



ADAPTIVE SILVICULTURE FOR  
CLIMATE CHANGE

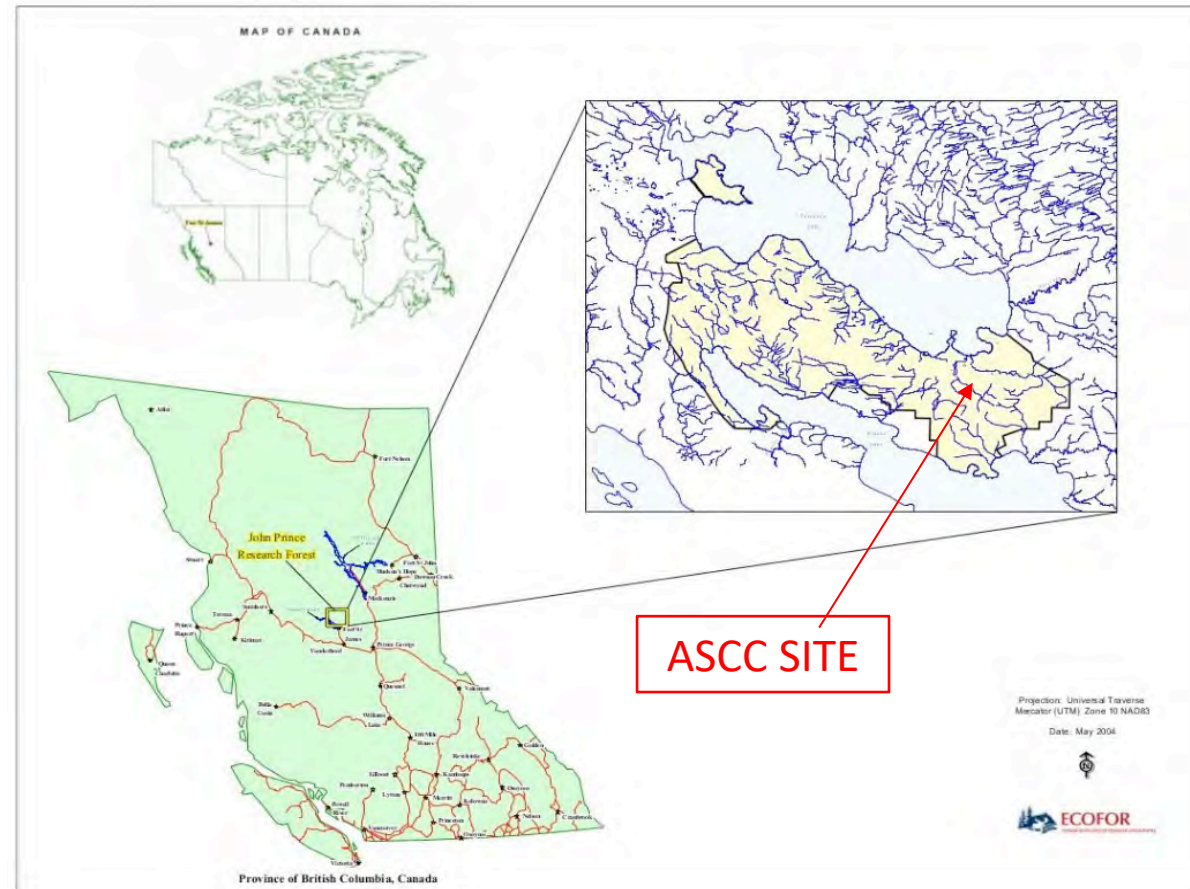
*2021 JPRF ASCC Trials – North Central BC*

# Location of the Trials

The site falls between latitude  $54^{\circ}37'50''$ - $54^{\circ}39'15''$  N and longitude  $124^{\circ}16'40''$ - $124^{\circ}21'10''$  W within an elevational range of 775-825m asl.

45 km north of the village of Fort St. James.

Located in the territories of Tl'azt'en Nation, Binche Whut'en, Nak'azdli Whut'en, and Yekooche First Nation.





## TI'azt'en Nation Land Use Plan

- Derived from Traditional Land Use Study
- Based on family-based 'keyoh' resource management area
- Incorporates protection, conservation & management guidance

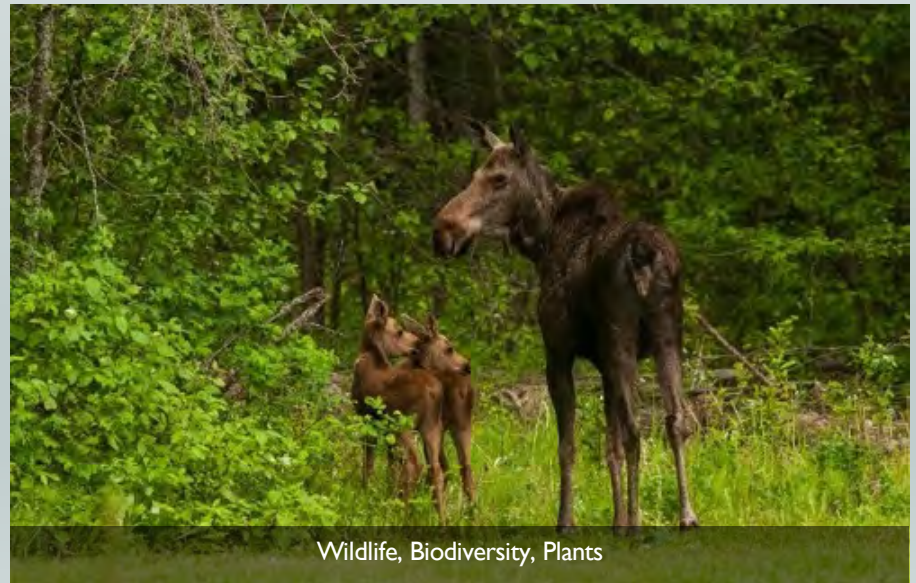




Culture, Place & History



Fisheries, Riparian & Water



Wildlife, Biodiversity, Plants



Recreation, Visual Quality

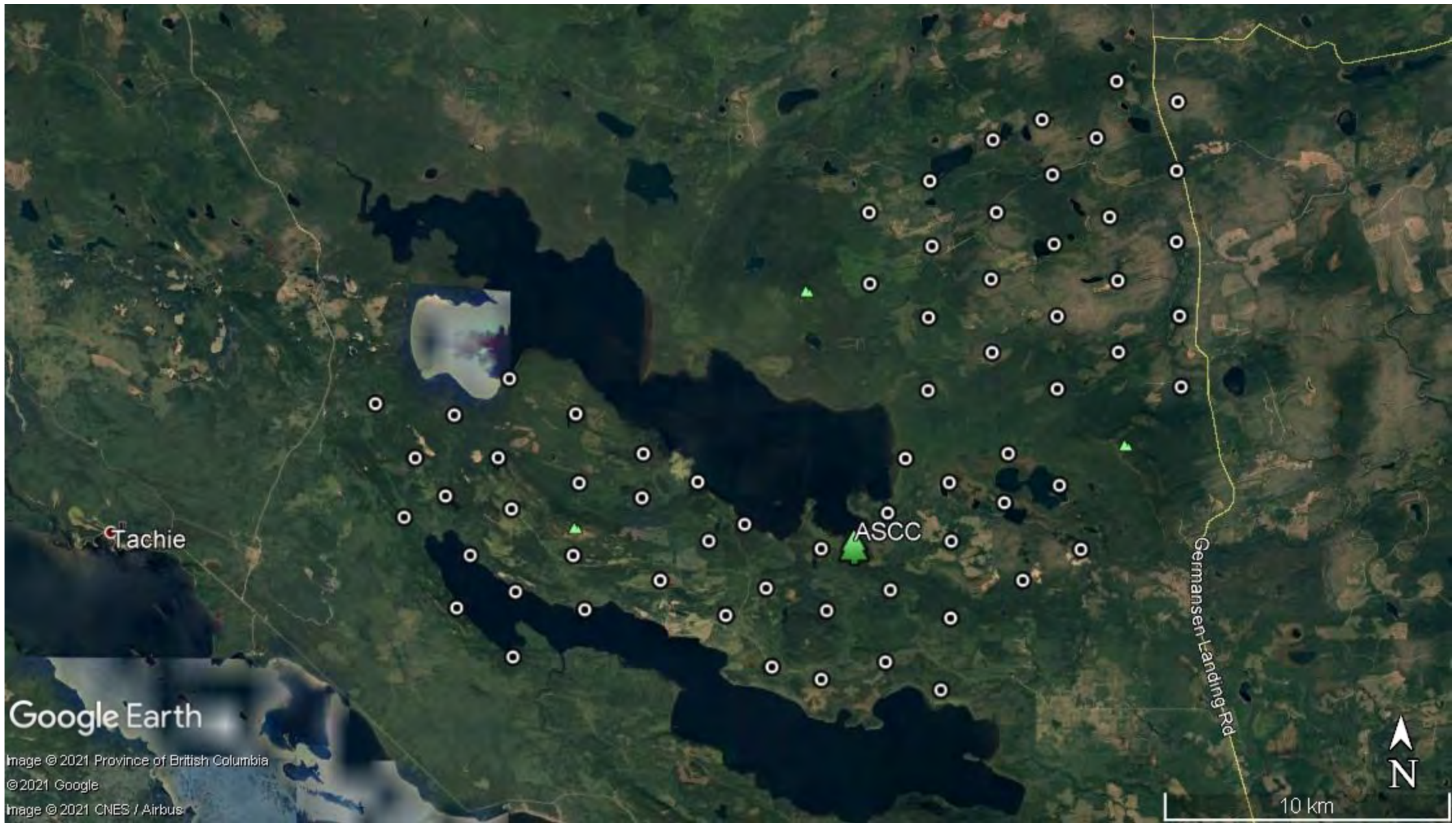


Image © 2021 Province of British Columbia  
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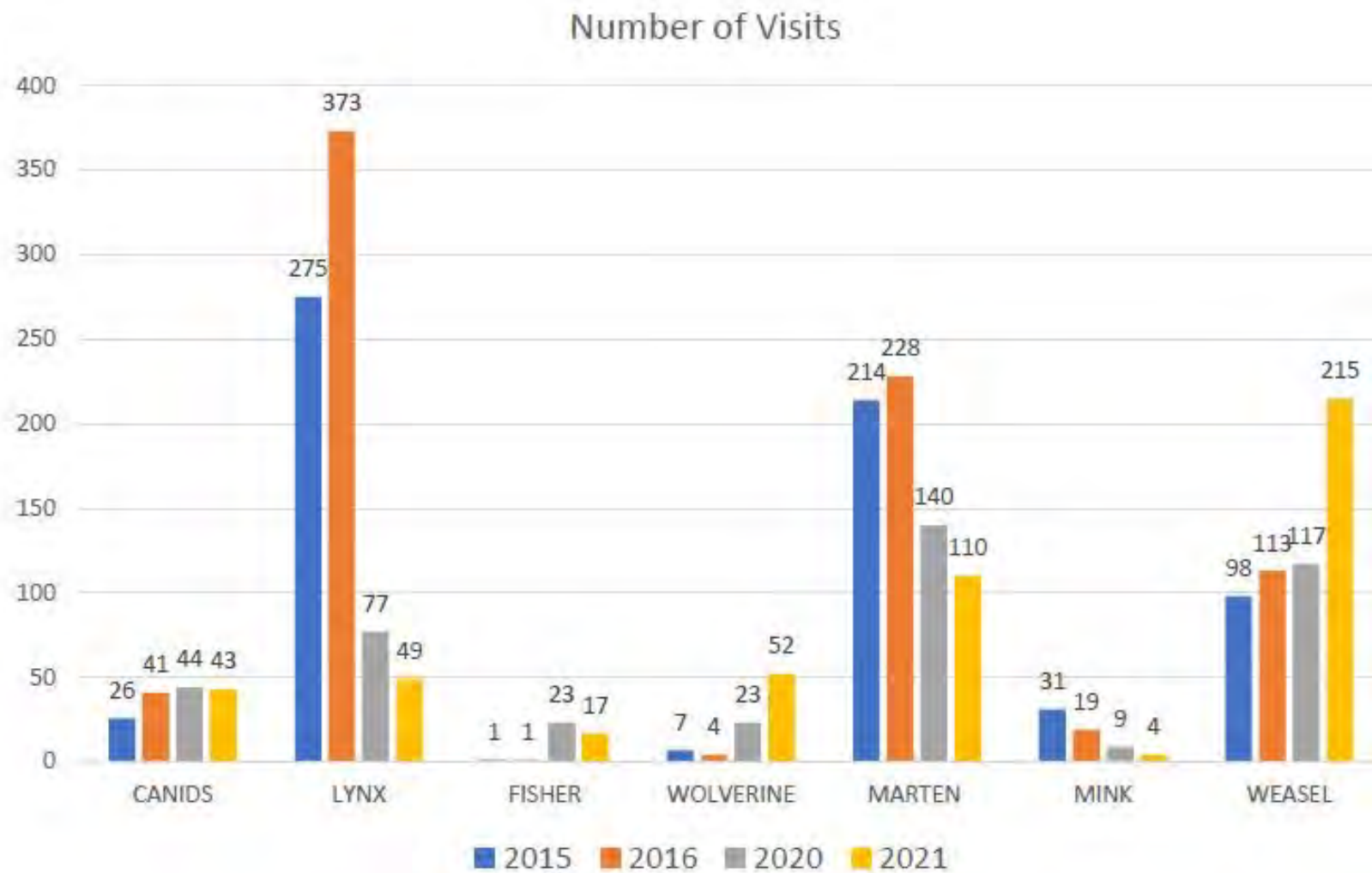
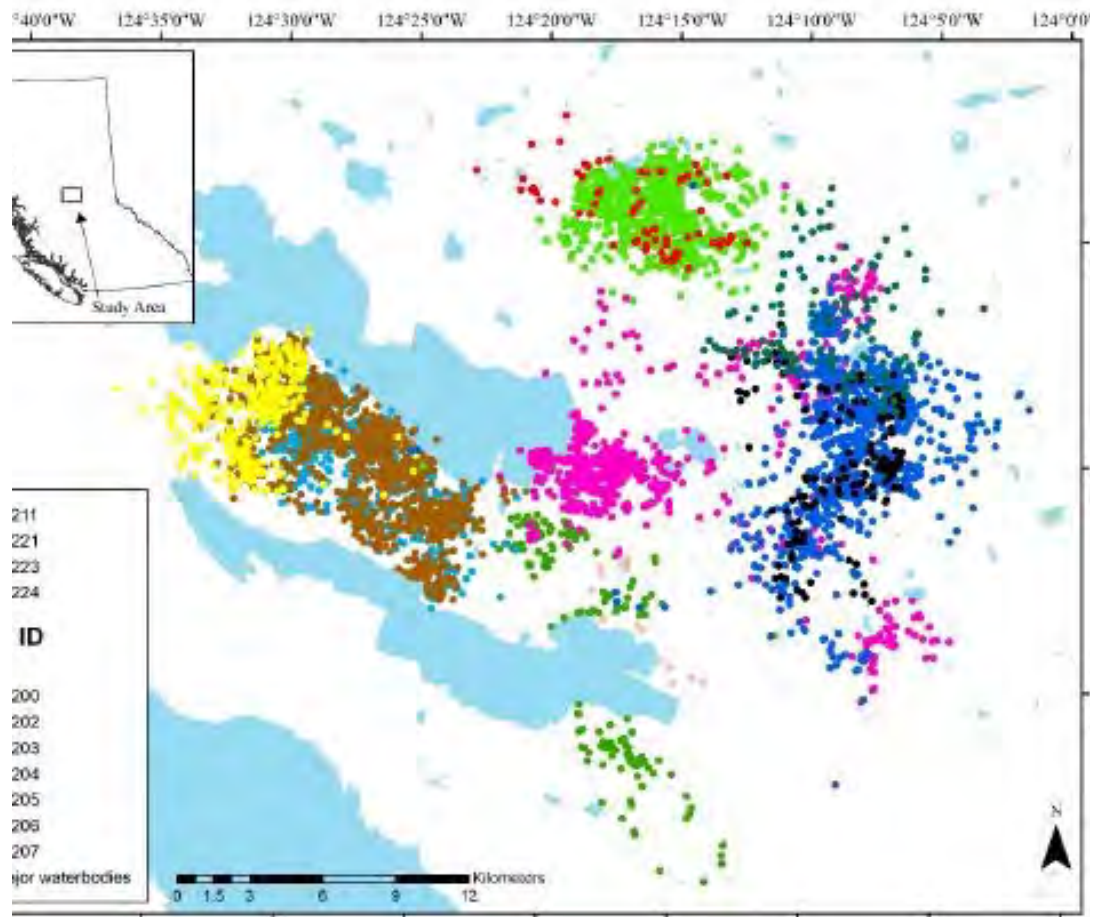


Figure 1. Number of visit days to camera sites by species February to March 2015, 2016, 2020, 2021.



GPS-collared Canada lynx ( $n=11$ ) locations from February 2020 – April 2021 in the John Prince and surrounding area.

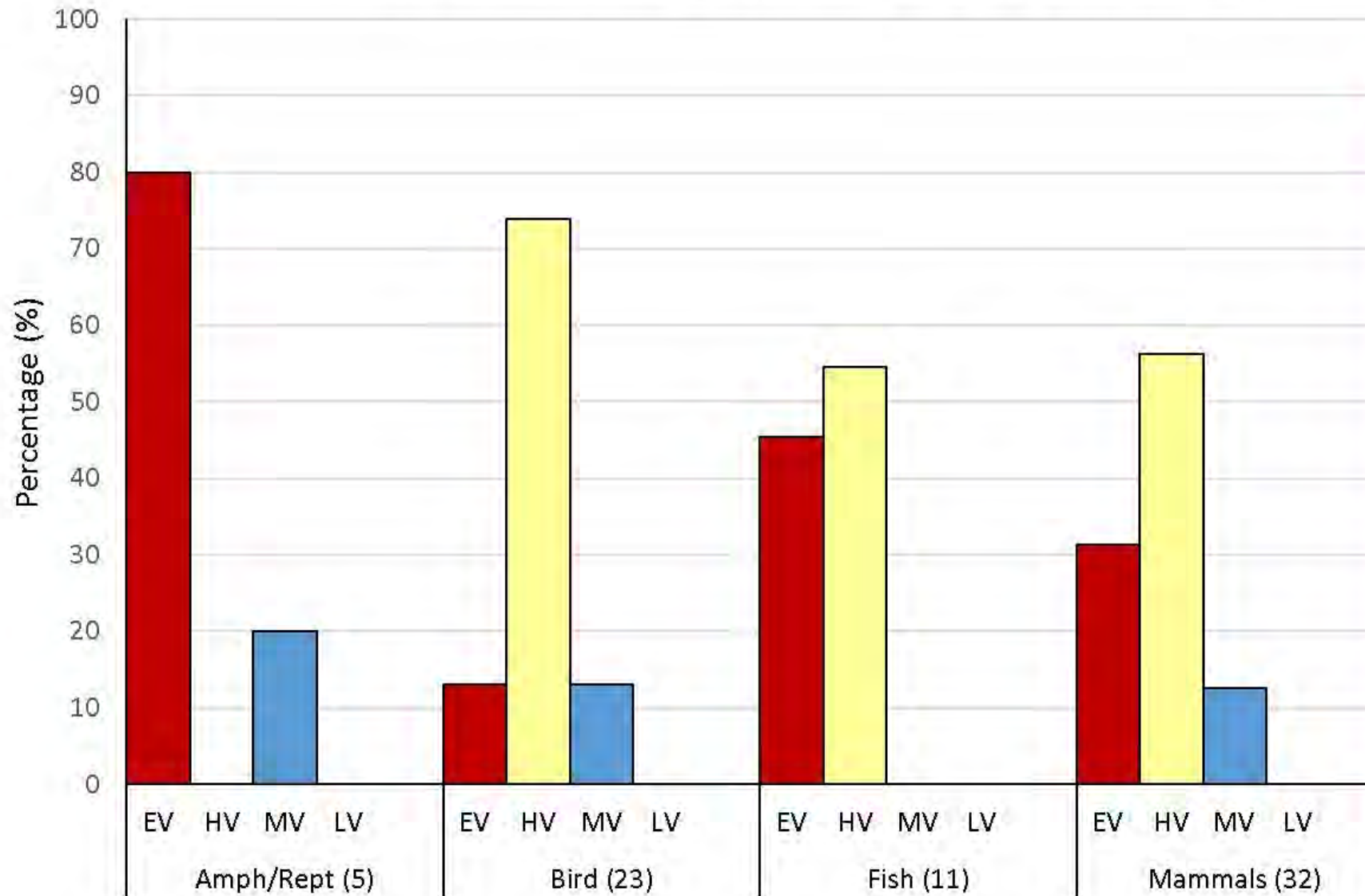


**Table 2:** Climate Change Vulnerability for species found across the John Prince Research Forest, Fort St. James, British Columbia.



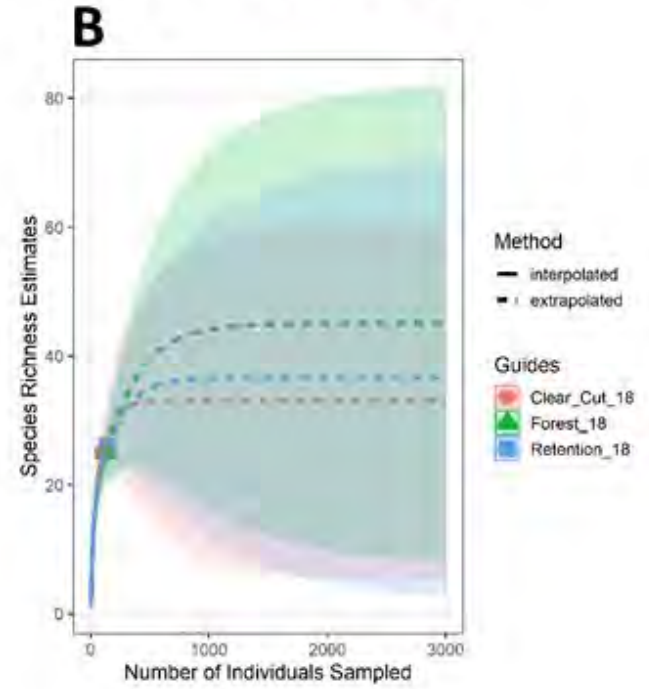
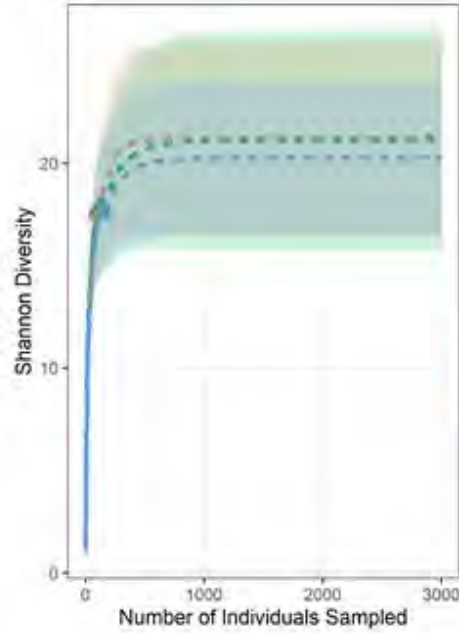
<b>Taxonomic Group</b>	<b>Species</b>	<b>COSEWIC Status</b>	<b>BC Status</b>	<b>G Rank</b>	<b>S Rank</b>	<b>CCVI Score</b>	<b>Confidence</b>
Mammal	<i>Alces alces</i> (Moose)		Yellow	5	5		VH
Mammal	<i>Cervus canadensis</i> (Elk)		Yellow	5	5		Mod
Mammal	<i>Odocoileus hemionus</i> (Mule Deer)		Yellow	5	5	HV	VH
Mammal	<i>Odocoileus virginianus</i> (White Tailed Deer)		Yellow	5	5	MV	Low
Mammal	<i>Lynx canadensis</i> (Lynx)	NAR	Yellow	5	5		VH
Mammal	<i>Puma concolor</i> (Cougar)		Yellow	5	4	HV	Mod
Mammal	<i>Canis lupus</i> (Wolf)	NAR	Yellow	5	4, 5	MV	VH
Mammal	<i>Canis latrans</i> (Coyote)		Yellow	5	5	MV	VH
Mammal	<i>Vulpes vulpes</i> (Red Fox)		Yellow	5	5	HV	Low
Mammal	<i>Pekania pennanti</i> (Fisher)		Blue	5	3		Low
Mammal	<i>Martes americana</i> (American Marten)		Yellow	5	5	HV	VH

## JPRF Climate Change Vulnerability by Species Group

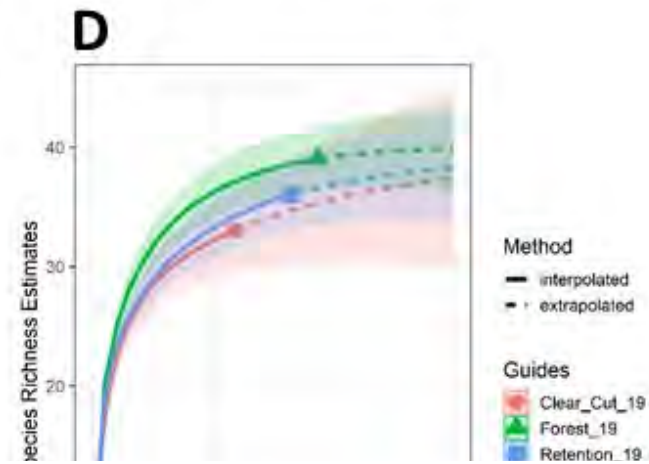
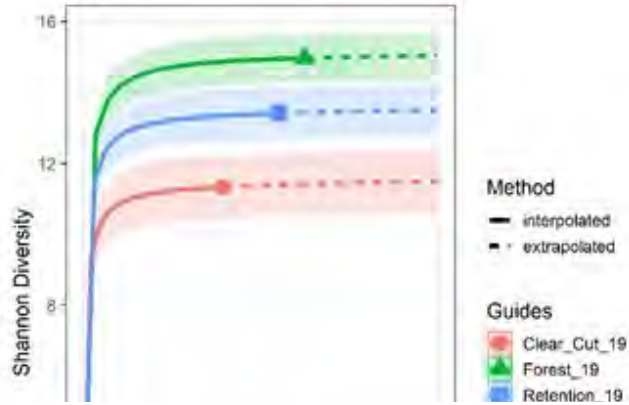


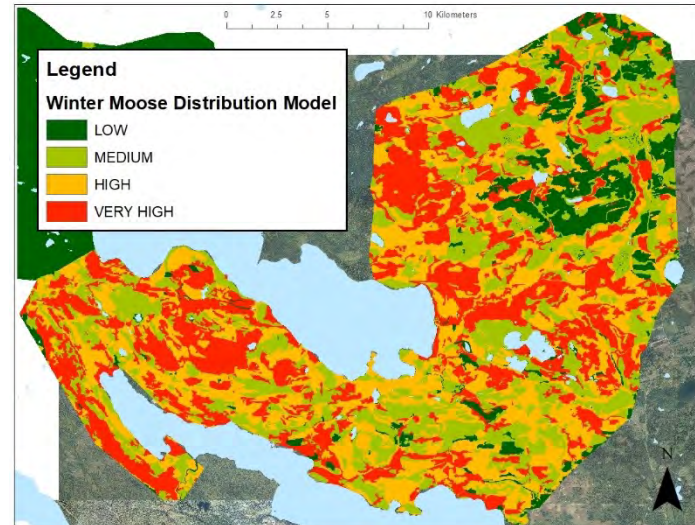
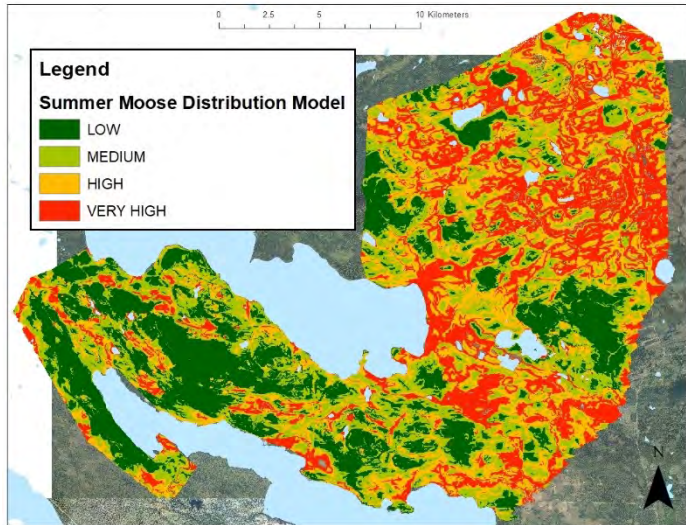


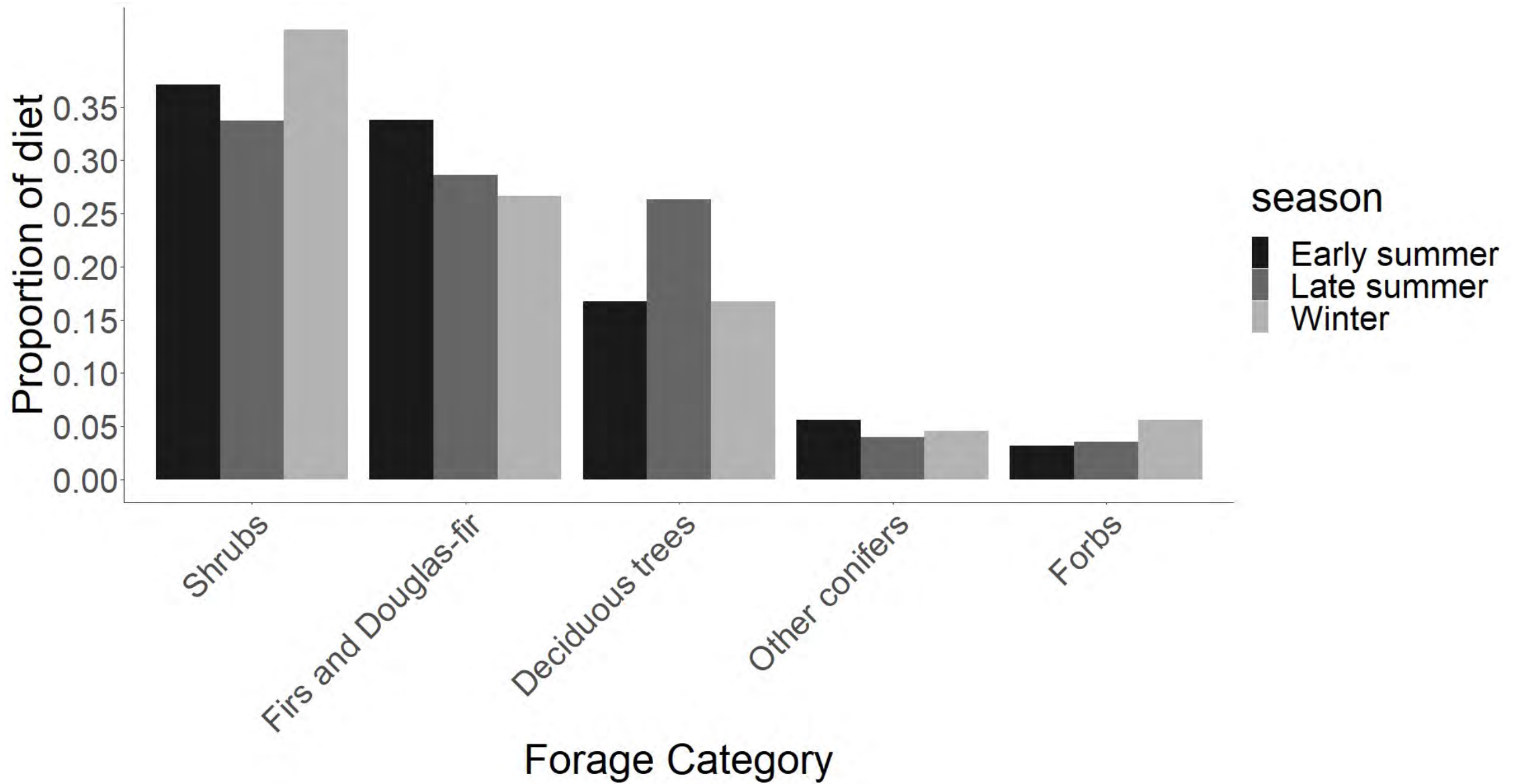
**2018**

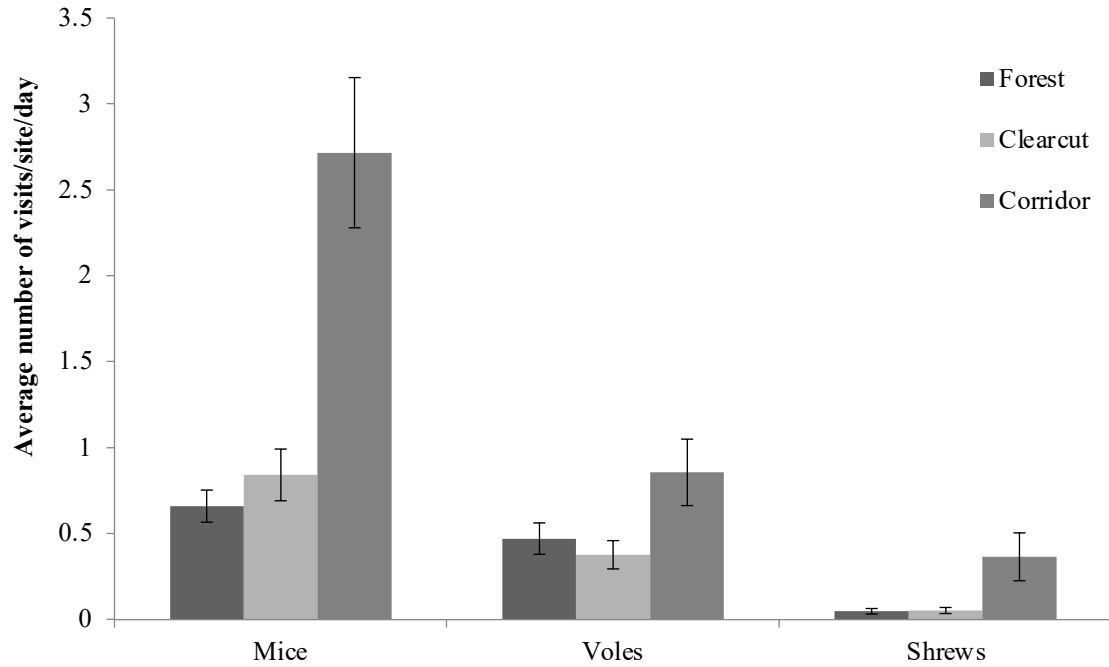


**2019**

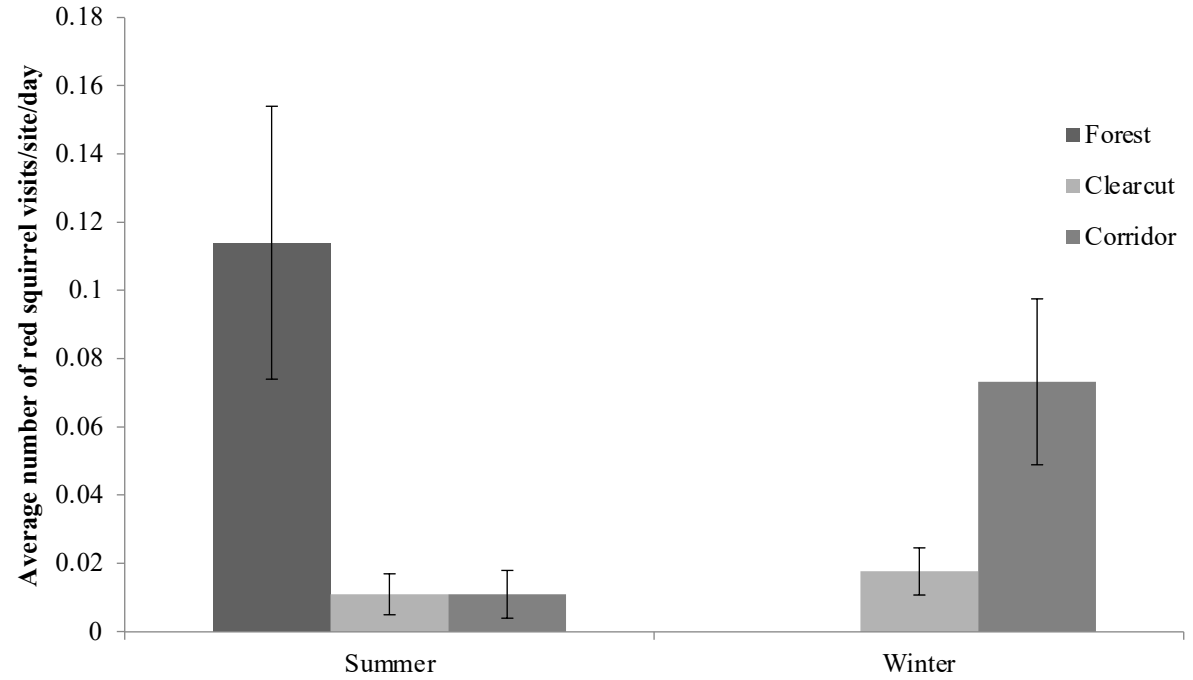








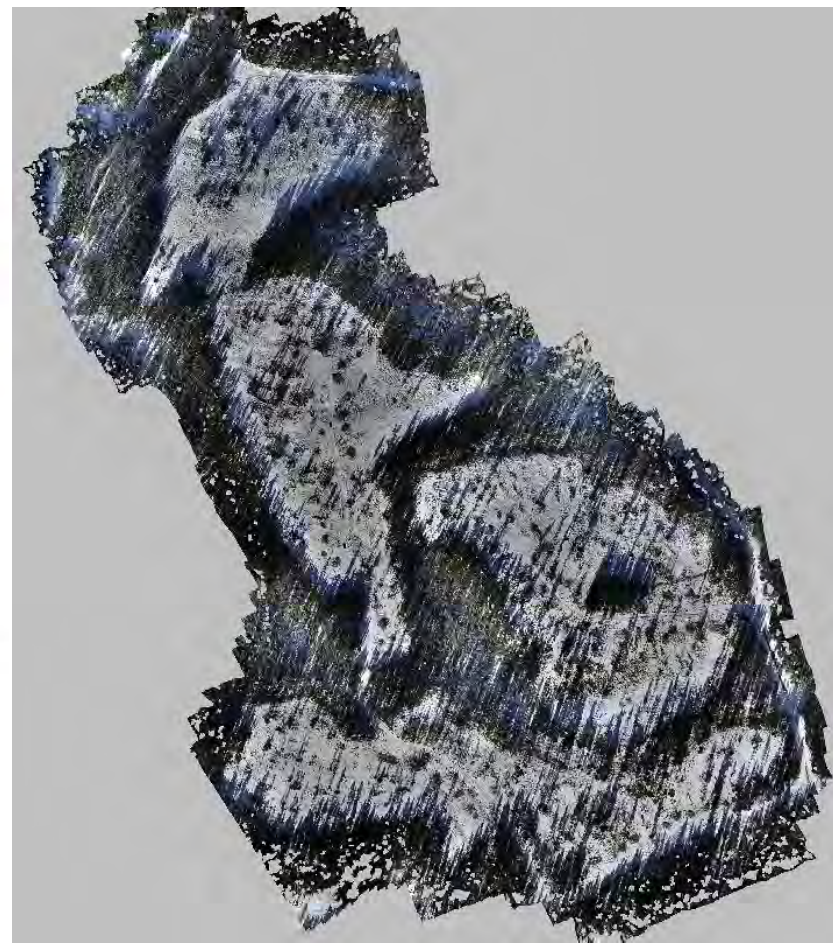
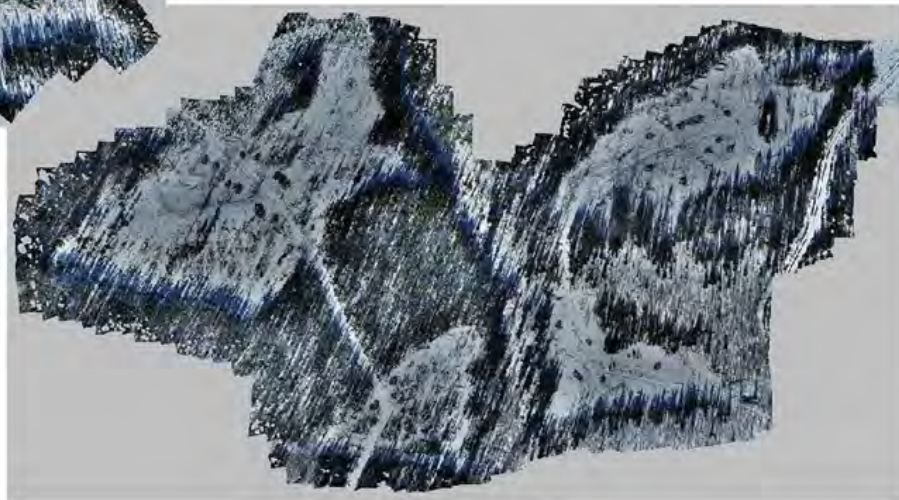
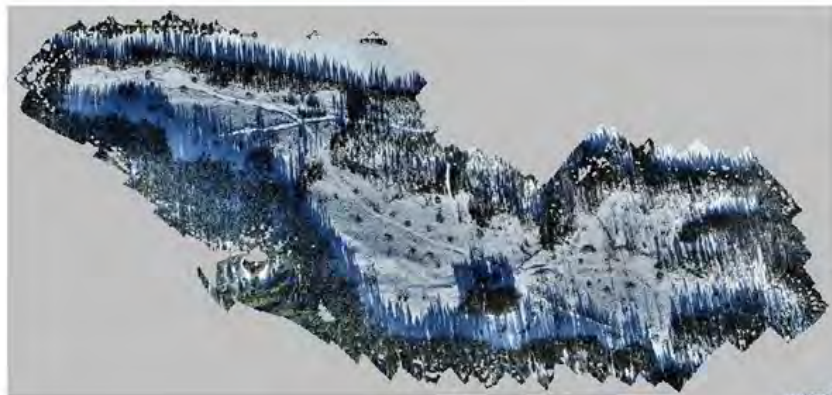
Average number of forest-floor small mammal visits ( $\pm 1$  SE) to camera traps in forest, clearcut and corridor locations within and surrounding a clearcut in central British Columbia during summer 2015.



Average number of red squirrel visits ( $\pm 1$  SE) to camera traps in forest, clearcut, and corridor locations during summer 2015 and winter 2017 within and surrounding a clearcut in central British Columbia.



Fisher – Our only red-listed mammal!

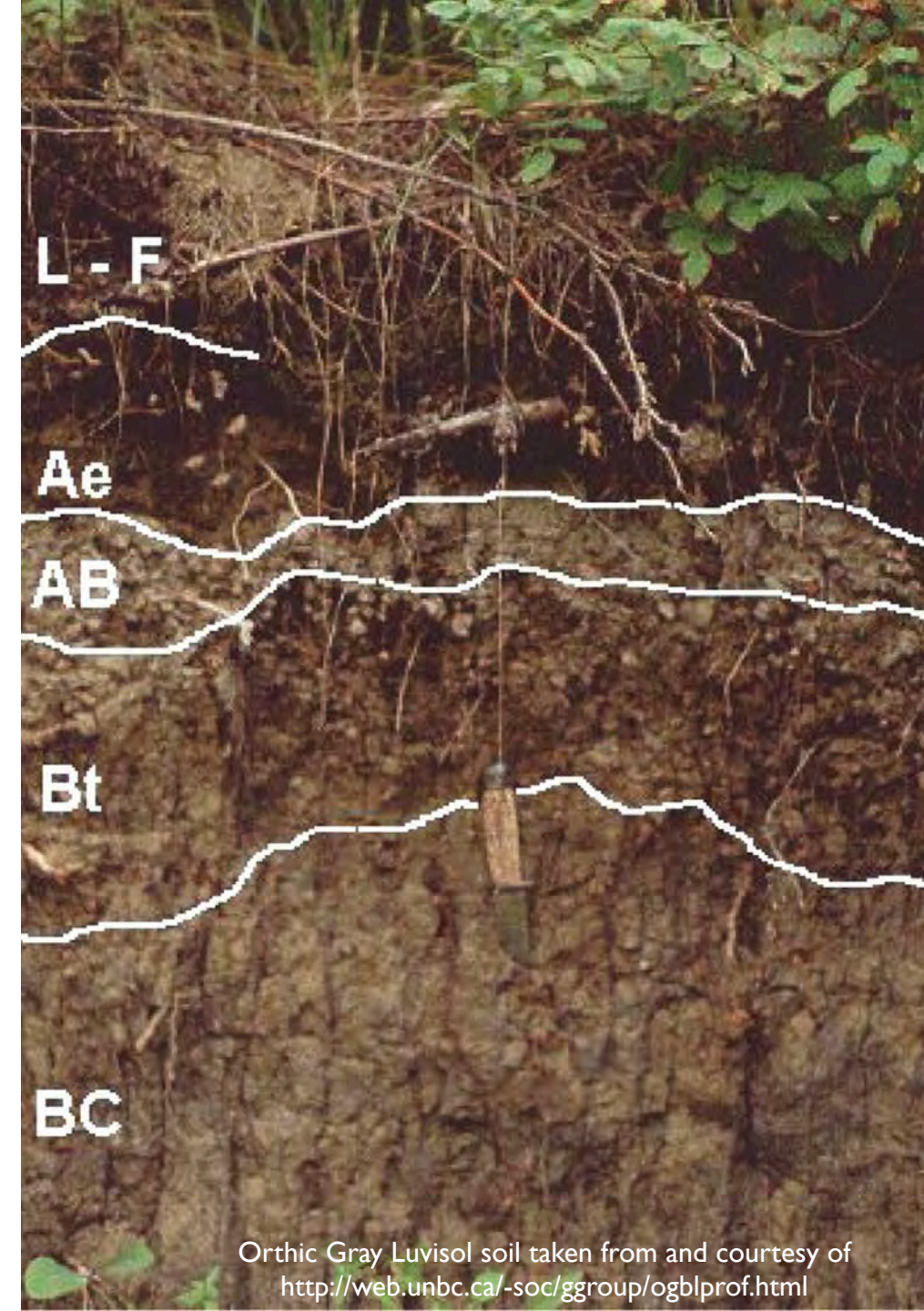


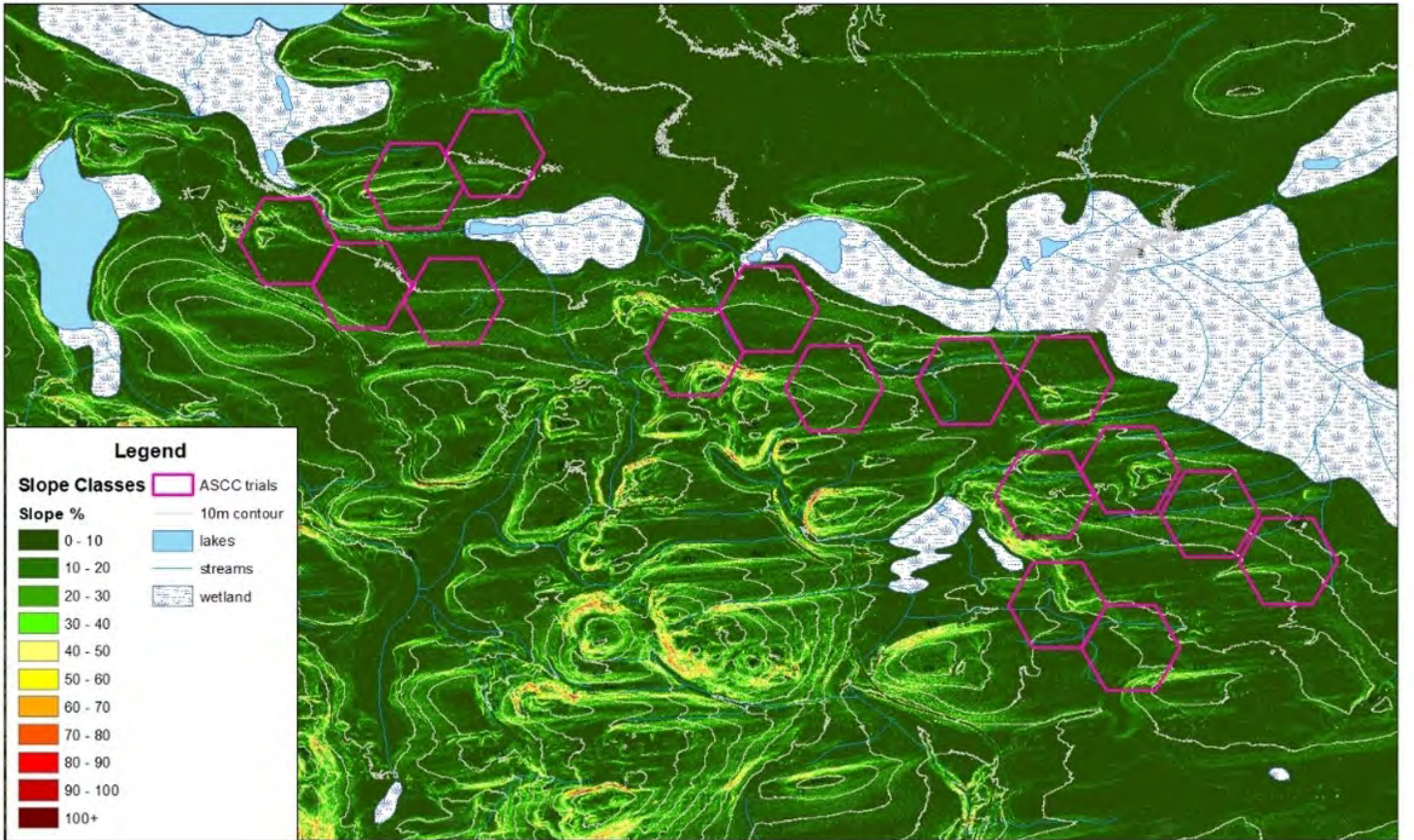
# TRIAL DESIGN

- 4 replications of 4 treatments : control, resistance, resilience & transition
- 10 ha units

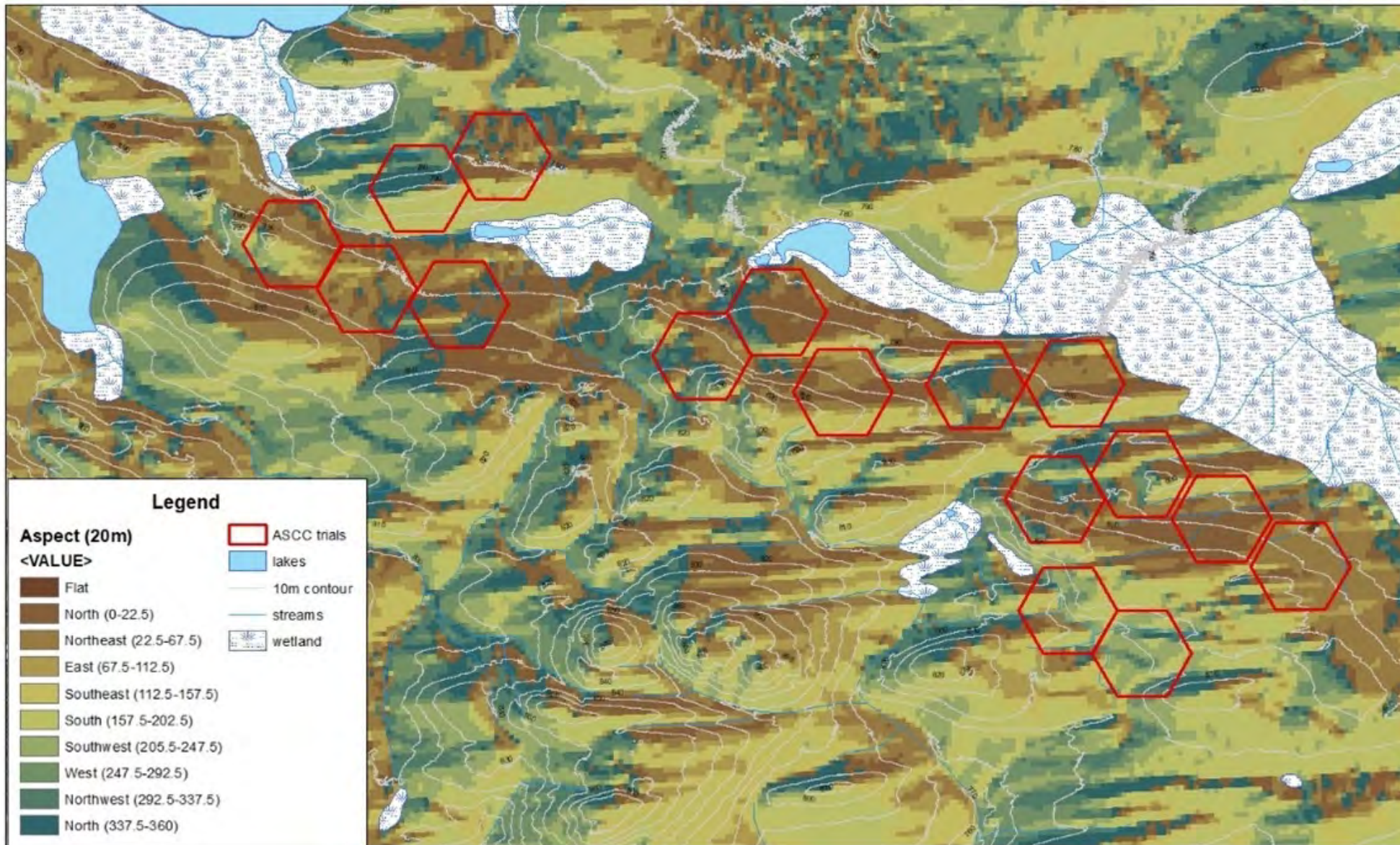
# GEOGRAPHY & SOILS

- Nechako Plateau
- Lacustrine & morainal soils
- Ortho grey luvisols of Barrett, Berman & Nithi soil associations
- Moderately coarse/fine clay, silty clay and sandy loams.
- Moderately well-drained

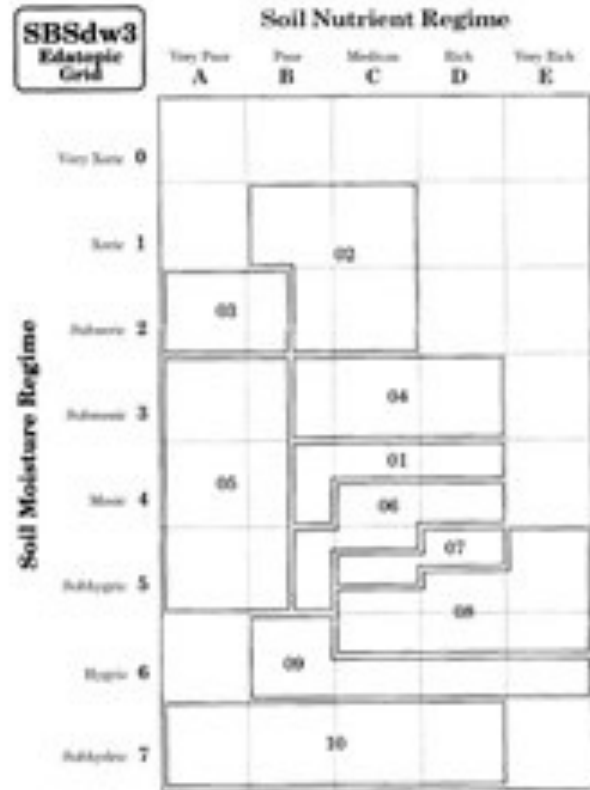




# JPRF ASCC Trial - Slope Aspect (2015 LiDar)



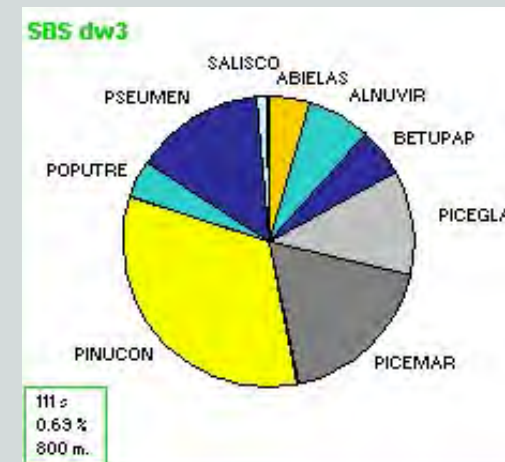
# STUART DRY WARM SUB-BOREAL SPRUCE VARIANT (SBSDW3)



- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 01 SawF4 - Finegrass                | 07 Saw - Twinberry                   |
| 02 F4P - Cladonia                   | 08 Saw - Oak fern                    |
| 03 P1 - Feathergrass - Cladonia     | 09 Saw - Horsetail - Glow moss       |
| 04 SawF4 - Bluegrass                | 10 Sb - Soft-leaved sedge - Sphagnum |
| 05 F5B - Feathergrass               |                                      |
| 06 Saw - Pink spines - Prickly rose |                                      |

FIGURE 13. Edaphic grid displaying site units in the SBSdw3 variant.

- Natural disturbance; Fire-origin seral forests, large even-aged openings (1000 ha+); Douglas-fir vets
- Hybrid Spruce, Lodgepole pine & Douglas-fir overstory mixes with spruce & sub-alpine fir understory
- Trembling aspen, paper birch and black cottonwood
- Coarse woody debris levels = 37 large pieces/ha



Douglas Maple



Saskatoon



Black Twinberry



Prickly Rose



Sitka alder



Red-osier  
Dogwood



Soopalallie



Thimbleberry



Birch-leaved Spirea



Black gooseberry



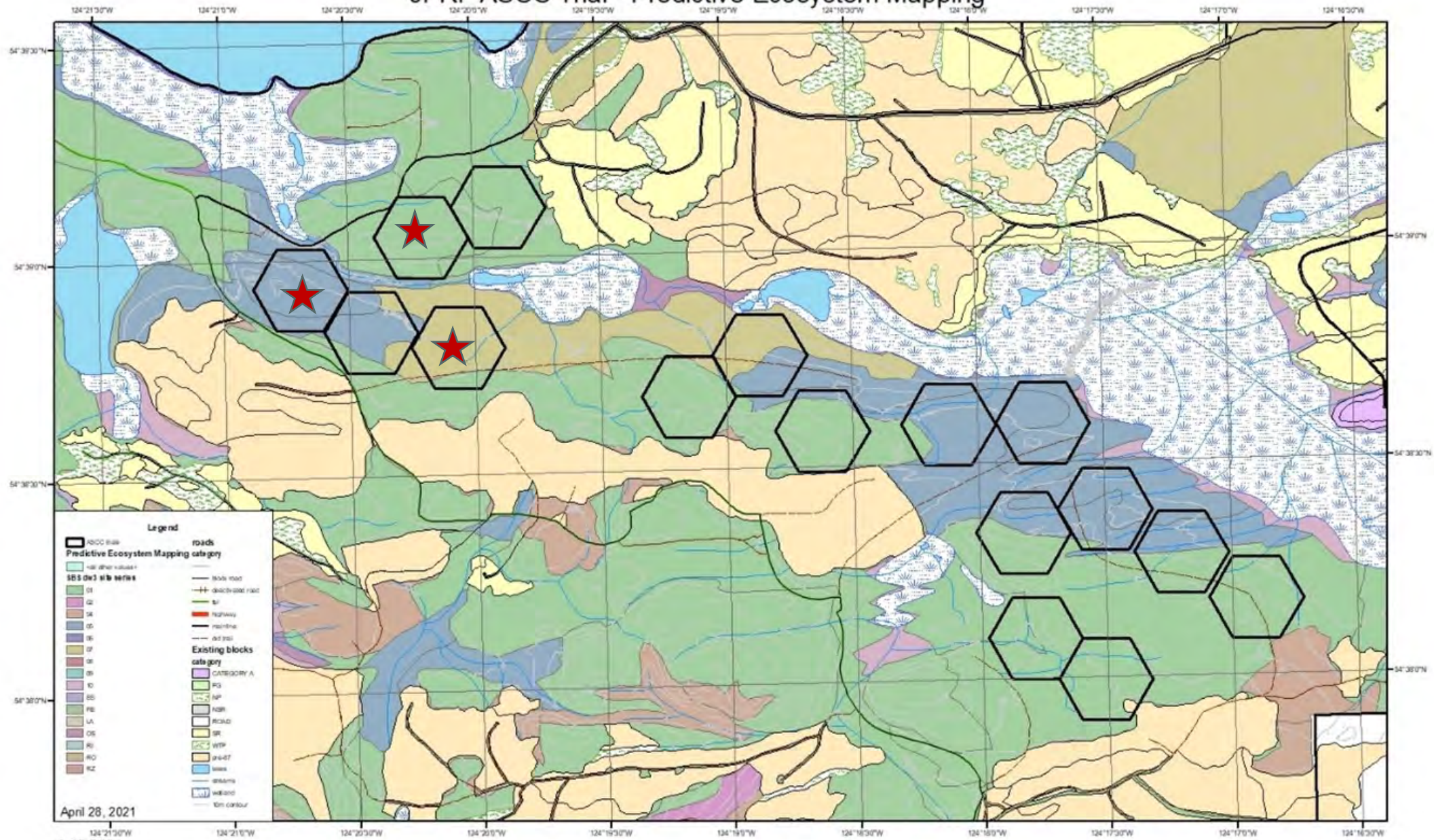
High-bush cranberry



Devil's club



# JPRF ASCC Trial - Predictive Ecosystem Mapping



# STUART DRY WARM SUB-BOREAL SPRUCE VARIANT (SBSDW3)



- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 01 SawF4 - Finegrass                | 07 Saw - Twinberry                   |
| 02 F4P - Cladonia                   | 08 Saw - Oak fern                    |
| 03 Pl - Feathergrass - Cladonia     | 09 Saw - Horsetail - Glow moss       |
| 04 SawF4 - Bluegrass                | 10 Sb - Soft-leaved sedge - Sphagnum |
| 05 F5b - Feathergrass               |                                      |
| 06 Saw - Pink spines - Prickly rose |                                      |

FIGURE 13. Ecotopic grid displaying site units in the SBSdw3 variant.

- Natural disturbance; Fire-origin seral forests
- Hybrid Spruce, Lodgepole pine & Douglas-fir overstory mixes with spruce & sub-alpine fir understory
- Trembling aspen, paper birch and black cottonwood
- Coarse woody debris levels = 37 large pieces/ha



SBSdw3 - 01



SBSdw3 – 07a



SBSdw3 – 07/08

# SITE SERIES

Average site index = 17.3 (range : 11.5-24.9)VRI

Current stocking standards:

SBSdw3						
site series	Species					
	Primary	Preferred (p)	Secondary	Acceptable (a)	Tertiary	Broadleaf
01	Fd	Fd	SxPILw <sup>32</sup>	BILw <sup>32</sup> Pw <sup>31,32</sup> Py	BIPw <sup>31,32</sup> Py	At <sup>a</sup> Ep <sup>a</sup>
02	Fd <sup>27</sup> PI	Fd <sup>27</sup> PI		Sx <sup>28</sup>	Sx <sup>28</sup>	At <sup>b</sup>
03	PI	PI		Sx	Sx	At <sup>a</sup> Ep <sup>a</sup>
04	Fd PI	Fd PI		Sx	Sx	At <sup>b</sup>
05	PI	PI		Sb Sx <sup>32</sup>	Sb Sx <sup>32</sup>	Act <sup>b</sup> At <sup>a</sup> Ep <sup>a</sup>
06	PI Sx <sup>32</sup>	PI Sx <sup>32</sup> Fd <sup>32</sup>	BI <sup>29</sup> Fd <sup>32</sup>	BI <sup>29</sup>	Sb	Act <sup>b</sup> At <sup>a</sup> Ep <sup>a</sup>
07*	Sx	Sx PI	BI <sup>29</sup> PI	BI <sup>29</sup>		Act <sup>a</sup> At <sup>a</sup> Ep <sup>a</sup>
08	PI Sx	PI Sx Fd <sup>3,32</sup>	BI <sup>29</sup> Fd <sup>3,32</sup>	BI <sup>29</sup>		
09	PI <sup>1</sup> Sx <sup>1,32</sup>	PI <sup>1</sup> Sx <sup>1,32</sup>	BI <sup>1,29</sup>	BI <sup>1,29</sup>		
10*	Lt <sup>1</sup> PI <sup>1</sup> Sb <sup>1</sup> Sx <sup>1,32</sup>	Lt <sup>1</sup> PI <sup>1</sup> Sb <sup>1</sup> Sx <sup>1,32</sup>				
<b>Footnotes</b>			<b>Broadleaf Management Constraints</b>			
1	elevated microsites are preferred		a	productive, reliable, and feasible regeneration option		
3	restricted to coarse-textured soils		b	limited in productivity, reliability and/or feasibility		
27	partial canopy cover required for successful establishment		Prince George region - max 1,400 total sph of aspen and cottonwood.			
28	limited by moisture deficit		Treat as 'ghost' trees in surveys.			
29	risk of heavy browsing by moose					
31	use pf resistant stock mitigates risk of white pine blister rust					
32	limited by growing-season frosts					

07a - Fd - Oak Fern variant: recommendation for Fd as a preferred species (Oneil et al, 1997)

# FOREST DAMAGE AGENTS

Table 2: Ranking of ecological and economic Importance of common forest insects occurring in the Omineca region.

Pest	High Importance	Moderate Importance	Low Importance
<b>Major Bark Beetles:</b>			
Douglas-fir beetle		+	
Mountain pine beetle		+	
Spruce beetle	+		
Western balsam bark beetle		*research needed	
<b>Other Insect Pests:</b>			
Aspen leaf miner			+
Birch leaf miner			+
Bruce spanworm			+
Conifer aphids/adelgids			+
Forest tent caterpillar			+
Hemlock looper			+
Large aspen tortrix			+
Pine needle sheath miner			+
Sawfly damage			+
Satin moth			+
Spruce/white pine weevil			+
Two-year cycle budworm			+
Warren root collar weevil			+

\*research needed: the full extent of the potential economic or ecological impact of this pest requires more research.

Table 3: Ranking of ecological and economic importance of common forest pathogens occurring in the Omineca region.

Pathogen	High Importance	Moderate Importance	Low Importance
<b>Stems Rusts/ Damage:</b>			
Comandra blister rust		+	
Stalactiform blister rust		+	
Western gall rust		+	
Mistletoe		+	
<b>Foliar Diseases:</b>			
Dothistroma (red band)			+
Venturia spp.			+
<b>Root Diseases:</b>			
Tomentosus root rot			+

Table 4: Ranking of ecological and economic importance of animal or abiotic damage occurring in the Omineca region.

Animal and Abiotic damage	High Importance	Moderate Importance	Low Importance
<b>Animal:</b>			
Moose			+
Hare/rabbits			+
<b>Abiotic:</b>			
Drought			*monitor
Frost			+
Snowpress			+
Windthrow**		+	

\* monitor: although this pest or pathogen is low importance in the Omineca, there is potential for an increase of spread within the next year or two and so the population should be carefully monitored.

\*\* windthrow of mature spruce is the primary cause of spruce beetle outbreaks and it is crucial that stands be actively monitored to provide information for rapid salvage to reduce the risk of initiating an outbreak.

Roberts, J and Yurkewich, J. (2018) BC Ministry of Forests, Lands, Natural Resource Operations, and Rural Development Omineca Region Forest Health Strategy 2018-19

at

[https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest\\_Health/TSA\\_FH\\_Strategies/180817\\_2018%20OFHS\\_sig\\_ned.pdf](https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest_Health/TSA_FH_Strategies/180817_2018%20OFHS_sig_ned.pdf)

# HISTORIC FOREST MANAGEMENT & LEGACY





HISTORIC  
SILVICULTURE  
IMPLICATIONS  
FOR FOREST  
STRUCTURE

## CURRENT FOREST CONDITIONS

Species Composition Sx33Bl25Fd17At13(PIAcSbEp)

Stems per ha (sph) 487 (+understory = 321 sph Bl8Sx2)

BA per ha (m<sup>2</sup>/ha) 21.1 - 30

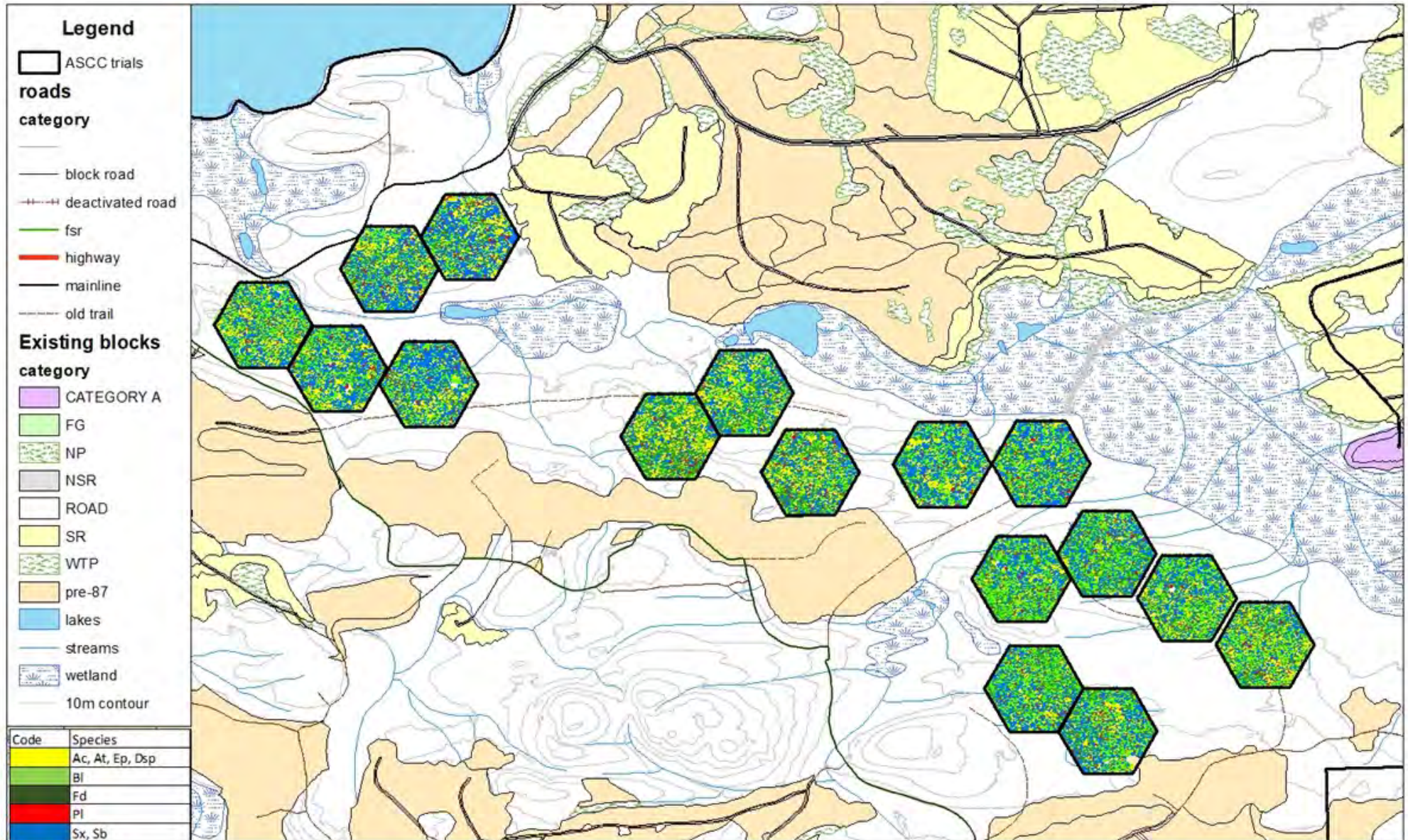
Biomass (kg/ha) 141,755

Volume per ha (m<sup>3</sup>/ha) Gross: 211 Net : 188-200

Height (m) Range: 10 – 43.7 Average: 21.0

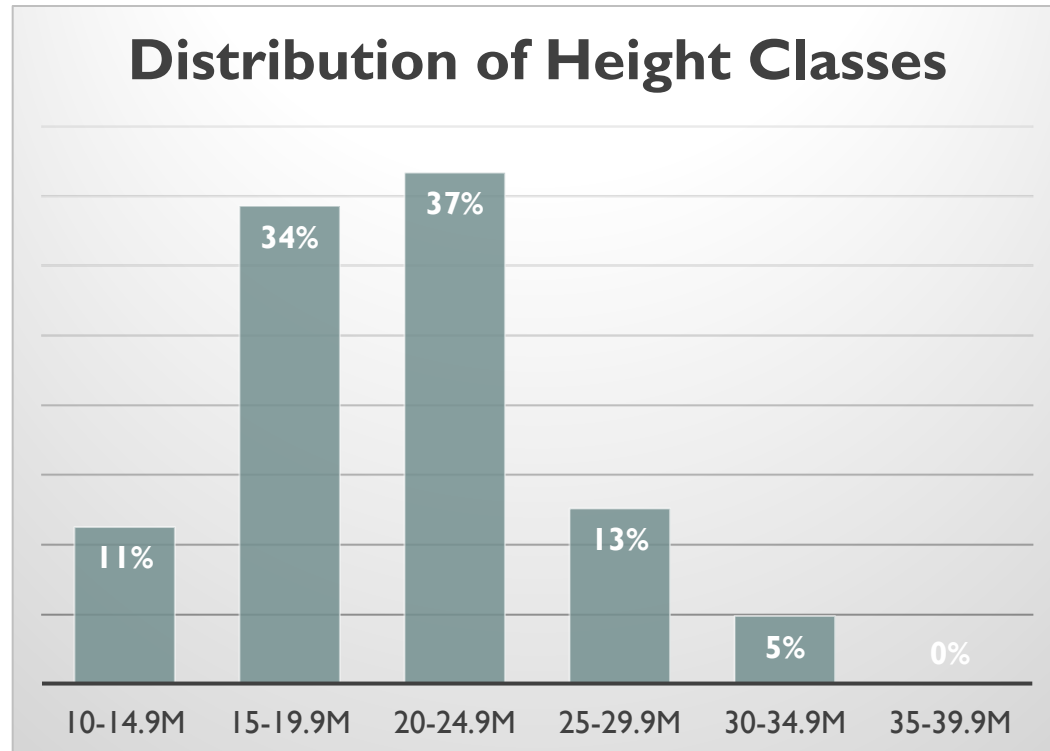
DBH (cm) Range: 7- 63.0 Average: 22.9

# JPRF ASCC Trial - Tree Species Distribution

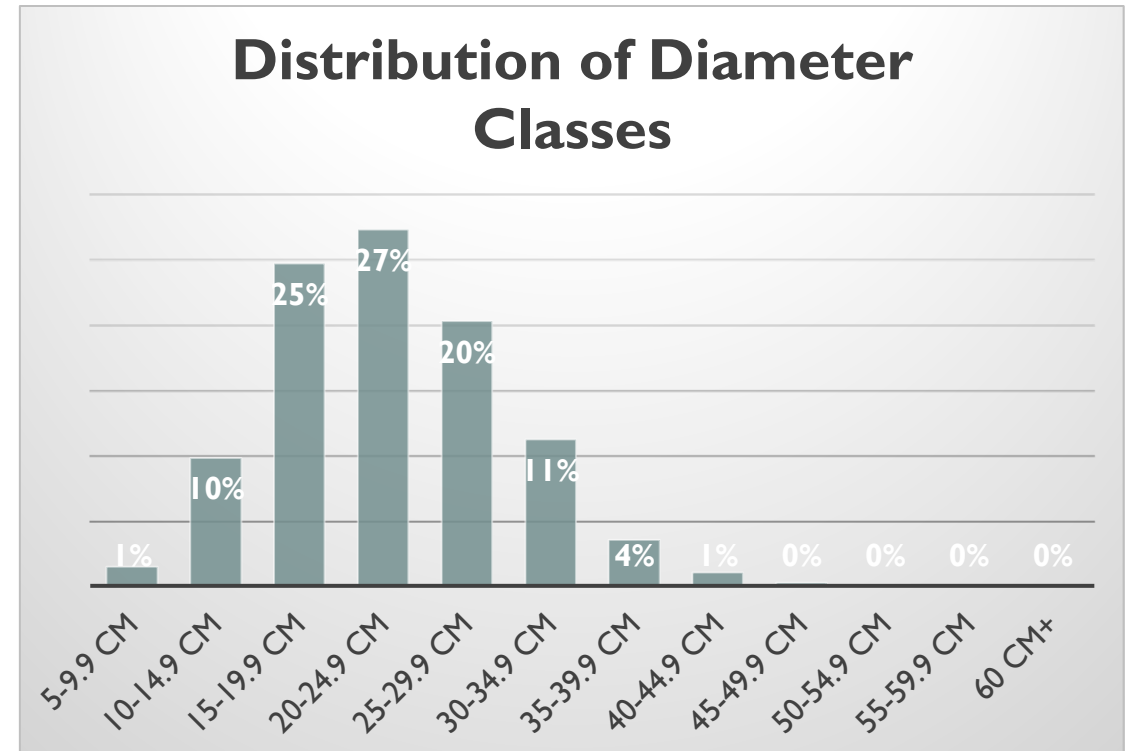


# STAND METRICS (LIDAR)

## Height Classes



## Diameter Classes



# HEIGHT CLASS BY SPECIES

