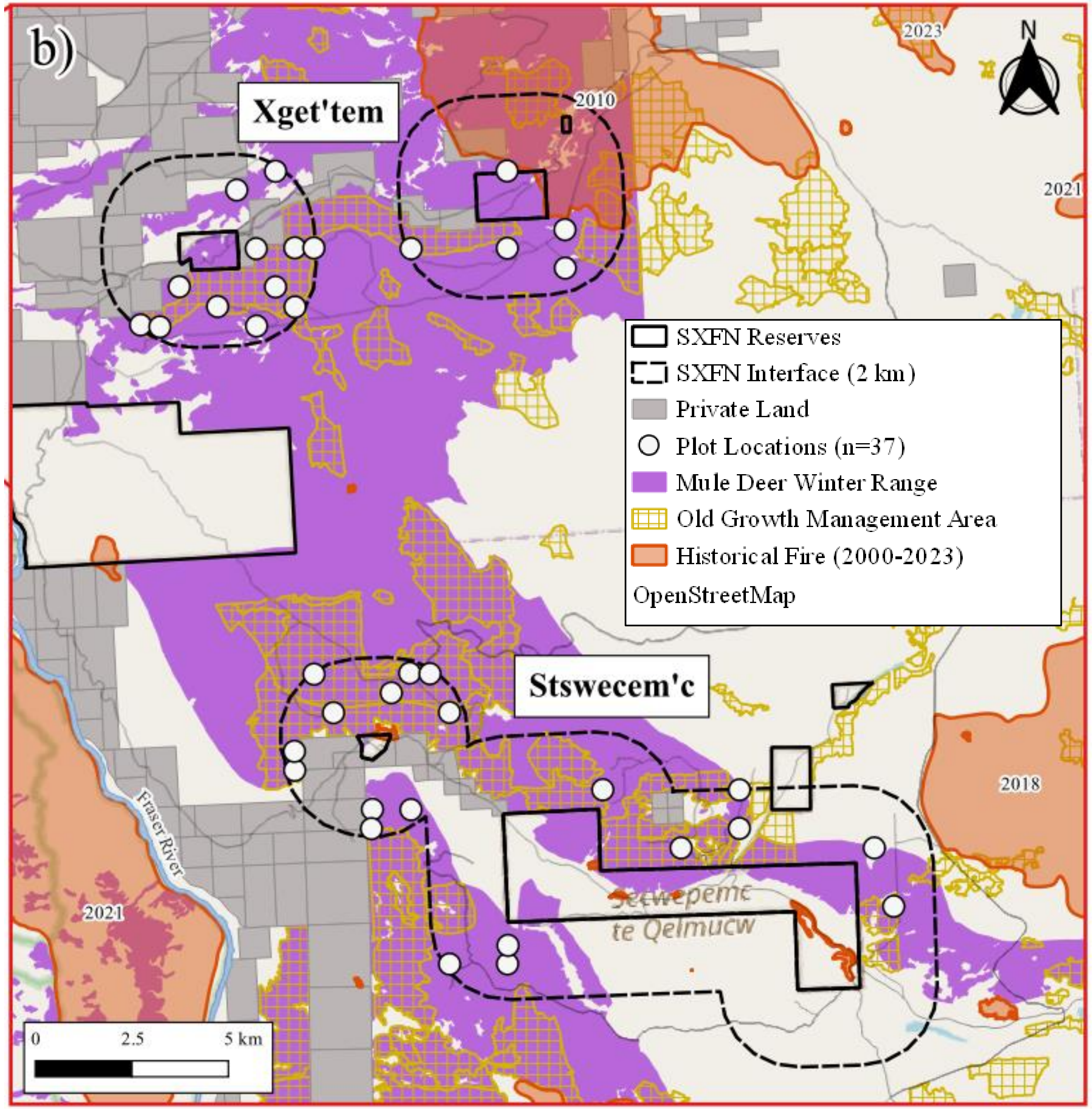


Flat Lake Fire 2021, J. Garsson

Wildfire risk for Stswecem'c Xget'tem communities

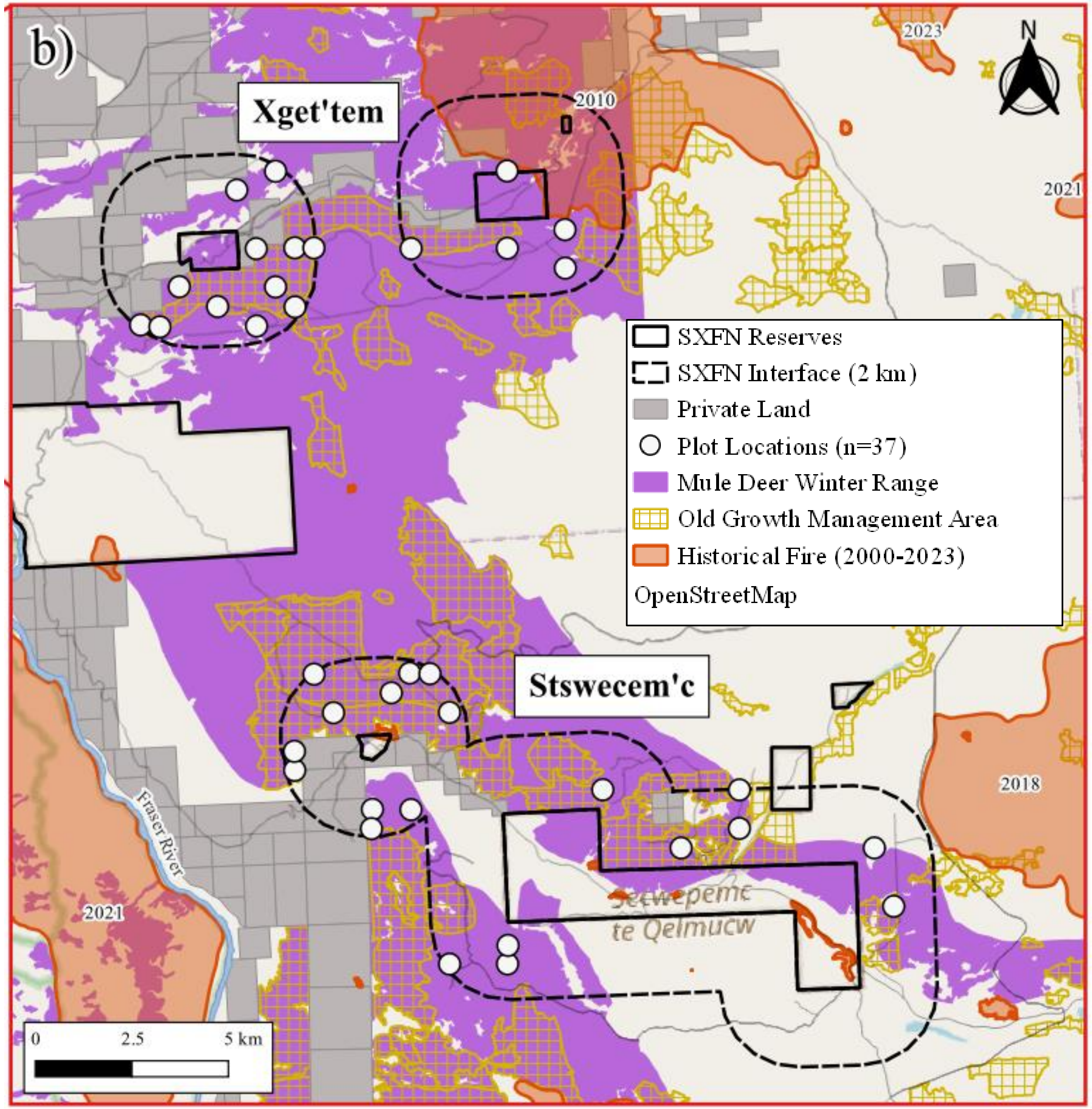






Research Questions

1. What are the fuel loads?
2. What is predicted fire behaviour?
3. How much fuel can be removed in a MDWR vs. intensive thin-from-below?
4. What is predicted fire behaviour after simulated fuel treatments?



Methods

1. Measured fuels at 37 plots
2. Modelled fire behaviour with Crown Fire Initiation & Spread model
3. Simulated thin-from-below
   - MDWR (GAR Order)
   - Intensive (150 tph)
4. Re-modelled and compared fire behaviour

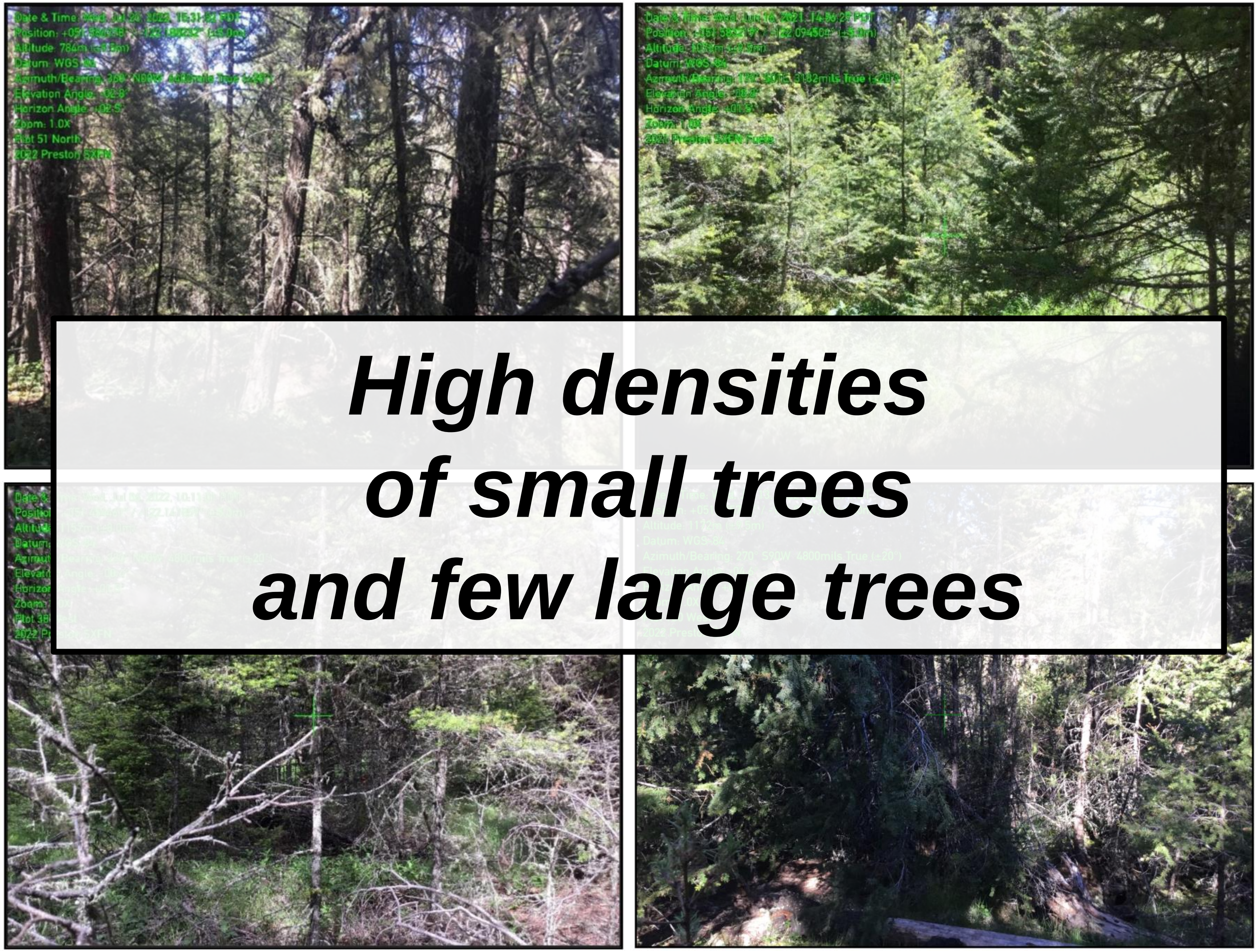
Q1 Fuel loads

Small trees (DBH<12.5cm)

- Median = 2,400 tph
- Range = 0 – 10,400 tph

Large trees (DBH>12.5cm)
Live Douglas-fir

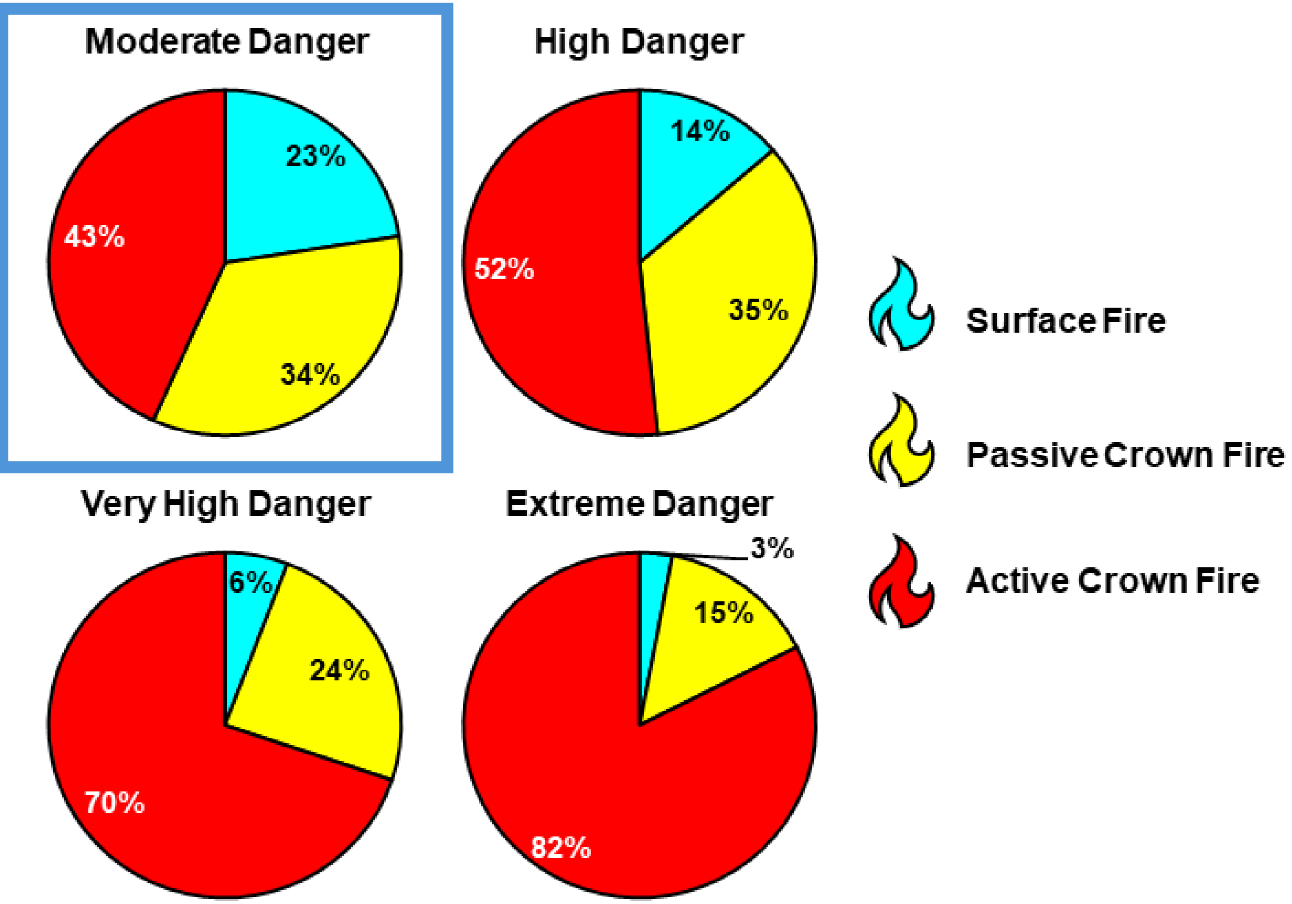
- Median = 288 tph
- Range = 0 – 1100 tph
- Median = **18 m^2/ha**
- Range = 0 – 55 m^2/ha



High densities of small trees and few large trees

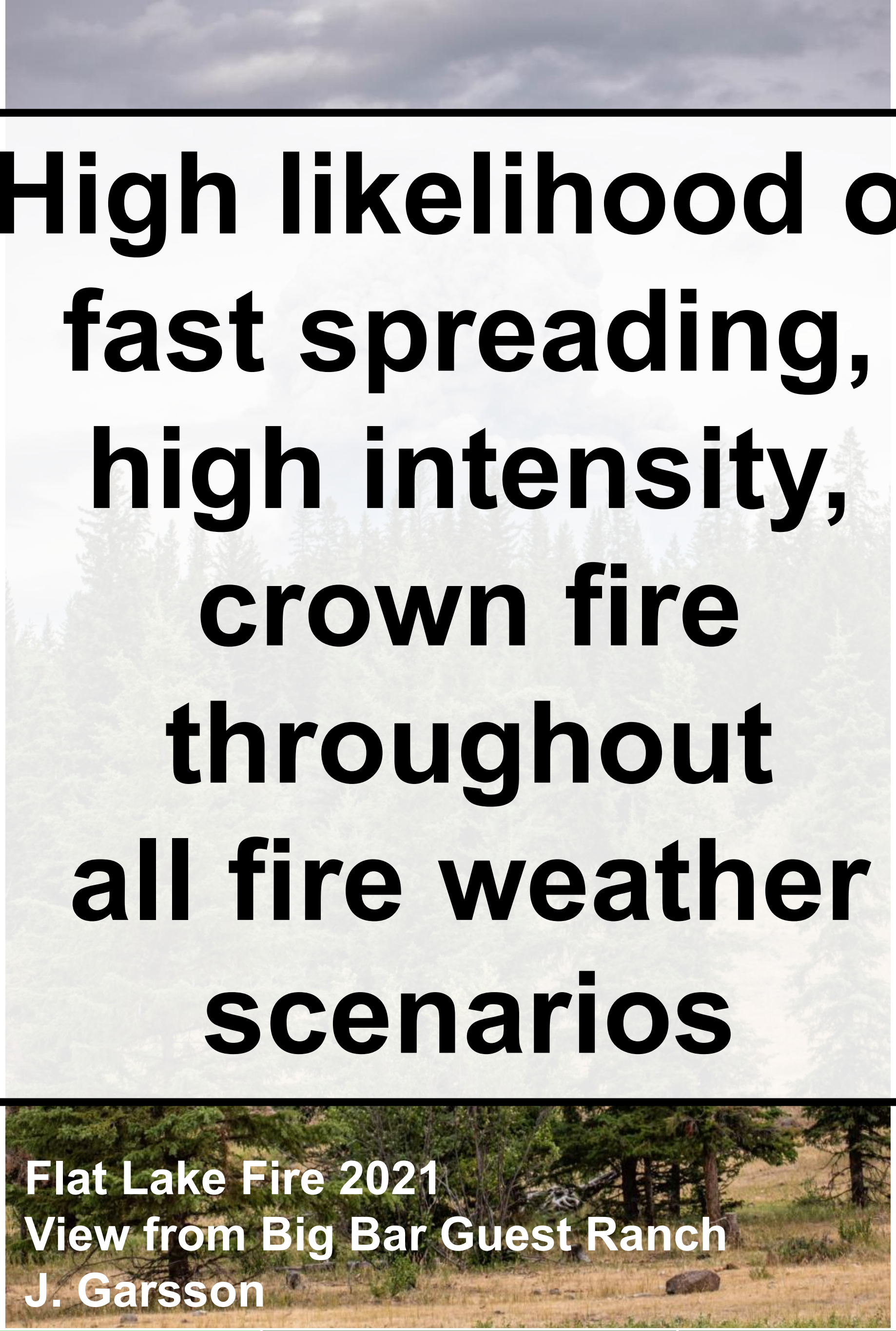
Q2 Predicted fire behaviour

37 plots + increasing fire danger



Moderate = 50th, High = 70th, Very High = 90th, Extreme = 97.5th percentiles of fire weather

High likelihood of fast spreading, high intensity, crown fire throughout all fire weather scenarios



Flat Lake Fire 2021
View from Big Bar Guest Ranch
J. Garsson

Q3 Fuel loads post-thinning

Simulated thinning treatments
- Reduced density, BA, and canopy cover
- Only density differs in MDWR (25 & 35%) vs. intensive thinning treatments

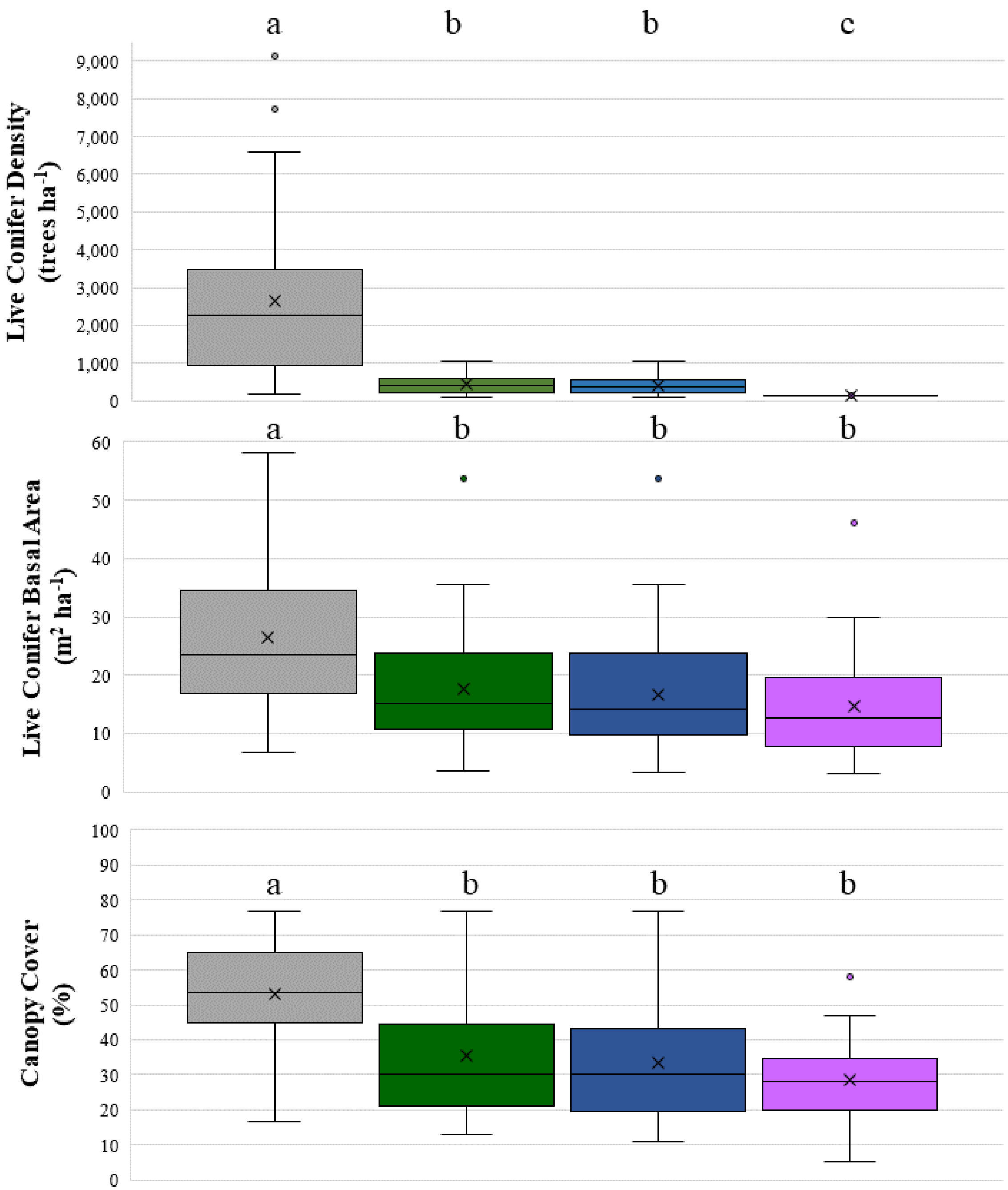
After intensive thinning basal area and canopy cover are n.s.d from MDWR treatments

Measured fuels

MDWR - 25% live conifer BA removal
- GAR Order GWM 9

MDWR - 35% live conifer BA removal
- GAR Order GWM 9 with 2022 Blanket Exemption for WUI

Intensive thinning to 150 tph
- Removal of small-medium trees

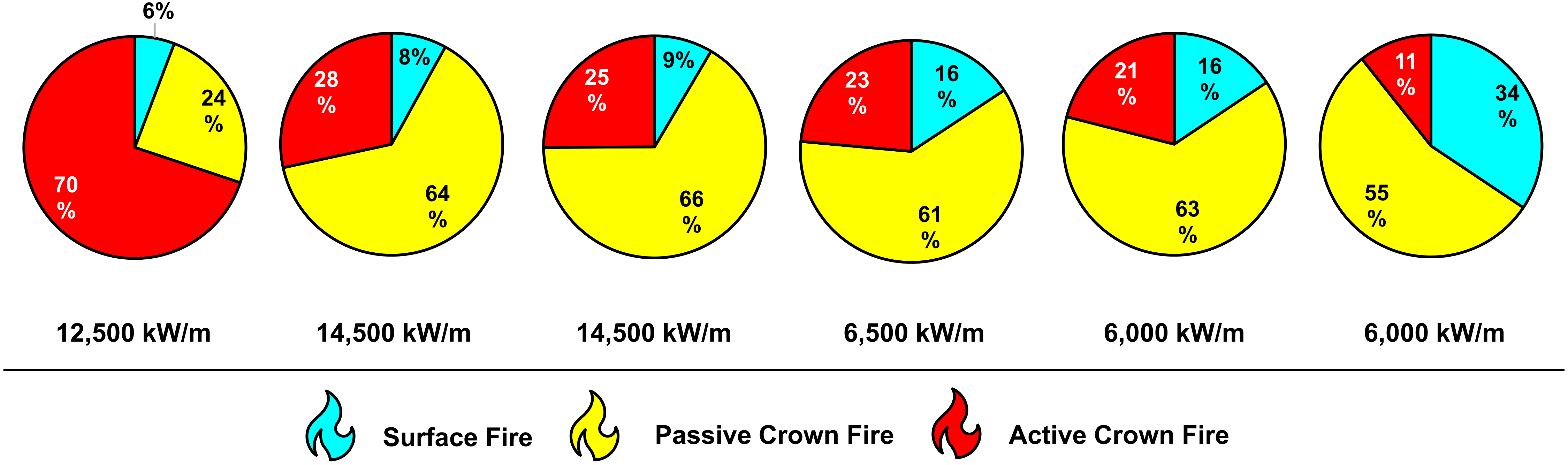


Thinning reduces active crown fire; Abatement reduces fire intensity; Intensive thinning + abatement shifts crown fire to surface fire

Simulated fuel treatments

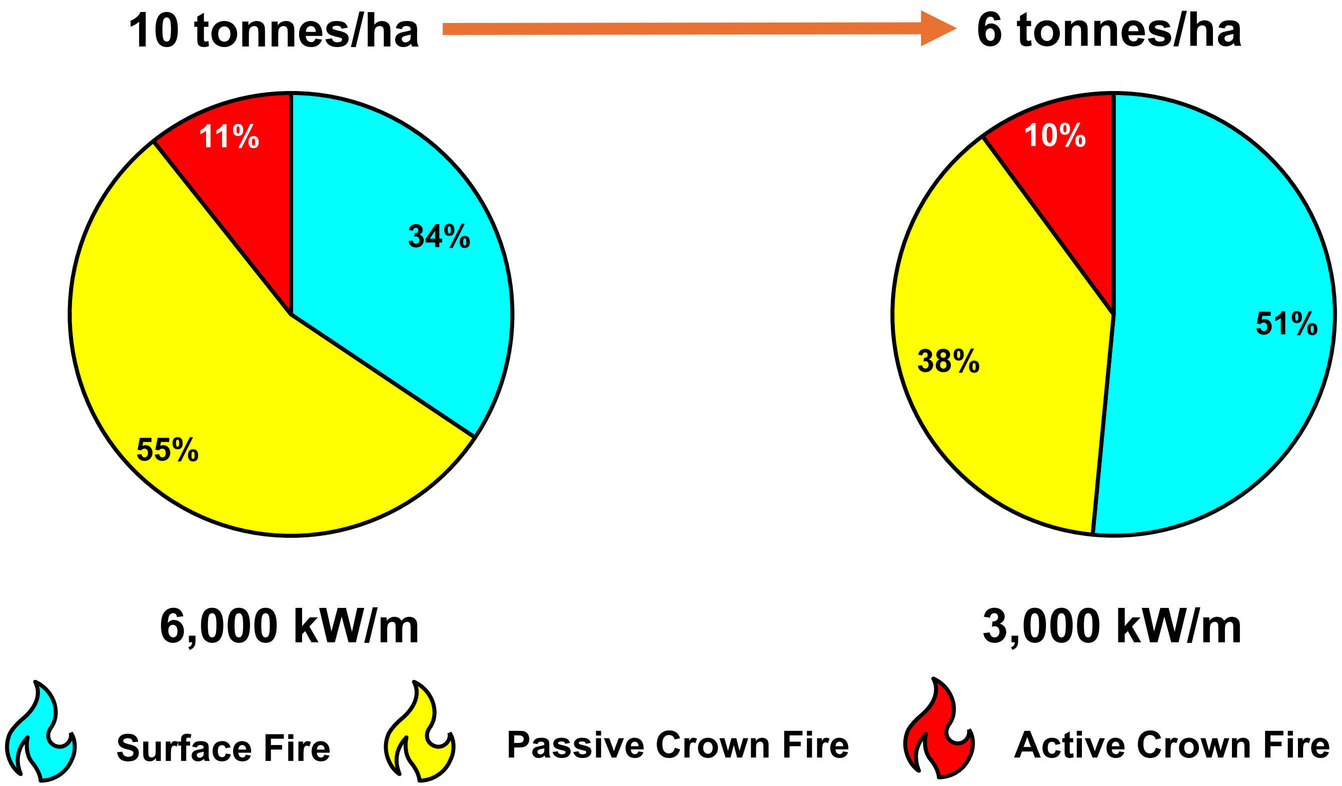
Thinning	0%	25%	35%	25%	35%	150 tph
Pruning				3.5 m	3.5 m	3.5 m
Abatement				10 tonnes/ha	10 tonnes/ha	10 tonnes/ha

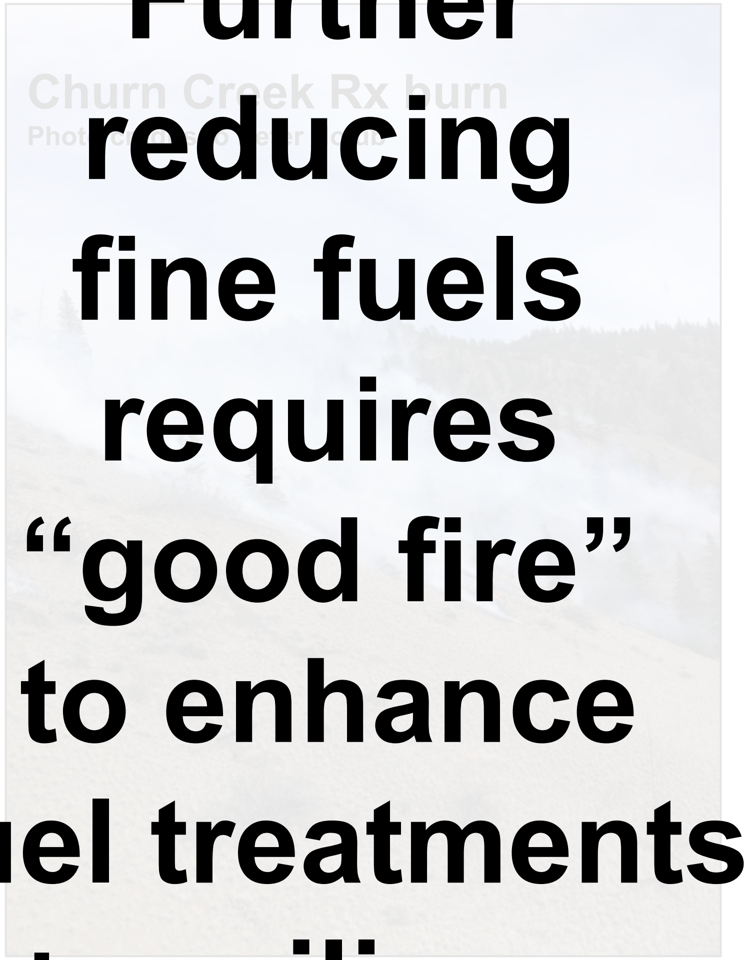
Predicted fire behaviour



Q4b How to reduce fire intensity and increase surface fire?

Predicted fire behaviour at 90th percentile FWI
Thin (150 tph) + prune + abatement





Further reducing fine fuels requires “good fire” to enhance fuel treatments + resiliency

Proactive forest stewardship is needed

MDWR & OGMA forest after 2010 Dog Creek Fire
(June 2021)

Are MDWR fuel treatments fire-resilient? Barriers to being adaptive on “Crown” land

In Progress: Tinmusket MDWR Fuel Break
SW of Dog Creek
(February 2023)

#LandBack facilitates proactive, adaptive stewardship

Thank you

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Stswecem'c Xget'tem FIRST NATION

THE UNIVERSITY OF BRITISH COLUMBIA
Community Engagement

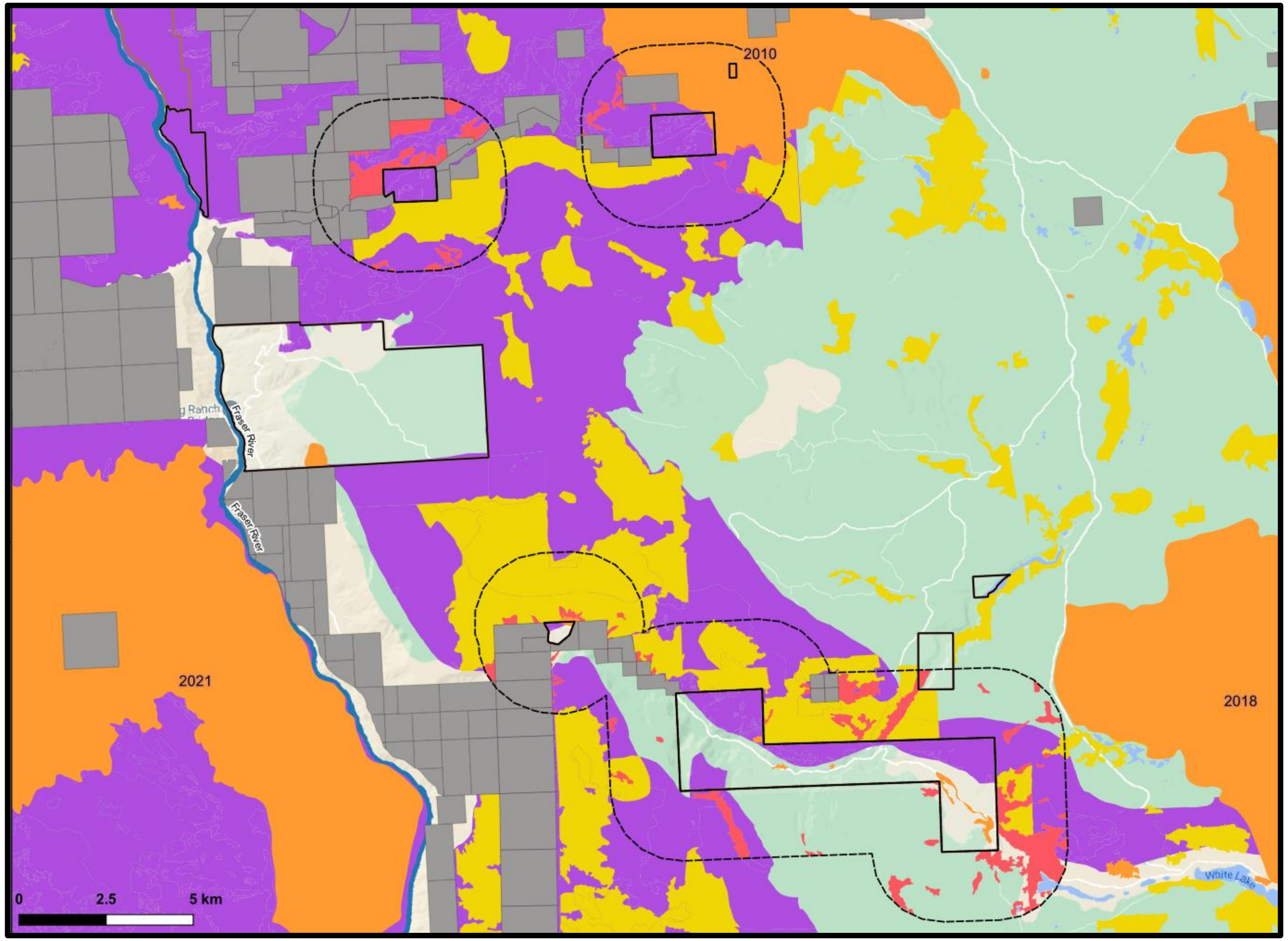
BRITISH COLUMBIA
BC Wildfire Service

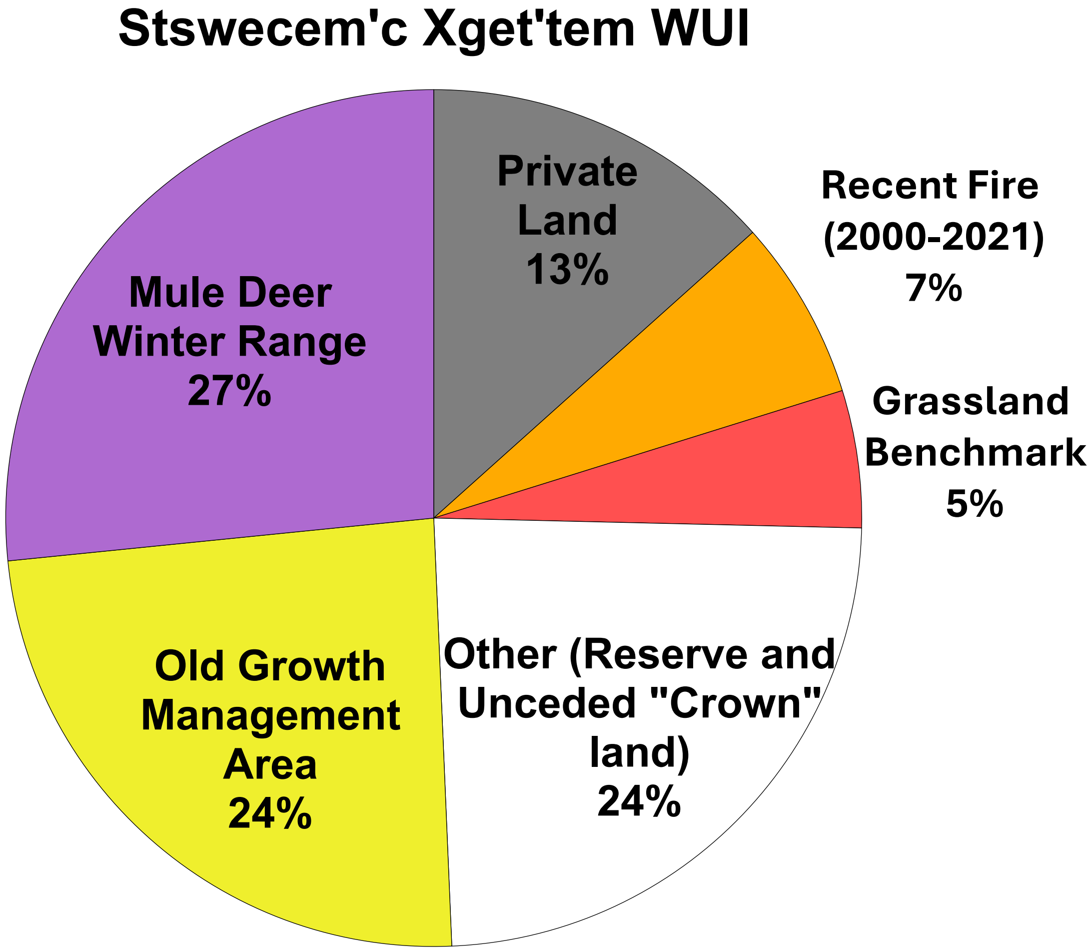
PICS
PACIFIC INSTITUTE FOR CLIMATE SOLUTIONS

forestry
university of british columbia

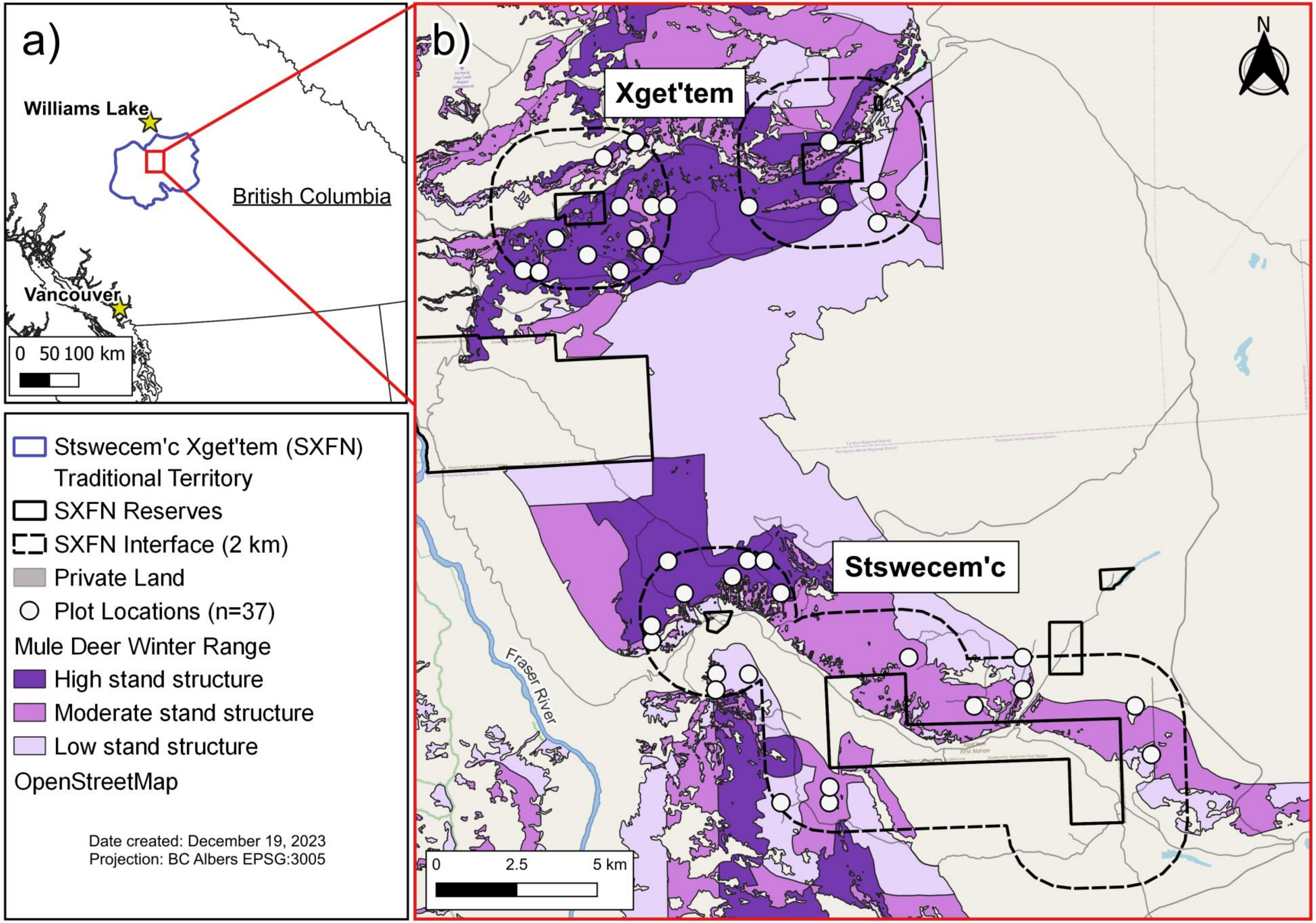
Mitacs

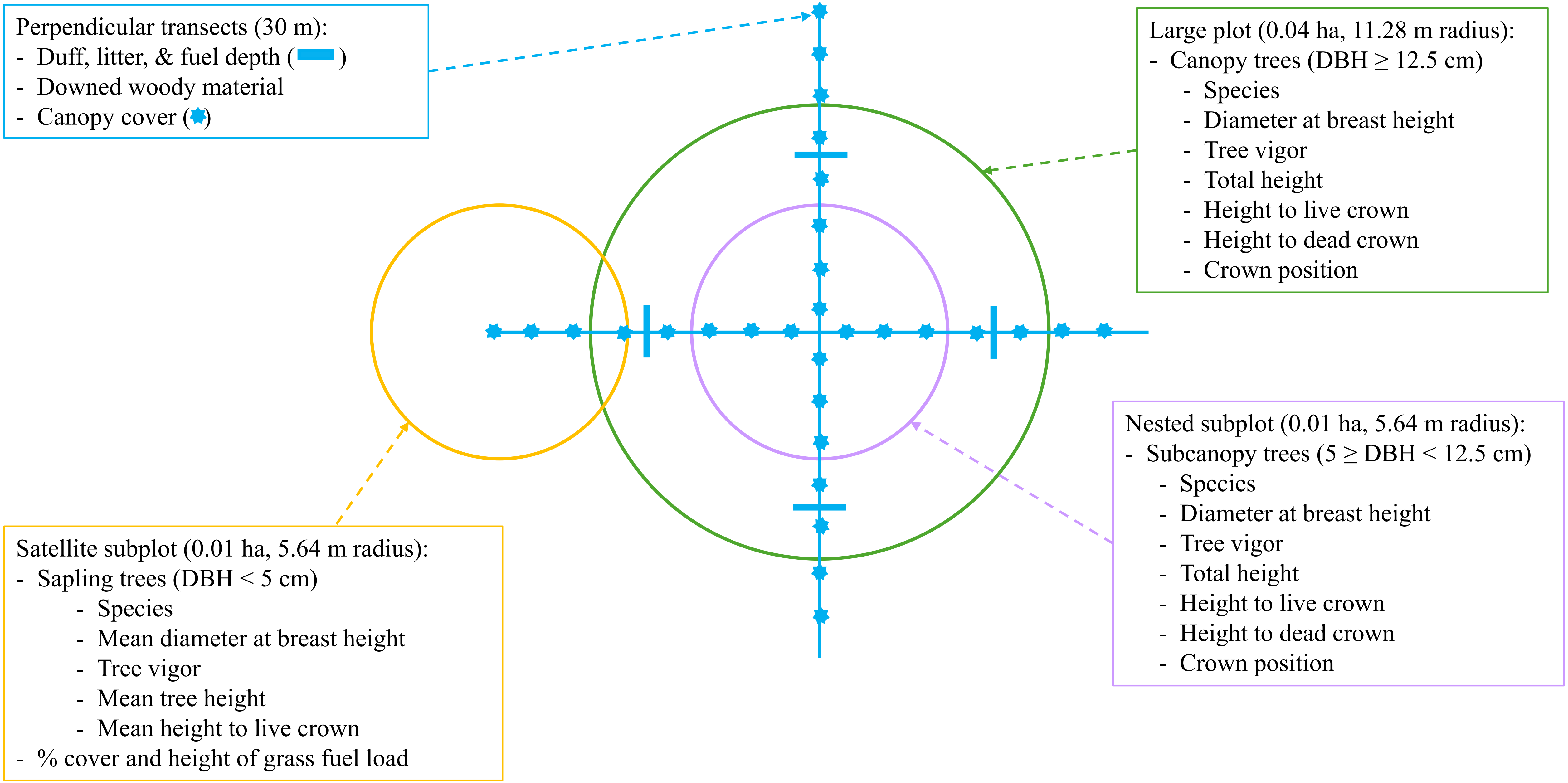
Canada Wildfire





MDWR and OGMA 55% of WUI


a)
Williams Lake
British Columbia
Vancouver
0 50 100 km
b)
Xget'tem
Stswecem'c
Fraser River
N
0 2.5 5 km
Stswecem'c Xget'tem (SXFN) Traditional Territory
SXFN Reserves
SXFN Interface (2 km)
Private Land
Plot Locations (n=37)
Mule Deer Winter Range
High stand structure
Moderate stand structure
Low stand structure
OpenStreetMap
Date created: December 19, 2023
Projection: BC Albers EPSG:3005


Perpendicular transects (30 m):
- Duff, litter, & fuel depth ( )
- Downed woody material
- Canopy cover ( )
Large plot (0.04 ha, 11.28 m radius):
- Canopy trees (DBH ≥ 12.5 cm)
- Species
- Diameter at breast height
- Tree vigor
- Total height
- Height to live crown
- Height to dead crown
- Crown position
Nested subplot (0.01 ha, 5.64 m radius):
- Subcanopy trees (5 ≥ DBH < 12.5 cm)
- Species
- Diameter at breast height
- Tree vigor
- Total height
- Height to live crown
- Height to dead crown
- Crown position
Satellite subplot (0.01 ha, 5.64 m radius):
- Sapling trees (DBH < 5 cm)
- Species
- Mean diameter at breast height
- Tree vigor
- Mean tree height
- Mean height to live crown
- % cover and height of grass fuel load

Four weather scenarios

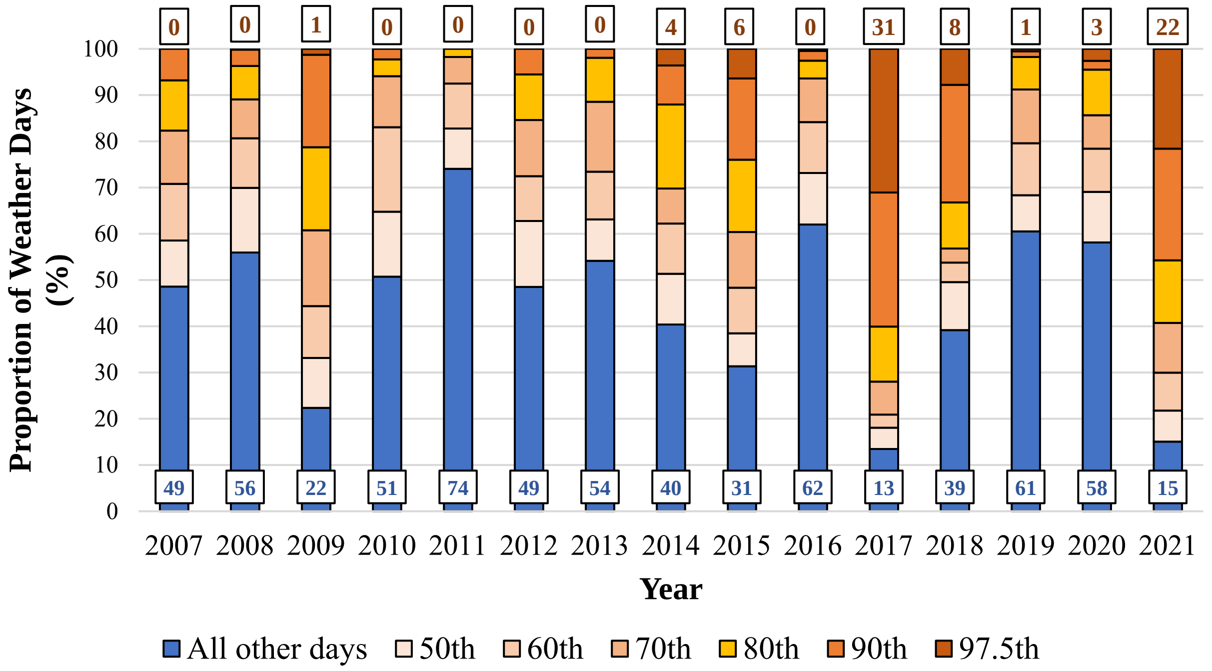
- Fire Weather Index (FWI) percentiles
- May 15 – August 31 fire season, 2007 – 2021 (15 years)
- Data from NR Canada's Daily Weather Grid

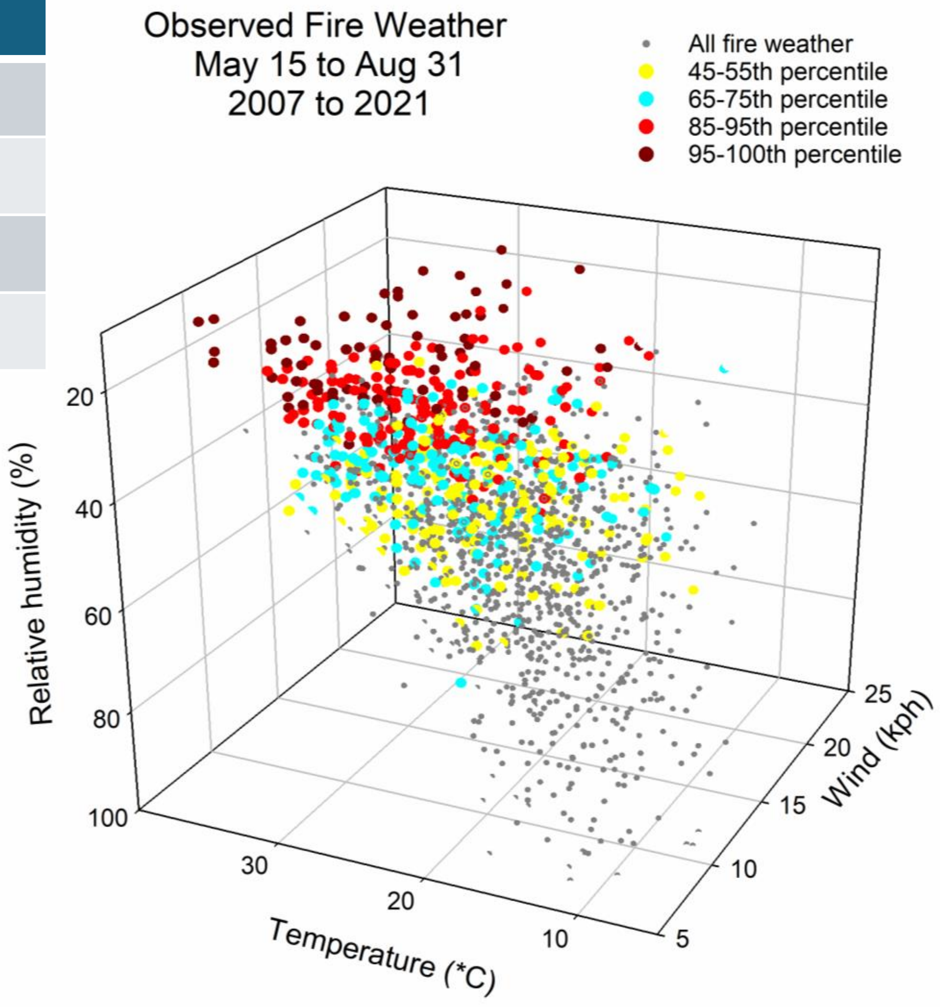
50th Percentile | 70th Percentile | 90th Percentile | 97.5th Percentile

Average weather day → **Extremely hot, dry, windy weather day**

Weather Scenarios Are Variable

FWI Percentile	Temperature (*C)	Relative Humidity (%)	Wind Speed (km/hr)	Precipitation (mm)
50th	20 ±4	43 ±10	11 ±4	0.4 ±0.6
70th	22 ±4	37 ±9	11 ±4	0.2 ±0.3
90th	24 ±4	29 ±7	12 ±4	0.1 ±0.2
97.5th	27 ±4	23 ±6	14 ±5	0.0 ±0.1





Fire Behaviour Predictions by Crown Fire Initiation and Spread Model (CFIS)

Fuel data [37 plots] + Weather data [2007-2021]

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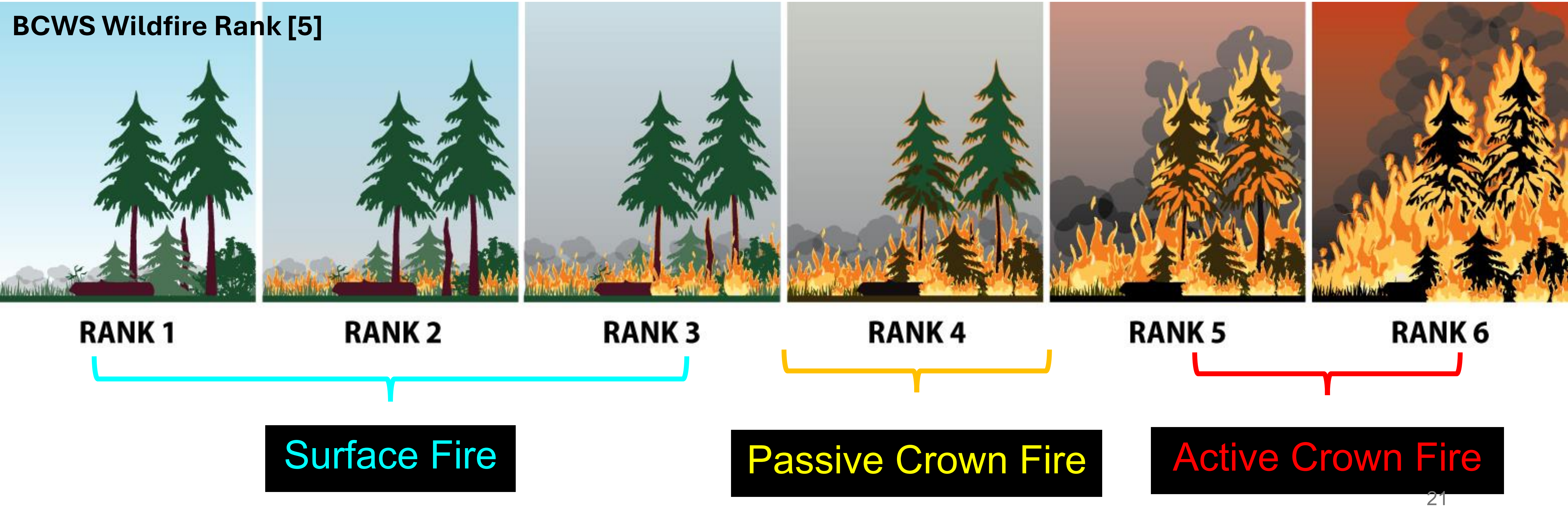
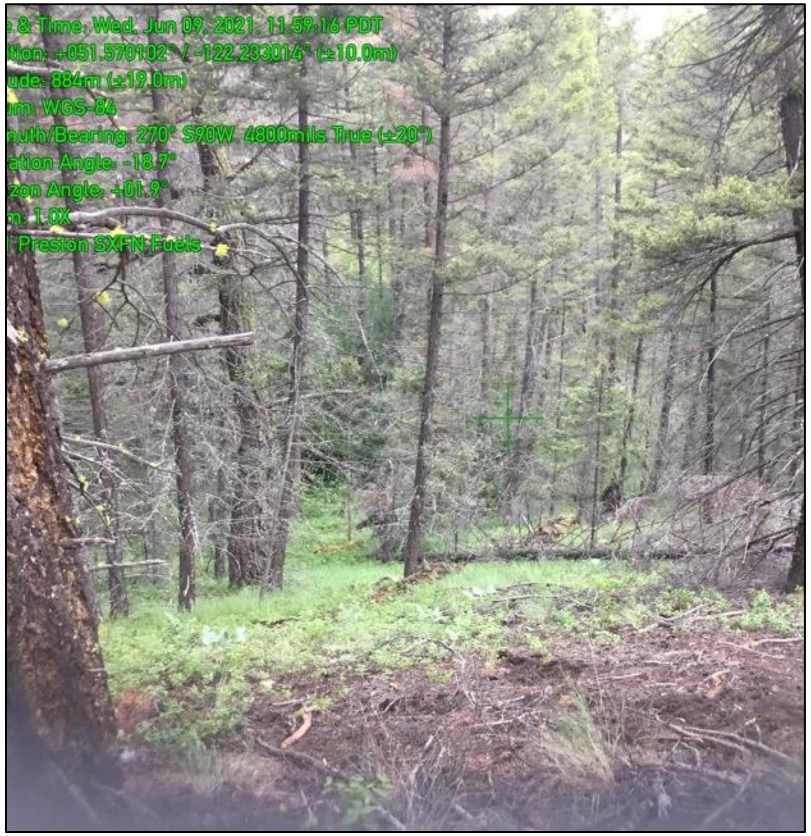
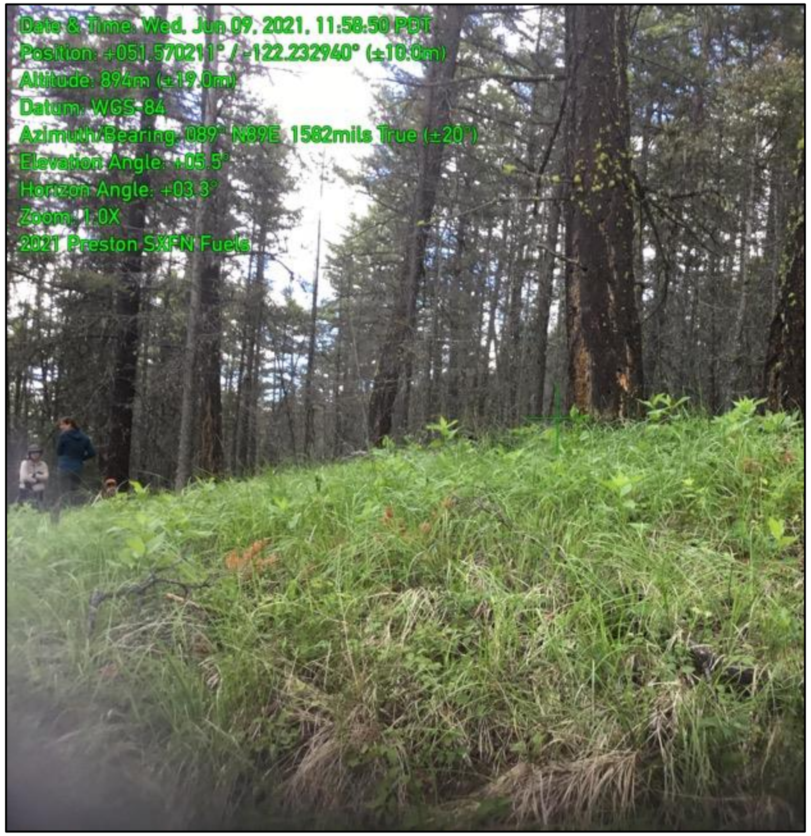
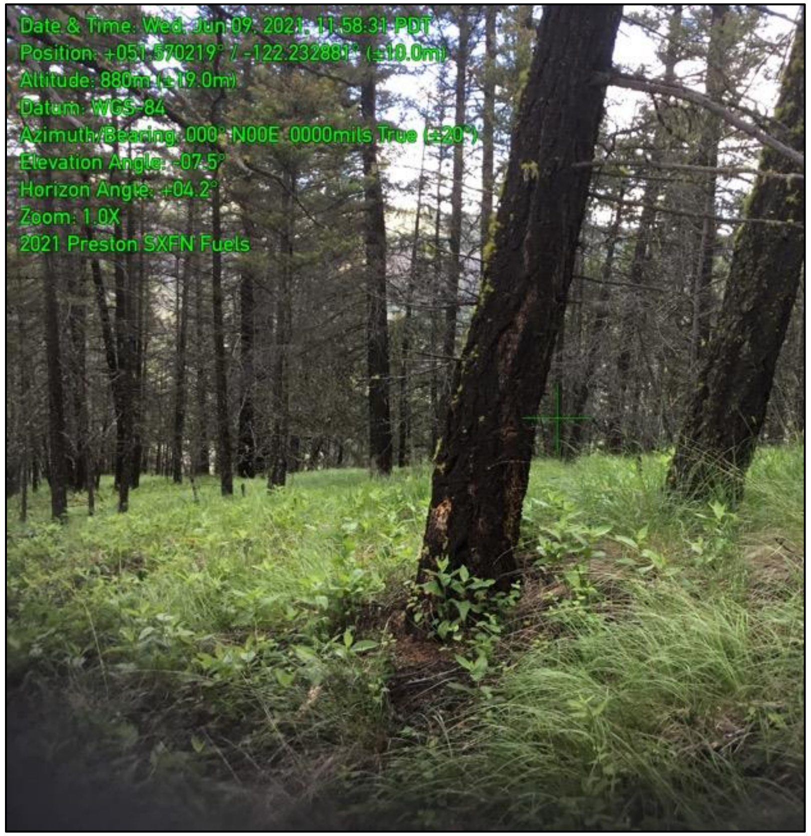
>21,000 Crown Fire Likelihoods + Fire Behaviour Predictions

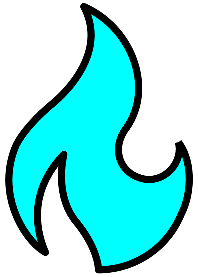


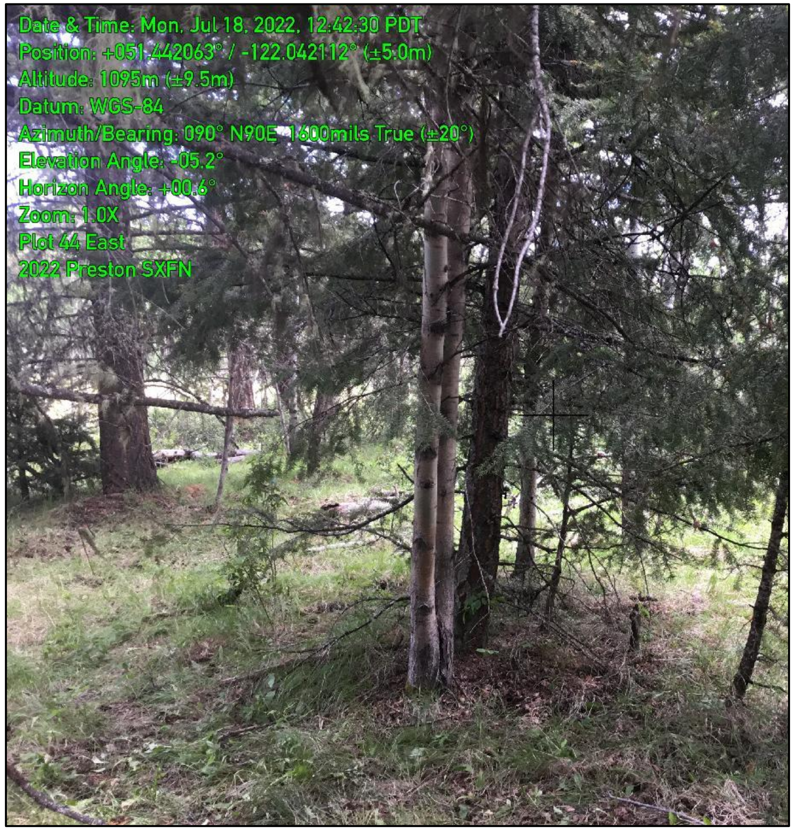


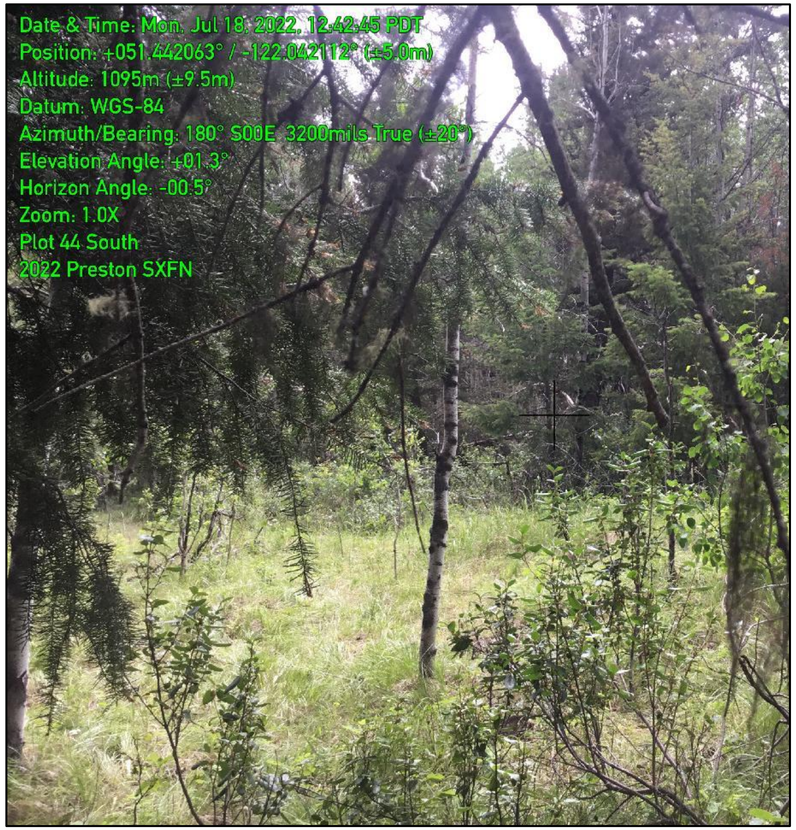




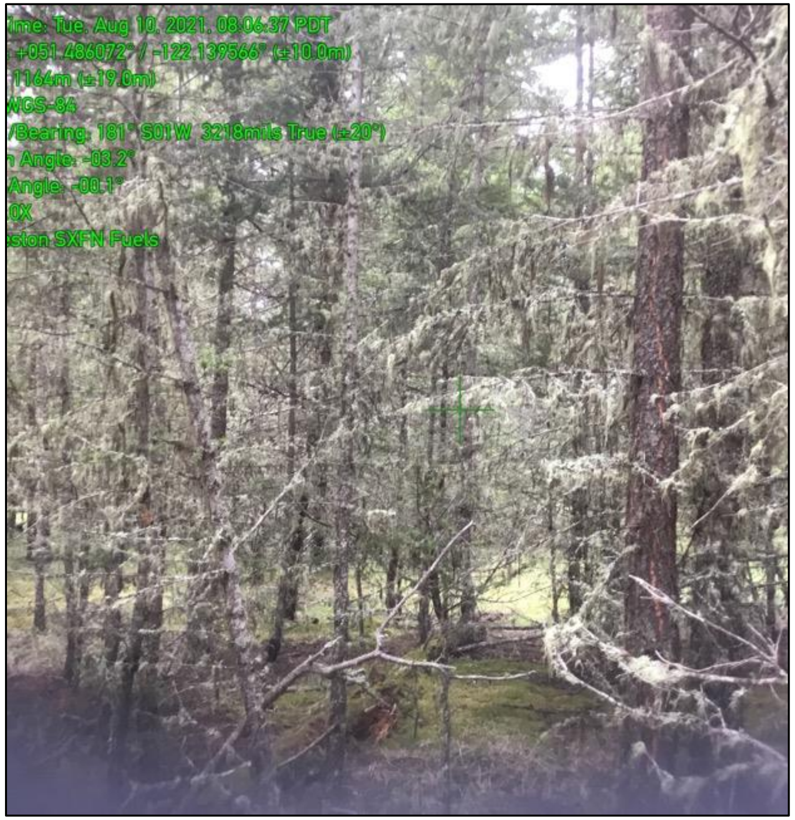
Surface Fire Predicted

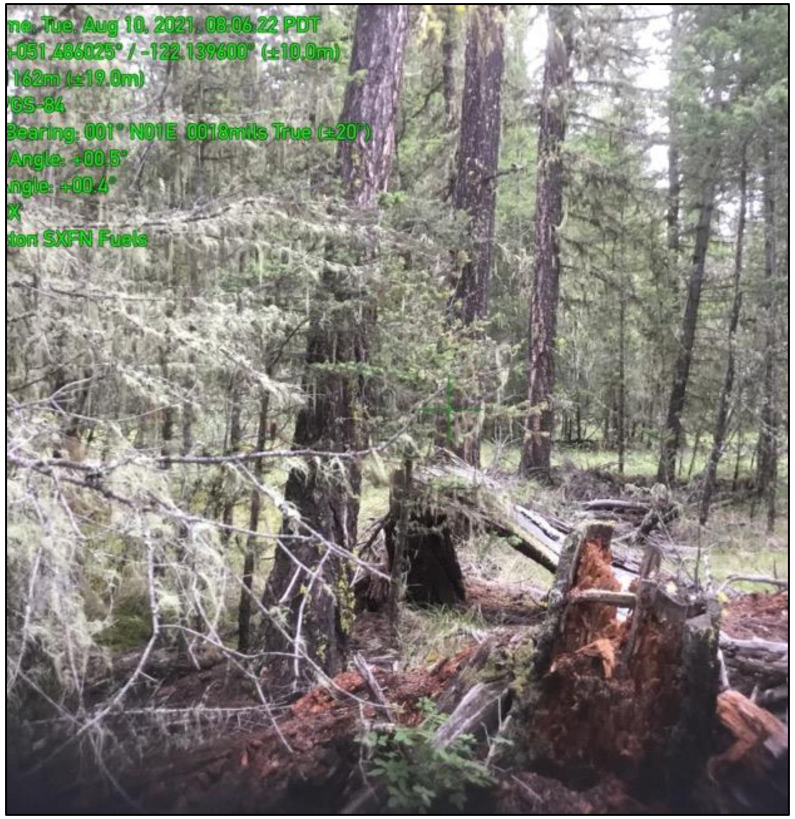


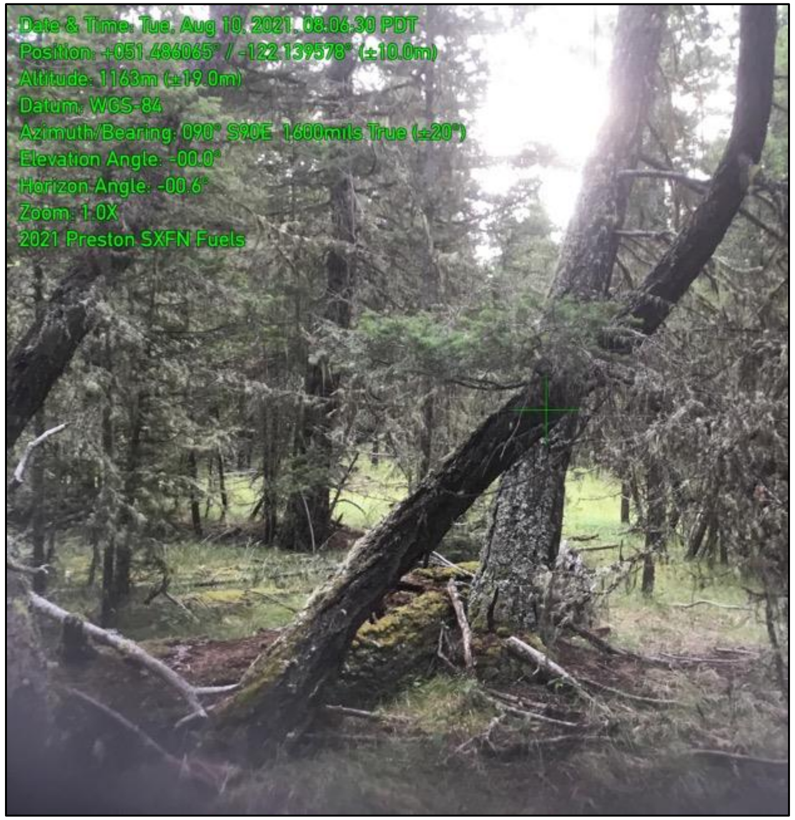




Passive Crown Fire Predicted







Active Crown Fire Predicted

Simulated MDWR thin-from-below treatments

1. All dead conifer trees with DBH < 37.5 cm were removed.
2. Living conifer trees with DBH < 12.5 cm other than Douglas-fir, including lodgepole pine, hybrid spruce and Rocky Mountain juniper were removed.
3. Ninety percent of living Douglas-fir trees with DBH < 12.5 cm were removed, which is the maximum percentage allowed for the sapling and subcanopy tree layers.
4. Living conifer trees with 12.5 ≥ DBH ≥ 37.5 cm other than Douglas-fir were removed from smallest to largest based on DBH. Removal continued until 25% (or 35%) of the total pre-harvest basal area of all live conifer canopy trees was achieved; if these thresholds were not achieved, I proceeded to step 4.
5. Living Douglas-fir trees with 12.5 ≥ DBH ≥ 22.4 cm were removed from smallest to largest based on DBH classes. Within DBH classes in this size range, trees were removed up to a maximum of 85% of the basal area. Removal continued until 25% (or 35%) of the total pre-harvest basal area of all live conifer canopy trees was achieved; if these thresholds were not achieved, I proceeded to step 5.
6. Living Douglas-fir trees with DBH from 22.5 to 37.4 cm were also removed from the smallest to largest based on DBH classes. However, the amount removed from each DBH class was the larger of two values: (a) the maximum percentage of basal area for each class or (b) an alternate maximum basal area for removal from each class calculated using the BDq method for managing uneven-aged forests that has been adapted for different types of MDWR. Removal continued until 25% (or 35%) of the total pre-harvest basal area of all live conifer canopy trees was achieved. If these thresholds were not achieved, I calculated the total basal area and percentage of basal area that was removed.

2007 GAR Order

Table 2. Values for development of residual stand curves for managing mule deer habitat in BG, IDFxm/xw and IDFdk3/dk4/dw biogeoclimatic units in the Cariboo Region. Separate requirements are given for two different situations in moderate habitat in IDFxm/xw: (A) for warm aspect stands with slope ≥30%, (B) for all other stands. Combinations of various levels of B, D, q and the large tree reserve can produce a wide range of residual stand curves to meet the mule deer habitat requirements described in Table 1.

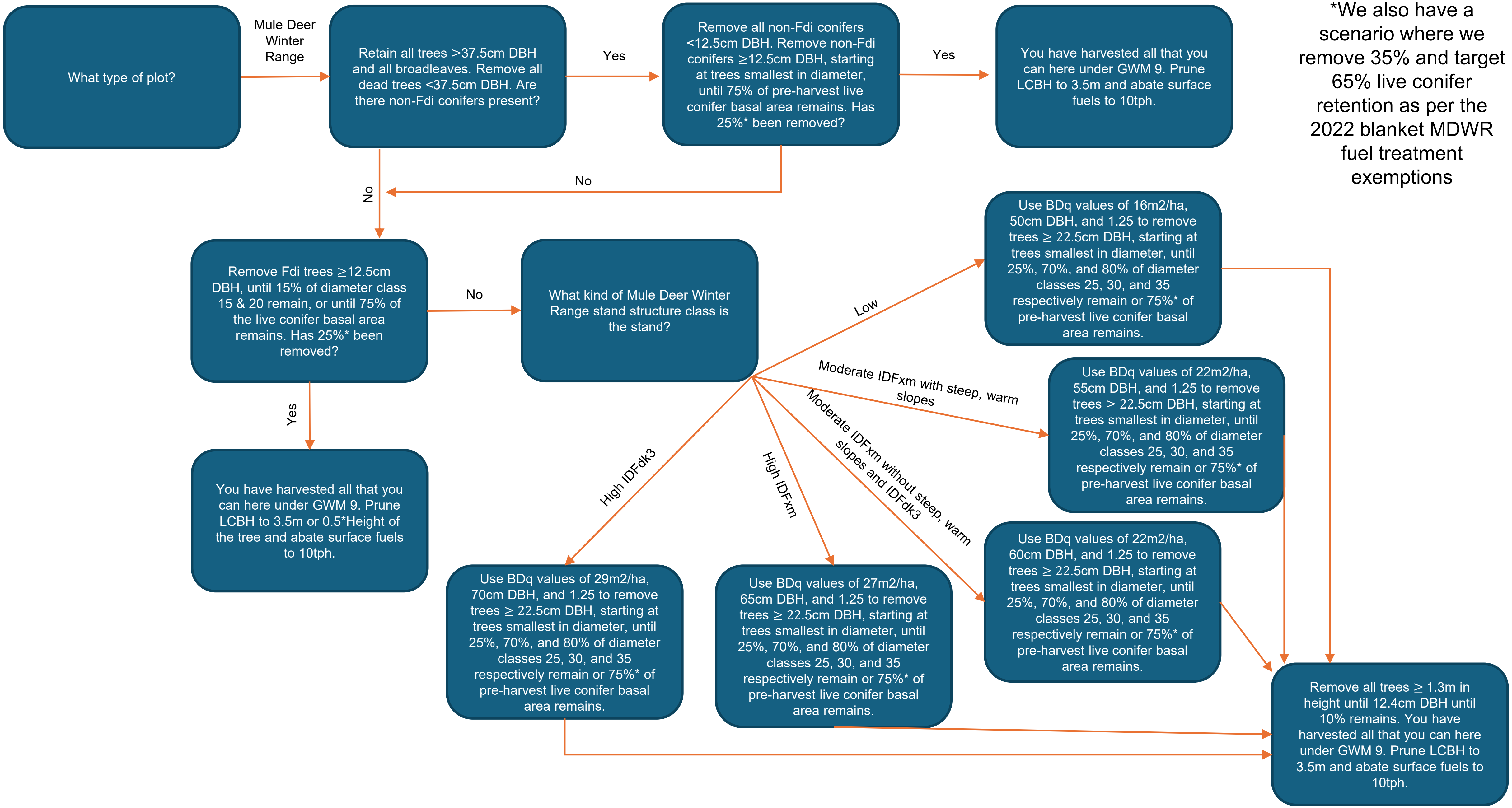
Stand Structure Habitat Class	Biogeoclimatic Unit	Recommended values defining residual stand curves			
		B (m2/ha, ≥12.5cm)	D (cm)	q (using 5 cm dbh classes)	Large Tree Reserve (m2/ha, >D)
Low	BG, IDFxm/xw and IDFdk3/dk4/dw	≥16	≥50	1.25 – 1.4	0 – 1.6
Moderate	BG, IDFxm/xw (A)	≥22	≥55	1.25 – 1.4	0 – 2.0
	BG, IDFxm/xw (B)	≥22	≥60	1.25 – 1.35	0 – 2.2
	IDFdk3/dk4/dw	≥22	≥60	1.25 – 1.35	0 – 2.2

2022 Blanket Exemption Letter

Table 2. Range for percent removal of basal area in fuel management prescriptions, by dbh class (diameter at 1.3 m above ground). The dbh value is at the centre of each class.

dbh Class (cm)	Minimum % Removal	Maximum % Removal
5	45	90
10	45	90
15	30	85
20	20	85
25	0	75
30	0	30
35	0	20
40	0	10
45+	0	10

GWM 9 Fuel Treatment Simulation Decision Tree



Why 150 tph?

- 2016 Fire Stocking Standards document
  - 150 tph was minimum for preferred species in the IDF dk1 example
- Brookes 2019 Thesis
  - 92 tph mean historical density in Knife Creek IDF
- Greene 2021 Dissertation
  - 75-355 tph in reconstructions for rocky mountain trench IDF-PP
  - Figure on the right

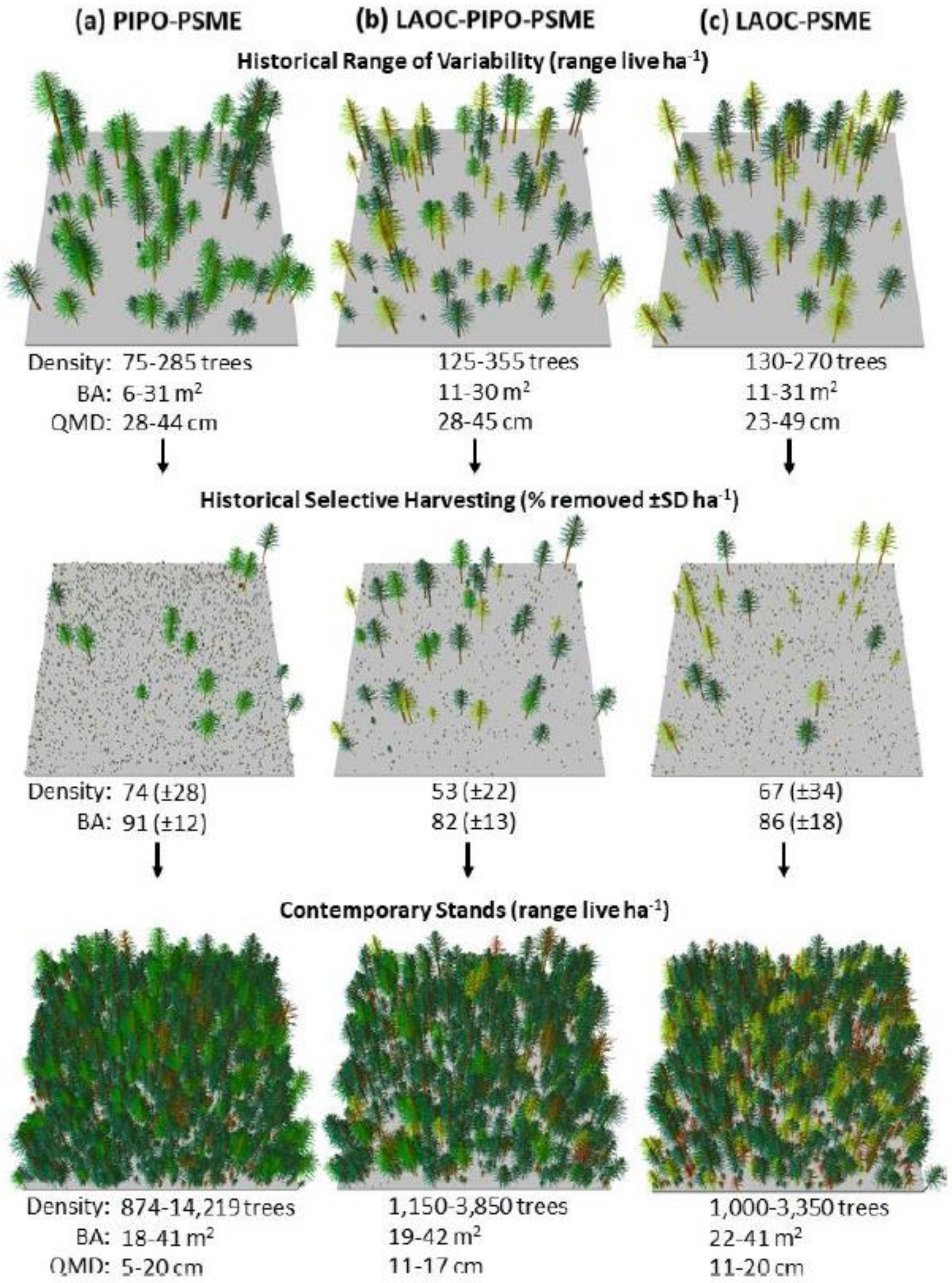
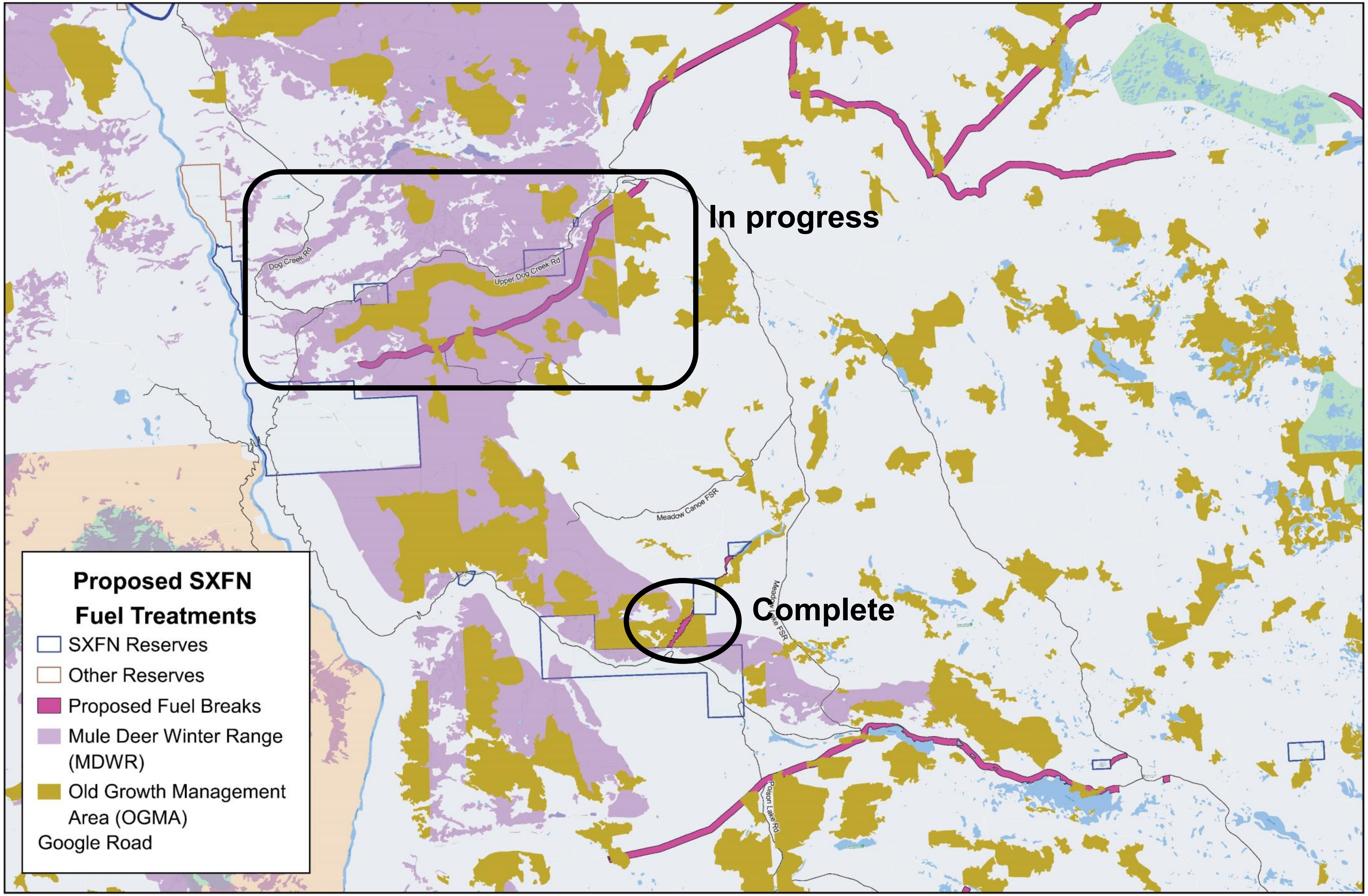


Figure 3.5 Historical range of variability of dry forests stands and changes through time following European settlement.



In progress
Complete
Dog Creek Rd
Upper Dog Creek Rd
Meadow Canoe FSR
Meadow Lake FSR
Poison Lake Rd
Proposed SXFN Fuel Treatments
SXFN Reserves
Other Reserves
Proposed Fuel Breaks
Mule Deer Winter Range (MDWR)
Old Growth Management Area (OGMA)
Google Road