

# Does Fire Really Matter?

## Whitebark and Limber Pine Regeneration and Fire in the Canadian Rockies

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### Study objective

To gain a better understanding of the fire dynamics in Canadian Rocky Mountain whitebark (WBP) and limber pine (LP) ecosystems.

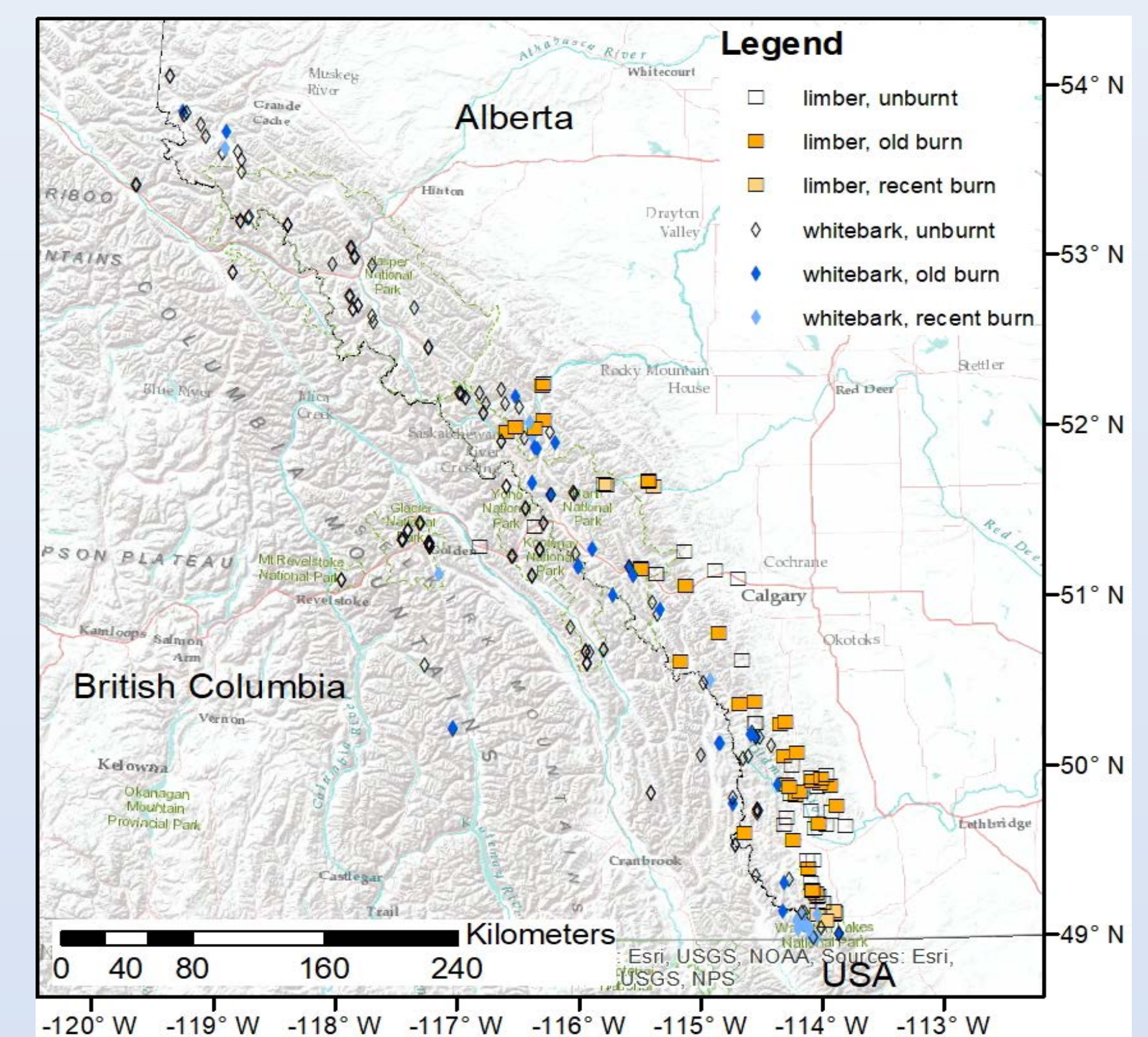


### Research questions

1. What is the relationship between fire history and WBP and LP regeneration in Canadian Rocky Mountains?
2. What is the relationship between fire severity and WBP and LP regeneration in Canadian Rocky Mountains?
3. How can wildfire management protocols be best applied to sites in these ecosystem types?

### Methods

1. Whitebark Pine Ecosystem Foundation monitoring protocols assess stand and tree regeneration and health
2. Alberta Wildfire fire history and fuels surveys were streamlined to characterize fire history, severity, and fuel loads, types, connectivity, and other key variables
3. All crews trained together to ensure consistent data collection



### Results

1. In some of these ecosystems fire does not seem to drive regeneration: only 47% of 164 whitebark and 54% of 80 limber pine stands showed fire evidence
2. Recent fire effects ( $\leq 20$  years): fewer LP seedlings, higher blister rust infection on WBP saplings, slightly more total WBP regeneration than unburnt stands (*Figure 1*)
3. Older fire effects ( $> 20$  years): more LP seedlings than in unburnt stands or more recent burns (*Figure 1*)
4. GIS fire polygons were inaccurate for older fires ( $\sim 2/3$  of stands with fire evidence were missed) but captured more recent burns
5. Fire severity could not be determined accurately using our methods in mixed-severity fire stand types: maximum severity obscured evidence of less severe burns
6. GIS fuel type layers in Alberta were inaccurate as they derive from poor inventory of WBP and LP stand types; nearly all stands were C7 fuel type (*Figure 2*)
7. Regeneration abundance was not correlated with elevation or latitude, and only weakly related to mature tree density ( $R^2 = 0.13$ )
8. Fuel loads were generally low, with variable horizontal and high vertical fuel continuity due to high branch retention; wetter WBP stands in the north and west had higher fuel loads

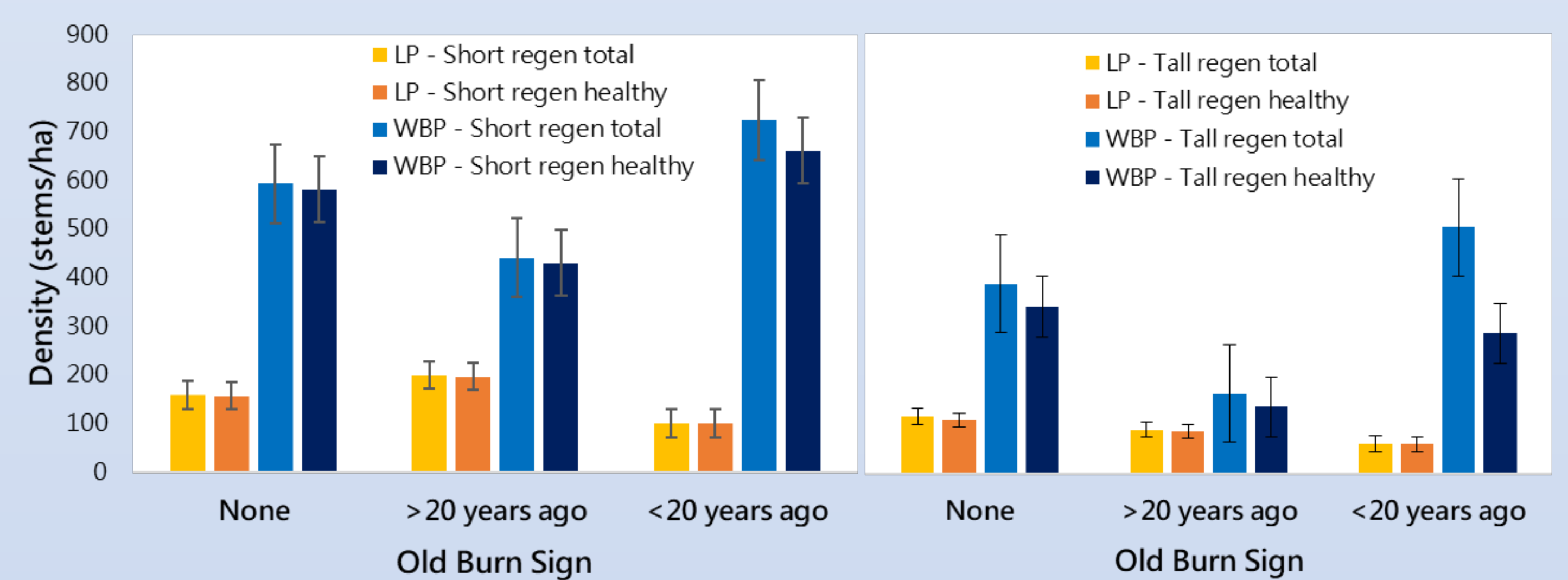


Figure 1. Density of short (0-50 cm, left) and tall (50-140 cm, right) LP and WBP regeneration by burn and health category (mean, SE)

### Management guidance

Based on this study, to support recovery objectives for these species, we recommend for the Canadian Rockies:

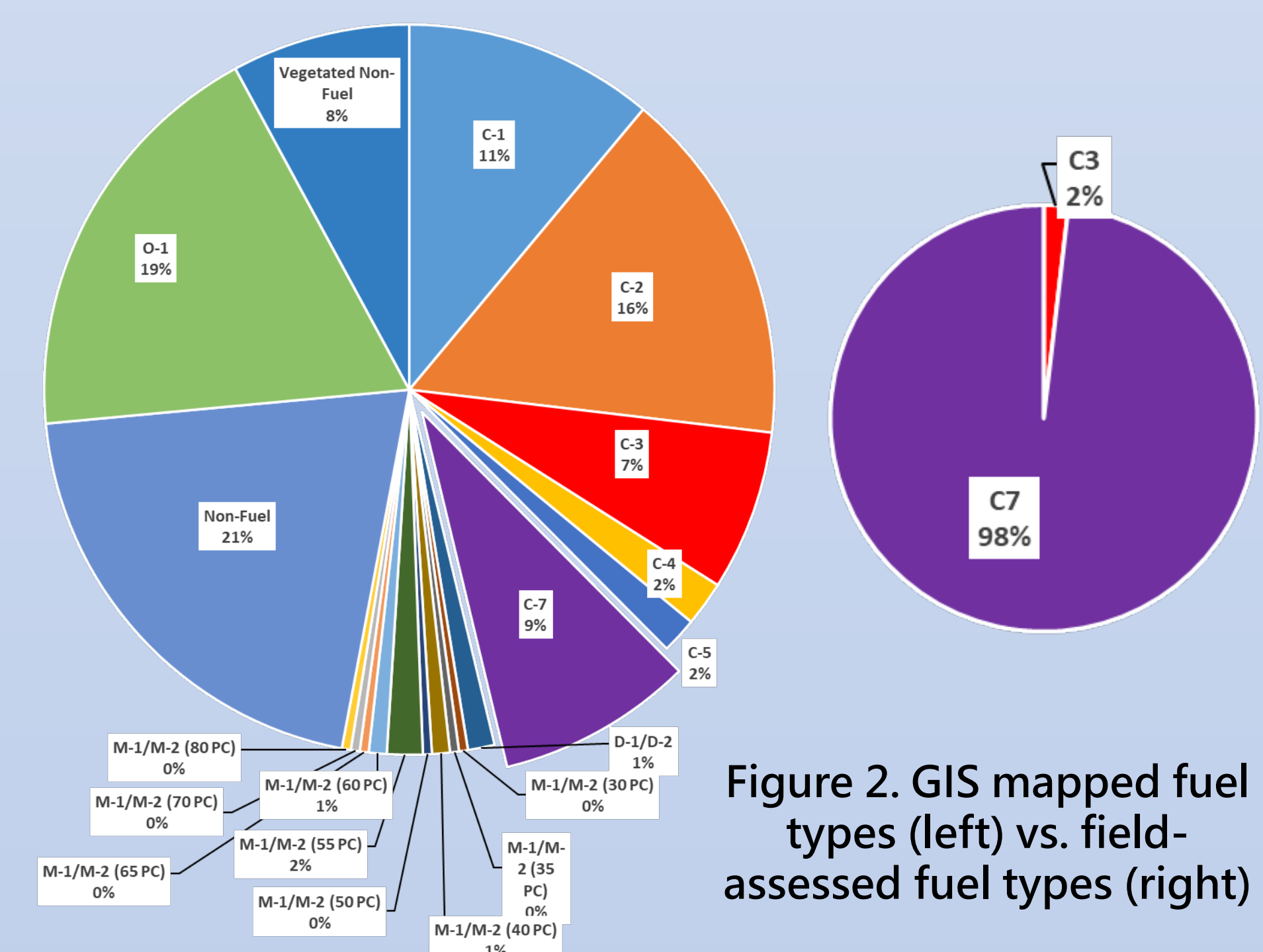
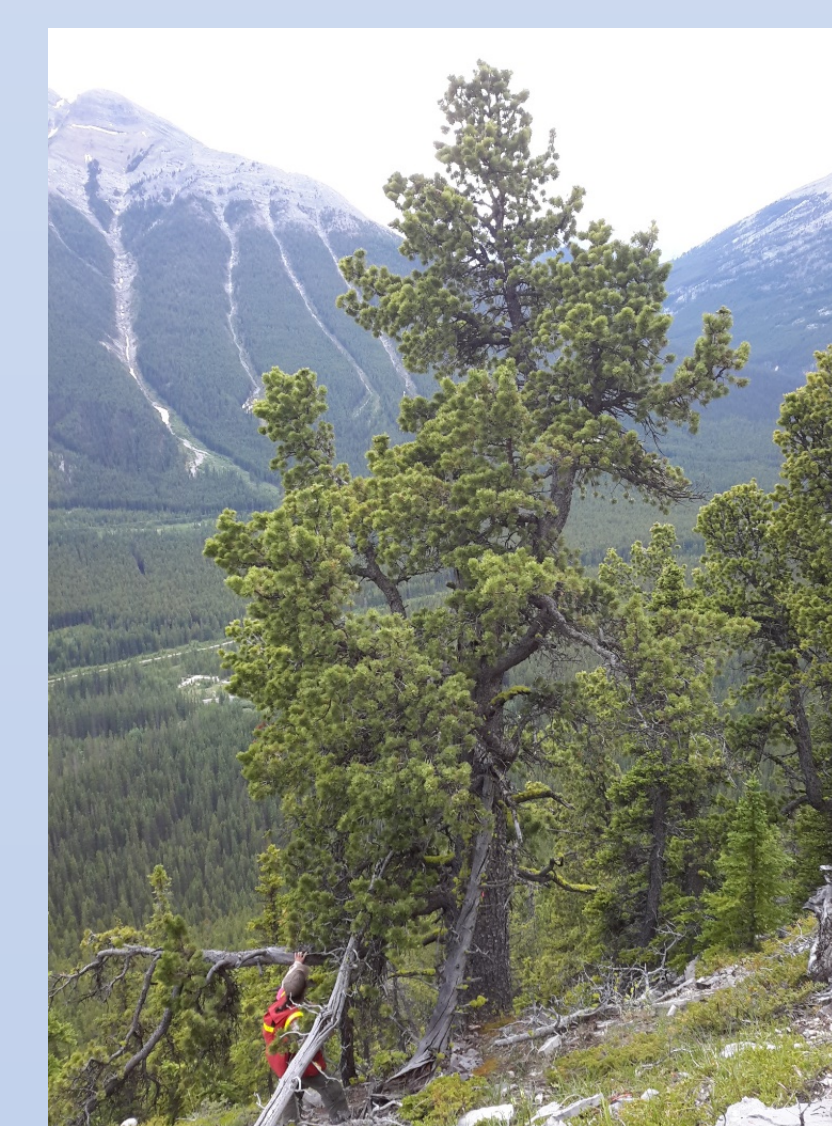


Figure 2. GIS mapped fuel types (left) vs. field-assessed fuel types (right)

Objective	Species	Study findings	Wildfire Management Recommendations	Prescribed Fire Recommendation
Protect plus trees, cone-bearing trees	LP & WBP	Fire damaged or killed cone bearing trees.	Full suppression of Initial Attack fires or partial suppression on larger wildfires threatening high value plus trees. Allow fires to burn if no plus trees are present and stands are open.	Avoid higher intensity prescribed fire within stands. Ensure cone bearing trees survive. Carefully consider use of low intensity prescribed fire to reduce competing vegetation.
Promote regeneration	LP	Fire did not improve health or amount of regeneration, reduced the number of seedlings and damaged the seed bank.	Manage wildfires near whitebark and limber pine stands to create openings for future regeneration and/or barriers to future wildfire spread.	Use moderate or high intensity prescribed fire near denser whitebark pine stands to create openings for future regeneration and/or barriers to future wildfire spread.
	WBP	Recent fire seemed to increase seedling and sapling regeneration, but also increased blister rust on saplings.		
Reduce competition	LP	Fire damaged or killed remaining seedlings and trees; may increase regeneration of competing species		1) Use low/moderate intensity prescribed fire or terra torching to target competing species in limber or whitebark pine stands. May be paired with fuel augmentation treatments. 2) Burn sites planned for planting limber and whitebark pine where competing vegetation may impede survival of planted seedlings.
	WBP	Fire damaged or killed remaining seedlings and trees; may increase regeneration of competing species.		

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