R E P O R T

PARKS CANADA
KOOTENAY/ RADIUM
LLYK FIRE MANAGEMENT

The Redstreak Restoration site is located immediately south of Kootenay National Park administration building on a bench above the village of Radium Hot Springs. The unit is comprised of a combination of Federal and Provincial Crown lands. The area designed for treatment was harvested during the winters of 2001/02 and 2002/03. Total area is 87 ha. At the time of the burn, the unit was comprised of very light fuel loads of a mix of light slash and open grass. The unit is was well contained by roads to the east, west and north.
Approximately 70% of the unit had a very light slash load with intermittent areas of grass/herbaceous vegetation. The S1 fuel type was defined as having 50% of the foliage on the ground post logging.
Approximately 30% of the unit was comprised of O1-b mixed with the slash type resulting from the harvesting.

The Prescribed Burn was a joint effort between Parks Canada and BCFS.

Fire Weather desired

FFMC=87/91
DMC=20/50

Fire behaviour desired

A low to moderate surface fire surface intensity with a relatively slow spread.

Weather desired=wind 5-10, wind S-SW

Vales at risk

-Town site of Radium
-Parks Canada residence
-Parks Canada administration building
-Parks Canada Readstreak campground
-Parks Canada woodpile Radium golf resort
-Treed island inside the unit

Public relation and information strategy

A significant effort was made to inform the public through a series of presentations with the village of Radium town council, Radium open house and the Colombia valley

chamber of commerce. Articles were put in the local newspapers. Local agencies, local logging companies were aware and invited on the burn days.

Pre-Burn preparation

In conjunction with the BCFS, the following was done:

- Completion of an environmental assessment
- Completion of a burn and holding plan
- Harvesting
- Communication strategy with local residents and surrounding agencies

A contract crew was hired to provide "hands on" support for the preparation of the burn. The work included the racking of the base of all Douglas firs inside the unit, deployment of all holding and fire suppression equipment.

<u>Burn days 1 on April 21</u>

Manifest
Kubian = IC, Morin = Ops section chief
-Parks Canada x 10
-BCFS x 3
-Radium fire dept x 4
-HIS contract crew x 5
-Technical specialist x 4

Weather

Forecast from BCFS for South East fire center:

April 20 PM:
Synopsis: An upper low-pressure area sitting well south of the 49th is rotating cloud east to west over southern section of the region. In the North, a high-pressure center is also pushing thin cloud over northern sections. The high to north should expand southward tonight and tomorrow so dry, warm conditions are expected to continue.

Outlook:
The ridge pattern should remain the main feature over the 3-5 day period. Bans of cloud should drift south-eastward over eastern areas but precipitation from these clouds look unlikely. Warm Temps should continue.

Spot forecast for April 22, light up time:14:00

Today: Sunny with a few clouds, Tonight mainly clear skies, Saturday a mix of sun and cloud.

Synopsis: High pressure across the central interior resulting in sunny skies for now. An upper trough is expected to penetrate into the area late Friday threatening some shower activity mainly in the night.

Venting = Good

Temp (max): 22, (min) 1, RH 27/75

Outlook: Bands of cloud drifting across the area Sunday through Tuesday but the chance of any precip is small. High pressure should continue to dominate.

Fire indices

FFMC= 86
DMC=40
DC=360

FBP Observation

Point #1 – 566533
5607005

14:40 - Ignition started

14:46 – Moving at 0.5m/min.
Flame height 0.4-0.5m
Strips being laid 1m apart
Wet Corner, grass burning patchy

14:55 – Moving at 0.2m/min.
Flame Height 0.25m

15:02 – Moving at 1m/min. in 50% cover of 01-b – self-extinguishing
Moving at 2m/min. in 100% cover of 01-b

15:15 – Moving at less than 1m/min. in 90% 01-b and 2% slash with some 5cm green up
Flame height 0.2-0.5m

Point #2 - 566658 On plateau of SW corner
5607088

15:36 – Trees almost candling

16:35 – Moving at 0.5 m/min. in 01-b
Moving at 0.1 m/min. in slash

17:05 – About 20% of the fuel treated in the area is burned

Point #3 - 566864
5607048

17:28 – Fuel (01-b) on the SE aspect, which is the 2002 logging, has better fire spread
Moving at 1m/min.
Flame height 0.5m

17:55 – Small pockets of aggressive fire
Moving at 3m/min. with 2m flame heights on south facing slopes

Point #4 – 567106
5607080

18:07 – Pocket of 01-b moving at 3m/min.
Flame height 3m
18:20 – Moving at 10m/3min.
Flame height 0.75-1m
15% slope – E/SE aspect

Estimated 40% of fuel burned on SE slopes

19:00 – Moving at 0.5-1m/min.
Flame height 0.5m in patchy 01-b on flat terrain
Strips being laid 15m apart

Recorded weather on sit, April 21

Time	Temp . Celcius	RH	Wind Speed km	Wind Direction	Wind Gusts km	% Cloud Cover	Location of Reading

12:40	16.6	30	2.2	N	75	North End (Admin)
13:00	16.4	40	1.0	N	75	North End (Admin)
13:15	16.2	40	2.4	N	75	North End (Admin)
13:30	18.4	35	0.6	N	75	North End (Admin)
13:45	21.4	40	0.9	N	75	Near Houses
14:00	19.5	32	1.5	N	80	SW Corner
14:15	20.1	30	2.6	N	80	SW Corner
14:30	18.5	34	1.5	N	80	SW Corner
14:45	19.1	31	2.2	N	75	SW Corner
15:00	19.7	25	1.6	N	75	SW Corner
15:30	19.3	28	1.5	Variable	65	SW Corner
16:00	21.0	22	1.6	W	65	South Central
16:30	22.4	22	1.5	Variable	65	South Central
16:50	22.2	22	1.2	Variable	60	South Central
17:15	20.9	23	2.5	E	50	South Central
17:30	19.8	24	0.0	None	50	South Central
18:00	20.0	24	1.1	SE	50	South Central
18:30	21.0	25	1.1	SE	50	SE Corner
19:00	19.8	32	0.0	None	50	SE Corner
19:30	15.7	41	2.4	W	50	Near Pond
20:00	16.4	34	1.4	Variable	50	North End (Admin)

<u>Burn day two Friday April 22, 2005</u>

Manifest

IC = Morin, Ops section Chief=Quinn
Warden = 6
HIS = 5
Technical specialist=4
Parks Canada trail crew = 4

The second burn day was better due to lower RH, sun exposure and higher temperatures.

Point #5 - 566462
5608292

13:53 – Ignition Started

Point #6 - 566607
5608197

14:27 – Moving at 5m/min. in 100% 01-b
Flame height to 1m
East aspect

Point #7 - 566592
5608131

14:38 – Fire working up boles

Point #8 - 566595
5608117

14:57 – Moving at 2m/min in 75% 01-b
Flame height 1.5m

3m fire whirl seen on East flank – Rick Kubian

Point #9 - 566856
5607844

15:30 – Moving at 4m/min.
Flame height 2m

15:40 – Moving at 6m/min.
Flame height 5m
15:40 – Fire jumps east road

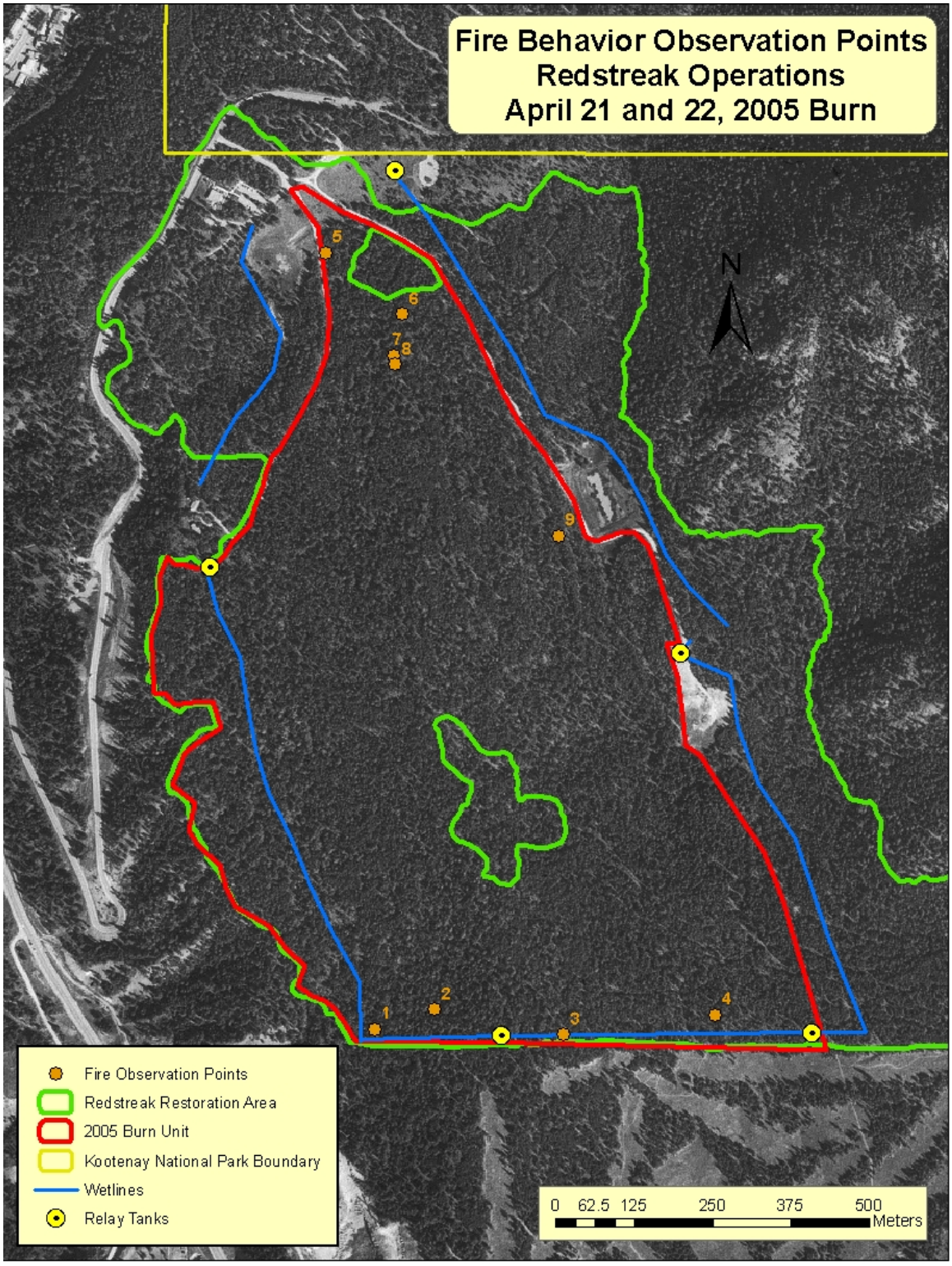
15:55 – Moving at 10m/min. in 2 year old 01-b
Flame height 2m
Minor candling in trees
Fire whirls observed
Day 1 fire restarted and moving to join Day 2 fire

16:20 – Moving at 6 or 7m/min.

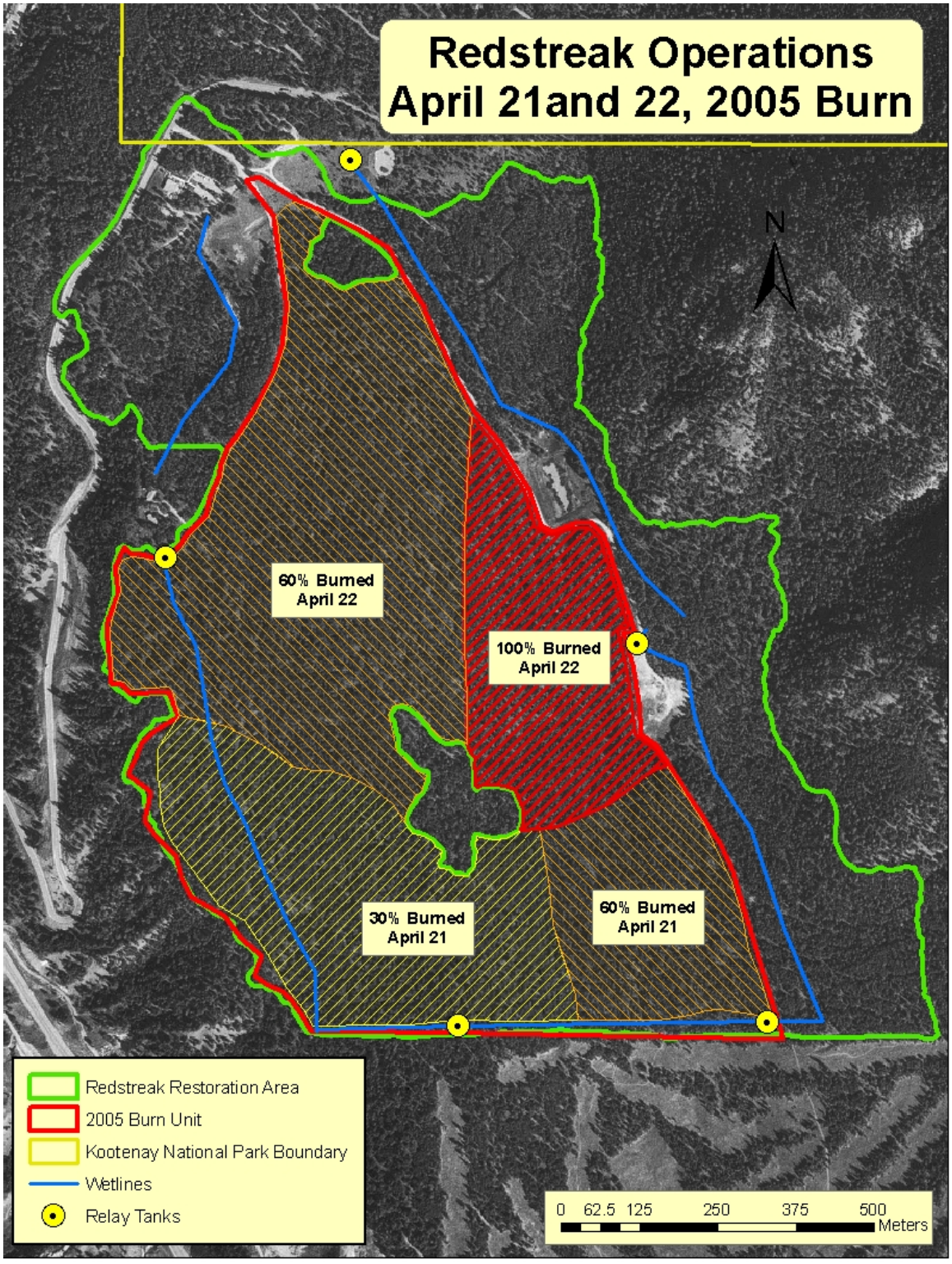
16:45 – Slope above woodpile (Day 1 fire)
Continuous flame front at 1.5 to 3m h

Recorded weather on site, April 22

Time	Temp. Celcius	RH	Wind Speed km	Wind Direction	Wind Gusts km	% Cloud Cover	Location of Reading
13:45	23.3	22	1.2	W		10	North End (Admin)
14:00	21.2	19	5.7	W	15	10	North End of Unit
14:30	23.6	17	3.5	W	10	10	North End of Unit
14:45	22.8	15	6.2	W	15	10	North End of Unit
15:00	22.0	14	2.8	W	8	15	North End of Unit
15:30	23.7	10	3.3	W	7	15	Woodpile
15:50	20.8	14	7.0	S	12	10	West of Woodpile
16:30	24.2	9	6.3	S	14	10	West of Woodpile
16:45	23.3	12	12.0	S	26	10	West of Woodpile
17:00	22.1	10	6.0	S	13	10	Near Houses
17:30	23.0	11	2.2	S	7	20	Near Houses


Fire Behavior Observation Points
Redstreak Operations
April 21 and 22, 2005 Burn
N
1
2
3
4
5
6
7
8
9
Fire Observation Points
Redstreak Restoration Area
2005 Burn Unit
Kootenay National Park Boundary
Wetlines
Relay Tanks
0 62.5 125 250 375 500
Meters

Readstreak burn results for April 21-22



Post burn

The third day of the PB was the start of moping up the West and South boundaries of the unit as well as the North/East Island and around the residences. Hose lay and sprinkler system was used in combination with hand tool. The HIS contract crew spent a total of four days looking for hot spots and putting them out.
On April 27 a strong wind started some hot spots well inside the perimeter and spread the flame toward the West side of the unit toward the highway. At 15:30 I responded to a spreading fire after doing a patrol. We put an other hose lay along the West side of the unit and started doing some fire suppression to stop the spread. A helicopter with a bucket was dispatched to help contain a small spread outside the unit. Although the small escape wasn't going to challenge us, it was appropriate to respond adequately due to the vicinity of the Radium Town site.

No rain came on the unit for a while after ignition. April 24 gave us 0.2 mm.
On April 29 we were still having an FFMC of 91.6 and the BUI was up to 61, DC 384.1.
On May 3 we did a scan of the unit and few hot spots were found mostly inside the unit and the contract crew kept extinguishing them.
On May 4 we received 0.4 and on the 7 we received 0.3. The first significant rain event was on May 8 with 6.7 mm.
On May 10 the remaining of the gear was pulled out of the Redstreak unit and no further suppression work was done.

Area burnt

87ha

Fire effects:

Here is some information provided by Hillary Page M.Sc.
Sage Ecological Research

Burn

The two day prescribed burn encompassed all of Site one and the western half of site 2 (Fig. 2). Site 1 is located on relatively level ground (mean slope = 3%) with few slopes and gullies, except for a strong slope on the eastern boundary of the block, that leads into site 2. The western half of site two is east facing with mesic plant communities (pinegrass, aspen, chokecherry) occupying

the site. Site one was more recently harvested (2003) than site two. Site 1 had significantly more ($p<0.0001$) fuel (dead wood) on the ground as measured in 2004 (Site 1: 14.67% SD=3.98% versus Site 2: 7.39% SD=4.81%). Site one was also characterized as having greater vegetation cover (Table 2).

Desired indices for the prescribed burn were between the range of 87-91 for the fine fuel moisture code (FFMC), 20-50 for the duff moisture code (DMC), buildup index (BUI) of <60 and the initial spread index (ISI) between 3 and 15. The preferred weather included a wind speed of 5-10 km/hr from the south-southwest.

The goal of the prescribed fire was a low to moderate intensity surface fire with relatively slow spread. The DMC was considered critical to the objective of burning slash and surface litter.

Table 1. Summary of understory cover characteristics by functional/descriptive group at three restoration sites sampled in 2004.

	Site 1		Site 2	
Understory component	**mean**	**SD**	**mean**	**SD**
Bunchgrass Cover[1] (%)	0.84	1.41	1.36	1.79
Grass Cover[2] (%)	7.07	10.51	19.14	27.85
Forb Cover (%)	4.64	4.28	8.24	5.08
Carex Cover (%)	4.13	6.40	4.64	7.64
Shrub Cover (%)	10.24	7.55	12.06	7.42
Exotics species cover	3.5	4.32	2.47	6.47
Conifer cover[2] (%)	0	0	0	0

[1] Includes native bunchgrasses considered historically common listed on pg. 9.
[2] Includes any native grass that is not classified as a bunchgrass.

Other objectives of the burn included reduction of the litter layer and slash accumulation that restrict forb and grass production and burn conditions that favour growth of bluebunch wheatgrass and rough fescue

The first day of burning (April 21)had an average temperature of 19° (ranging from 16.6° to 21.4°) and rH of 30% (ranging from 22 – 41). Average wind speed was 1.5km/hour, coming from the north most of the day. Cloud cover was high, ranging from 50% to 80%. The second day of burning was hotter with an average temperature of 22.7° and rH of 14%. Average wind speed was 5.1km/hr coming out of the south and west. Cloud cover was lower on the 22nd ranging from 10% – 20%. On April 21st, the FFMC was 87, DMC 40, the DC 360. April 22 codes were the same except the FFMC which increased to 91 due to a drop in the rH. Rate of spread on the 21st was approximately 1.3m/min with flame heights of 0.5m – 3m. Rate of spread was approximately 5.5m/min on the

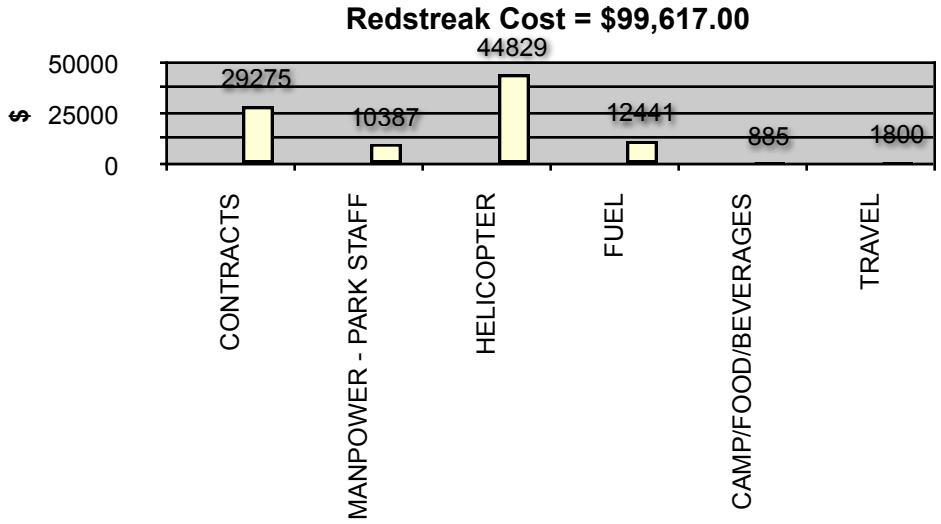
22nd.with flame heights from 1 – 5m. Average scorch height on the trees on the 21st was 3.1m and 9.5on the 22nd.

Average ground scorch of the entire burn was 39.4% (Stdev=43.9%). The percent of burn coverage (on the ground) differed significantly between days ($p<0.0001$). Scorch in plots burned on day 1 was 19% (Stdev= 34) and scorch in plots burned on day 2 was 52% (Stdev=45%). Duff consumption also varied significantly ($p<0.001$) between days, 0.14cm (Stdev=0.51) on day1 and 0.7cm (stdev=1.3) on day 2. Scorch and duff consumption did not vary between site one and site two, i.e. year of harvesting did not significantly impact fire behaviour. Therefore, analysis of the understory response was stratified by burned and unburned sites.

Just in case you were writing your report, I have some additional info that might be useful. There was significant consumption of fuel (not measured in size classes – only as wood >1cm diameter) and a significant increase in bare soil. There was a weird increase in litter cover, but I think it is because the larger pieces of fuel were converted into a litter layer during the fire. There was not a significant increase in bunchgrass cover or density, but the fact that there was no decline is significant, usually one observes a decrease in cover and production in the first year after burning. Actually I found bunchgrasses in plots where I did not see them before implying some plants have been 'released' due to the consumption of the duff layer (their emergence was probably also a function of the precipitation this year as well). One of your objectives stated you wanted a burn that did not compromise spring growth of bunchgrasses – I think you could say you achieved that. I included a couple of paragraphs from the draft in case they are useful to you.

"Bare soil cover in the burn plots was 5% (stdev=5%). This was a significant increase from 2004 (3%; stdev=5) ($p=0.01$). Litter increased unexpectedly from 70% (stdev=11) to 80% (stdev=8; stdev=8) ($p<0.001$) in the burn plots. Increased litter cover is likely due to the significant consumption of dead wood (>1cm diameter) ($p=0.0002$) (Fig. x) (12%; stdev=5 to 7%; stdev=5)."

"Bunchgrass cover was low (Table 3) relative to other grassland sites in the trench (Page 2003, Page 2005). Rough fescue made up nearly half of the bunchgrass cover (0.5%; stdev=3) with bluebunch wheatgrass and Richardson's needlegrass each making up 0.3% of the cover (stdev=2). Bunchgrass cover increased in 2005, but the change was not significant ($p=0.06$). As cover increased, so did the variability between plots. Rough fescue was found in eight plots in 2005 and six plots in 2004. Bluebunch wheatgrass was surveyed in one plot in 2004 and found in four plots in 2005. Increases in presence are not likely due to new plants but rather a reduction in the duff layer enabling emergence of plants in a high moisture year. Maintenance of cover and increases in bunchgrass density achieve the burn objective of the consumption of duff layers without compromising early spring growth of bunchgrasses like rough fescue and bluebunch wheatgrass."



Recommendations

Use of sprinkler:

The sprinkler system was an effective toll throughout the whole operation. Sprinklers were first used as holding toll and then as a mop up tool. The effectiveness of the sprinklers would have been increased by cleaning up (burning) as much vegetation as possible prior to applying water. The wet un-burnt fuel at critical areas was later available for combustion. Black lining first then sprinkler deployment would be more effective if no significant rain is in the forecast after ignition.

Complexity

When a prescribed burn is located near a major value at risk like a town site, it would be appropriate to say that it is a “moderate” complexity even if it is a “low” complexity. In the event of a dry system post burn, more work may be involved to put the unit out and other challenges may occur.

Cost

When burning near values at risk, we face different challenges that if we burn in the middle of the Park we all know that. In order to achieve the burn objectives and suppression efforts, it is really hard to put a price tag on the whole operation. The suppression and political post burn outcomes will always be weather dependent and the cost become variable. It is important to make the right decisions and include common

sense to minimize cost. The Redstreak prescribed burn was well-managed cost wise and objectives were met.

Inter agency help

Part of the unit was on provincial land and BCFS was involved at two levels: conception of the burn plans and help on the burn days with crews and equipment. In this case, no CFFIC request was made and there was no cost from Parks Canada toward the BCFS involvements. Prior to use neighbours on a friendly agreement basis, it is important to make sure that things are clear so there is no surprises. It would be good to be able to go through CFFIC without having any cost involved (in certain cases) but make it legal and avoid getting into problems if there is injuries or money issues.

Jean Morin
LLYK Crew Leader
Readstreak Burn Incident commander