FIRE HISTORY STUDY OF THE

WILLMORE WILDERNESS AREA

Sampling strategy

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1.0 INTRODUCTION

Forest management practices with the goal of approximating effects of fire are based on an understanding of the fire regime characterizing the managed area. The fire regime is defined by the frequency, seasonality, type (man vs lightning caused), intensity (non-lethal, mixed, lethal) and, size of fires occurring on the landscape. As a method of gaining insights on the fire regime, fire history studies have been a successful approach. Typically, regions of the mountain and boreal forests of Alberta are characterized by infrequent stand replacing fires. Lighter intensity fires, such as surface fires, also do occur, but evidence of these are much more difficult to detect. Over time, large disturbances also have a tendency to erase trees bearing evidence of previous fires. To partly overcome this problem, stand origin mapping has been the main method used in the mountain and boreal regions of Canada. This method consists of mapping all forest stands by their age of origin, which is assumed to have been fire originated.

2.0 ISSUES TO CONSIDER

Due to the large size of the Willmore Wilderness Area (WWA), the rugged terrain, remoteness and, great difficulty of access for some parts, likely over 20% of the stands could not be sampled. Further, such attempt to sample the entire study area would also be very costly. One must also ask what the primary goal of the study is. The production of one age-class distribution for the entire area or, the understanding of fire regimes regulating the ecosystems within the area.

Since the creation of a full stand origin map does not appear to be a viable approach in the case of the WWA, a different sampling strategy had to be considered in order to fulfill the goal of identifying and describing the fire regimes within the study area.

3.0 SAMPLING STRATEGY

It has been shown in other regions of the Canadian Rockies (Banff National Park, Kananaskis Country), that topography governs to a great extent the fire regime. As a matter of fact, valley orientation, elevation, proximity to the Continental Divide and aspect explain 80% of fire/age patterns in the mountains (Rogeau, Fortin and Pengelly in prep.). Since the WWA is also located along the east slopes of the Continental Divide and share similar precipitation and lightning regimes to that of Banff National Park and Kananaskis Country, the topographic-stand date model, developed for these regions, could be applied to the WWA. A screening of the 1949 air photos of the WWA showed very similar burning patterns which seem to support similar conclusions. This tells us that natural disturbances are not homogeneously distributed over mountainous landscapes and that fire cycles and other fire parameters vary spatially. Knowing which parameters are affiliated with different combinations of topographic elements, forest managers can in turn determine probabilities of burning accordingly.

Fire parameters, such as frequency, return interval, cycle, intensity and range of fire sizes, endemic to the WWA can still be determined by targeting a range of watersheds representative of the fire regimes found within the WWA. The criteria for watershed selection, to ensure representativeness and logistic/cost efficiency, were as follow:

1. Vegetation complexity
    Low: 1 to 4 fires
    Moderate: 5 to 12 fires
    High: > 12 fires

2. Valley category and its orientation: main or small valley perpendicular to a main one
    1: NW-SE
    2. NE-SW
    3. N-S
    4. E-W

3. Mountain Range (as loosely defined on the NTS 1:50,000 map sheets)
    Continental Ranges
    Front Ranges
    Foothills

4. Accessibility
    Good
    Average
    Poor

5. Sampled in 1998 as part of the AVI / fire aging initiative

4.0 RESULTS

A total of 88 valleys were identified within the Willmore Wilderness Area. 25% of the valleys were part of the Continental Ranges, another 25% as part of the Foothills and the remaining 50% comprised valleys of the Front Ranges.

Table 1 presents the proportion of valleys for different mountain ranges with low, moderate and high vegetation complexity. Whereas Table 2 presents the number of valleys in each category of main or small valley orientation.

Table 1 Percentages of valleys, for different mountain ranges, with low, moderate and high vegetation complexity.

Continental			Front			Foothills		
Low	Mod.	High	Low	Mod.	High	Low	Mod.	High
54	32	14	39	43	18	18	64	18

Table 2 Number of valleys in each possible category of valley orientation. Small valleys are perpendicular to the main ones.

		Small Valleys			
		NW-SE	SW-NE	N-S	E-W
Main Valleys	NW-SE (8)		17	6	1
	SW-NE (5)	15		5	7
	N-S (5)	1	3		3
	E-W (3)	6	1	2	

It was observed that 87% of areas of high vegetation complexity occur in main valleys. Out of the 21 main valleys, only 2 present a low vegetation complexity and both are located in the Continental Ranges. Actually, these two valleys represent main valley headwaters. Forests of the Continental Ranges account for only 20% of the high vegetation complexity found within the WWA. Although the number of valleys of low vegetation complexity in the Continental Ranges is similar to that of the Foothills, the Continental Range forests are generally much older. Forests of the Foothills were affected by large, recent (past 100 years) fires, which left very few patches of residual trees.

Table 3 is a list of the 88 principal valleys forming the WWA. Candidate valleys for field data collection are highlighted. Note that valleys showing an obvious change in direction were assessed separately for all directions.

Table 3 List of principal valleys of the Willmore Wilderness Area. Each valley was assessed for its vegetation complexity, its valley category (main or small), its valley orientation, its location within the Rocky Mountain Ranges, its number of fires, its access and, if it was sampled in 1998. Highlighted valleys were chosen as best candidates for field data collection.

Watershed	Map	Complex.	Mtn Range	Main	Small	nb. fires	Access	Transport	98 data
Muddywater Riv.	E13	H	C	1	0	25	G	H,T	X
L-Jackpine Riv	E12	H	C	2	0	21	G	H	X
M-Sheep Cr.	E13	H	C	4	0	22	G	H,T,C	X
M-Smoky Riv.	E11	H	F	1	0	13	G	H	
U-Sulphur Riv.	E10	H	F	1	0	15	G-A	H,T,C	X
M-Sheep Cr.	E13-14	H	F	2	0	12	A-P	H,C	
L-Smoky Riv.	E14	H	F	2	0	25	A	H,T,C	
M-Sulphur Riv.	E11	H	F	3	0	20	G	H,T,C	X
U-Smoky Riv.	E11	H	F	3	0	22	A	H	X
Muddywater Riv.	E14	H	F	4	0	16	G	H,T	
M-Wildhay Riv.	E9-8	H	F	1	0	14	G	H,T	X
M-Berland Riv.	E10-9	H	FH	2	0	20	G	H,T,C	X
Cowlick Cr.	E15	H	FH	2	1	13	G	H	X
Muskeg Riv.	E10	H	FH	3	0	15	G	H,T	
Walton Cr.	E10	H	FH	3	4	15	G	H	X
Castor Cr.	E5	L	C	1	3	2	G	H	
no name Muddywater	E12-13	L	C	2	1	2	G	H	
U-Jackpine Riv.	E5	L	C	1	0	3	G	H	
Spider Cr.	E5	L	C	1	2	2	G	H	
no name Beaverdam Cr.	E12	L	C	1	2	2	G	H	
Llama Cr.	E13	L	C	1	2	1	P	H	
U-Sheep Cr.	E13	L	C	4	0	3	G	H,T	
Meadowland Cr.	E12	L	C	2	4	1	G	H	
Ptarmigan Lake	E12-5	L	C	2	3	4	A	H	
Casket Cr.	E13	L	C	4	2	2	G	H	
Cote Cr.	E13	L	C	4	1	4	G	H,T	
Famm Cr.	E13	L	C	4	1	3	G	H,T	
South Muskeg Riv.	E10	L	F	2	3	2	G	H,T	
Persimmon Cr.	E10	L	F	2	4	1	G	H,T	
Desolation Cr.	E11	L	F	1	2	1	G	H	
Monoghan Cr.	E10	L	F	1	2	1	G	H,T	
Rockslide Cr.	E6	L	F	1	2	3	A-G	H	
no name2 Sulphur	E11	L	F	1	2	1	G	H	
West Sulphur Riv.	E10-7	L	F	3	4	1	G	H,T	
Deer Cr.	E10-7	L	F	1	4	1	G	H,T	
Swift Cr.	E13	L	F	2	4	1	P-A	H	

Watershed	Map	Complex.	Mtn Range	Main	Small	nb. fires	Access	Transport	98 data
no name1 Sulphur	E11	L	F	3	2	2	G	H	X
Faulk Cr.	E14	L	F	4	1	4	A	H	
Fortyone Mile Cr.	E9-8	L	F	1	2	2	P	H	
Seep Cr.	E9-8	L	F	1	2	3	A-G	H	
Carson Cr.	E9	L	F	1	3	3	A-G	H	X
West Muskeg Riv.	E10	L	F	2	1	2	G	H	
Headwaters Mumm Cr.	E9	L	F	2	1	3	P	T	
Pope Cr.	E10	L	F	2	1	4	G	H,T	
Headwaters Fox Cr.	E9	L	FH	1	2	4	P	H	
Broad Cr.	E9	L	FH	2	3	3	P-A	H	
Planet Cr.	E10-9	L	FH	2	4	1	G-A	H	
Crescent Cr.	E10-9	L	FH	3	2	1	G-A	H	
Beaverdam Cr.	E12	M	C	2	4	8	G	H	
Muddywater Riv.	E12-13	M	C	3	0	6	A-G	H	
M-Jackpine Riv.	E5	M	C	1	0	8	G	H	
Featherstonhaugh Cr.	E13-12	M	C	2	4	5	G	H	
Muddywater Riv.	E13	M	C	2	0	6	P	H	
no name Jackpine Riv.	E12	M	C	2	1	5	G	H	
no name de Veber Pk	E12	M	C	2	4	10	A	H	
Hardscrabble Cr.	E11	M	F	3	1	5	G	H,T	X
U-Wildhay Riv.	E10	M	F	4	1	7	G	H,T,C	X
U-South Berland Riv.	E10	M	F	3	2	11	G	H,T	X
North Berland Riv.	E10	M	F	1	3	11	G	H,T	X
no name west Smoky	E11	M	F	1	2	9	G	H	
no name Hardscrabble	E11	M	F	1	2	5	G	H	
no name east Smoky	E11	M	F	2	1	10	A	H	
Albertine Cr.	E14	M	F	2	1	7	A-P	H	
Delorme Cr.	E14	M	F	2	1	7	P	H	
Rock Cr.	E10-7	M	F	2	1	8	G	H,T	
Wolverine Cr.	E11	M	F	2	1	5	P	H,T	
Corral Cr.	E14	M	F	2	1	11	P	H	
Horn Cr.	E13-14	M	F	2	1	5	P	H	
Thoreau Cr.	E9	M	F	1	3	6	G	H,T	X
South Sulphur Riv.	E10-7	M	F	1	3	6	G	H,T	
Kvass Cr.	E11	M	F	3	4	10	G	H	X
no name Kvass	E11	M	F	4	1	7	P-A	H	
Jackson Cr.	E8	M	F	1	2	5	P	H	
Eagles Nest Cr.	E10-7	M	F	1	2	5	G	H,T,C	X
M-Sulphur Riv.	E14	M	FH	3	0	6	A	H	X
L-Sulphur Riv.	E14	M	FH	1	0	7	A	H	

Watershed	Map	Complex.	Mtn Range	Main	Small	nb. fires	Access	Transport	98 data
Moberly Cr.	E9	M	FH	1	2	6	A-P	H,T	
side creeks of Pinto Cr.	E9	M	FH	1	2	5	P	H,HWY	
Little Berland Riv.	E9	M	FH	1	2	6	P-A	H,T	
U-Berland Riv.	E10	M	FH	1	0	11	G	H,T	
L-South Berland Riv.	E10	M	FH	1	3	12	G	H,T	
Star Cr.	E9	M	FH	2	3	5	G	H,T	
Moon Cr.	E9	M	FH	2	3	6	G	H,T	X
Evans Cr.	E9	M	FH	2	1	6	G-A	H,T	
Adams Cr.	E10	M	FH	2	1	7	G	H,T	
Collie Cr.	E9	M	FH	4	3	7	A-G	H,T	
Sunset Cr.	E10	M	FH	4	1	6	G	H,T	
Stalk Cr.	E9	M	FH	4	3	5	A-P	H	X