

Wind Cave National Park Centennial Blocks 1 and 2 Prescribed Fire Monitoring Report

Prepared by andy thorstenson

Burn Unit Summary

Blocks 1 and 2 of the Centennial Prescribed fire comprise approximately 253 acres of ponderosa pine and mixed grass prairie southeast of Rankin Ridge fire tower. These units were ignited on November 3 and 5, 2006. The easternmost block of 113 acres is 70% grass with 2 forested ridges comprising another 30% of the block. Block 2 is comprised of one major forested ridge and 2 adjacent grassy valleys totaling 140 acres.

Personnel:	Block 1	Block 2
	Burn Boss: Steve Ipswitch	Dan Morford, Brett Pargman RXB2(t)
	Firing Boss: Sonya Feaster, Cody Wienk FIRB(t)	Eric Allen, andy thorstenson FIRB(t)
	Holding Specialist: Eric Allen	Steve Ipswitch
	Fire Monitors: Tyler Schmitt, andy thorstenson	Cody Wienk, Bob Manasek

Objectives:

- 70-90% mortality in ponderosa pine seedlings
- 40-60% mortality in pole sized (1"-6" dbh) ponderosa pine
- 20-40% mortality in ponderosa pine greater than 6" dbh



Engine 629 on the southwest corner of block 2

Weather Observations

National Weather Service in Rapid City generated spot weather forecasts for the fire. November 3 weather was characterized by nearly complete cloud cover and lower temperatures and a brief wind shift, whereas November 5 had warmer temperatures, less cloud cover, variable wind direction, and higher windspeeds.

Table 1. Weather Observations

Date	Time	Temp	Dew Point	RH	Wind		Comments
					Speed	Direction	
3 Nov	1400	52	22	30	2-3	e	100% cloud cover
3 Nov	1500	54	22	28	2-3	ese	
3 Nov	1535				7-12	nw	wind shift, light precip, <.01"
3 Nov	1600	53	30	41	6-9, g-15	n	precip ended
5 Nov	1100	55	27	34	4-6, g-9	n to w	50% thin cloud cover
5 Nov	1200	56	29	35	4-6, g-11	ese	50-6-% cc
5 Nov	1300	58	26	29	3-5, g-8	n-ne	10% cc
5 Nov	1400	60	29	31	1-3, g-6	sw, upslope	smoke inversion
5 Nov	1430	60	31	35	5-8, g-12	nw	east side dp2
5 Nov	1515	57	27	32	1-3	upslope	sheltered by canopy, 80% cc

Fire Behavior Observations

On November 3, fire activity in block 1 began slowly with limited rate of spread and some difficulty getting fire to carry in sparse grass fuels. With a shift and increase in winds, behavior increased in the grass though was still limited by grazed and bare patches. In the forest fuels under the ponderosa canopy, behavior was moderate with rates of spread from 1.5 to 10 chains per hour. The ponderosa provided continuous litter fuel which allowed for more uniform fire spread.

In block 2 on November 5, fire spread actively in all fuel types for the entire operational period. Ignition teams were occasionally pushed to ignite perimeters ahead of the main fire moving through the unit due to variable winds. Limited individual tree and group torching occurred where fire spread upslope or with the wind. Dry fuel conditions characterized the fuel bed under the canopy of ponderosa pine.

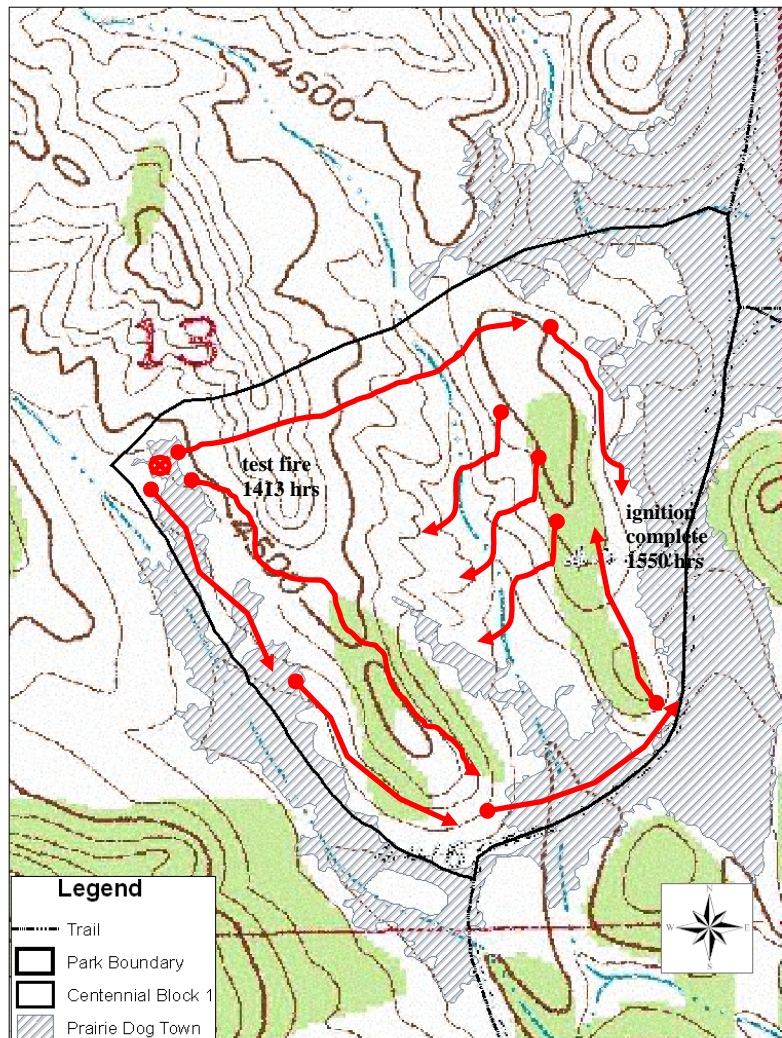
Table 2. Fire Behavior Observations

3 Nov Time	Location	Spread Dir.	ROS	Flame Length	FZD	Fuel Model	% Shade	Slope	Comments
1435	test fire	h/b/f	< .5 c/h	4-8"	2"	1 scsc	100	20	
1509	center	f	2 c/h	1'	1'	2 pipo litt 1 mixed	100	15	uniform spread
1523	center	f	5-6 c/h	1'-2'	6"-2'	grass	100	20	not bad,
1555	east line	h	10+ c/h	3'-6'	10'+	9 pipo			95% active perimeter
1600	east line	b	1.5 c/h	2"-8"	6"	pipo/grass	100		
1645	centennial	n/a	n/a	n/a	n/a	1,2,9	100	0-30	60-70% of grass, 75-80% of pipo burned
5 Nov Time	Location	Spread Dir.	ROS	Flame Length	FZD	Fuel Model	% Shade	Slope	Comments
1015	test fire	b	n/r 12-15	5"	3"	1, 2 grass 1 mixed	0%	0-5%	initial test fire
1030	near dp 1	flank	c/h	1-3'	1'	grass	0%	n/r	
1130	dp4 south	back	½ c/h	4"-8"	6"	2	n/r	n/r	
1250	aspect	head	≈ 40 c/h	10'	≈ 30'	2,9	30%		short duration upslope headfire

Fire Progression

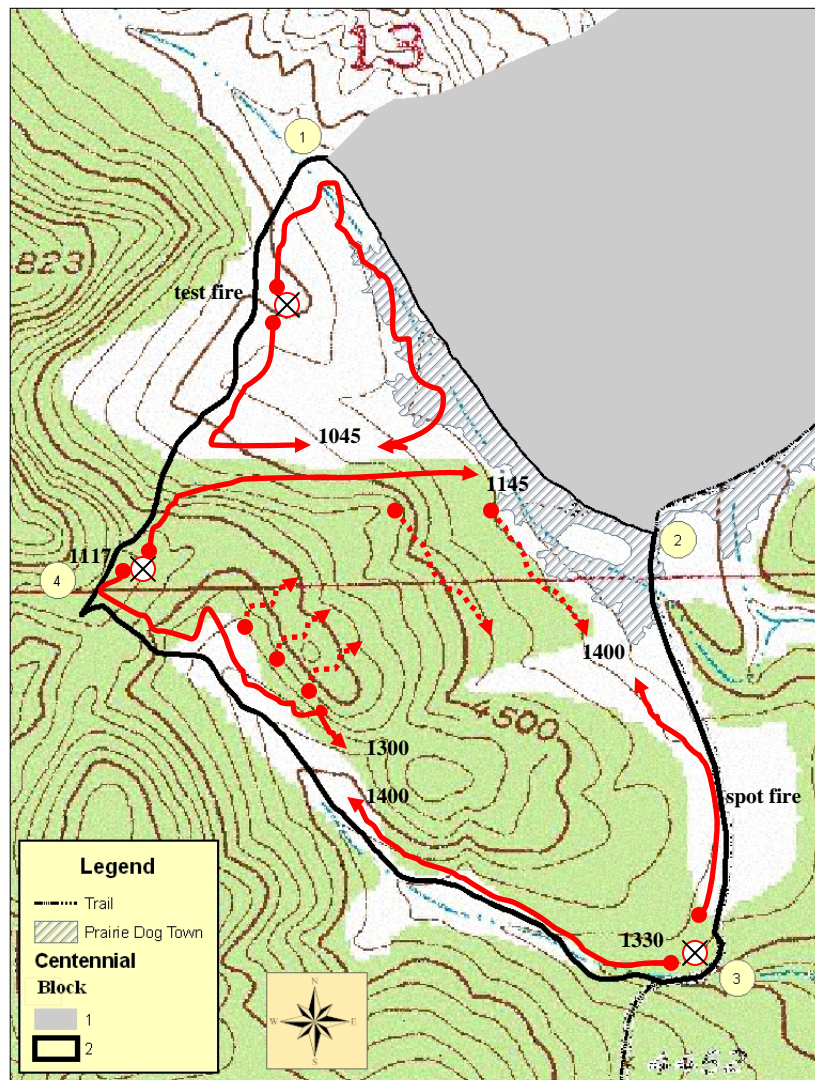
Ignition on Block 1 began on November 3 in the northwest corner with 2 ignition teams working the perimeter and interior. One team went south along the edge of the prairie dog town while simultaneously igniting the forested interior ridge. A second team went east along the north perimeter toward the eastern forested ridge. There were some challenges getting fire to carry through sparse grass fuels. A northwest wind eventually carried fire through much of the grass in the center of the unit. The 2 ignition teams continued perimeter firing eventually meeting on the east flank at about 1550 hours. See Map 1.

Map 1. Fire progression, Block 1



Ignition on Block 2 began on November 5 at 1015 hours just south of Drop Point 1 (DP1). Two ignition teams ignited the perimeter of the grassy portion at the north of Block 2 finishing at about 1045. Both ignition teams moved up the hill to the south at DP4 and began igniting with the east team moving along the north edge and the west team moving south along the west perimeter. The east team stopped near DP2 while the west team worked down a steep slope through heavy fuel. At about 1300 a small slopover was detected and quickly contained. Winds had been trending northwest and ignition teams reset at DP3 and began perimeter ignition at about 1330. Ignition on the south end was completed at about 1400 hours. See Map 2.

Map 2. Fire progression, Block 2



Smoke Monitoring

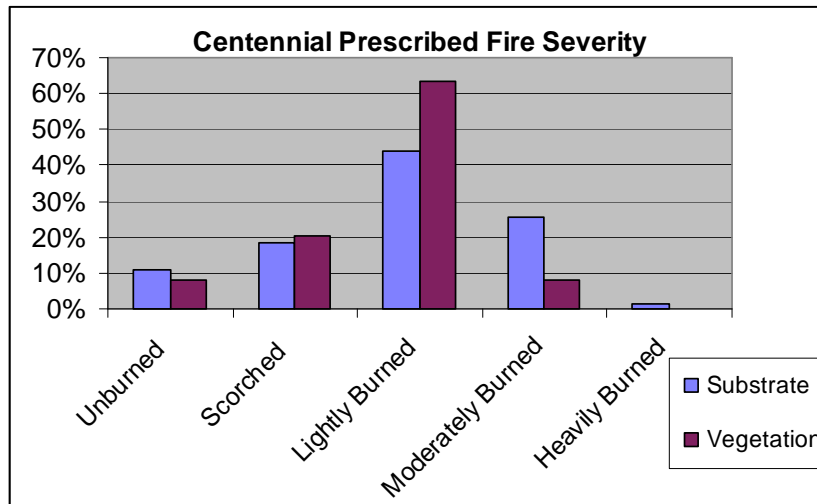
Smoke volume on November 3 was light as most of the area burned was grass. At the end of ignition a moderate volume of smoke rose 300' above ground level and moved to the east. On November 5, moderate to high volume of smoke was produced moving primarily east-southeast. Dispersal was good for most of the day with column rising 1000' or more above ground level. At

1500 hours, Chief Ranger Rick Mossman reported the smoke was not impacting SD Highway 79 east of the park. Toward the end of the day smoke production was moderate and cloud cover limited dispersal. Smoke then drifted downcanyon toward Beaver Creek to the southeast through the evening hours.

Immediate Postburn Results

Post-fire monitoring plot severity showed about 10% of sample points unburned, another 20% minimally impacted by fire (scorched), and the other 70% of the area falling into lightly or moderately burned categories. This corresponds well with visual estimations of the area on November 21.

Graph 1. Burn Severity Class



Tree mortality will be quantified in 4 monitoring plots over the next 2 growing seasons. Initial estimates range from areas with little scorch and minimal expected mortality in seedling sized trees to areas with high scorch and significant (70-90%) mortality in the seedling and pole size class. Plots also varied in the estimates of overstory mortality ranging between 0% and 30%.

Fuel Moisture

Fuel moisture from the Wind Cave fuel sampling site approximately 2 ½ miles southwest of the Centennial unit recorded relatively dry fuel conditions on November 1, 2006.

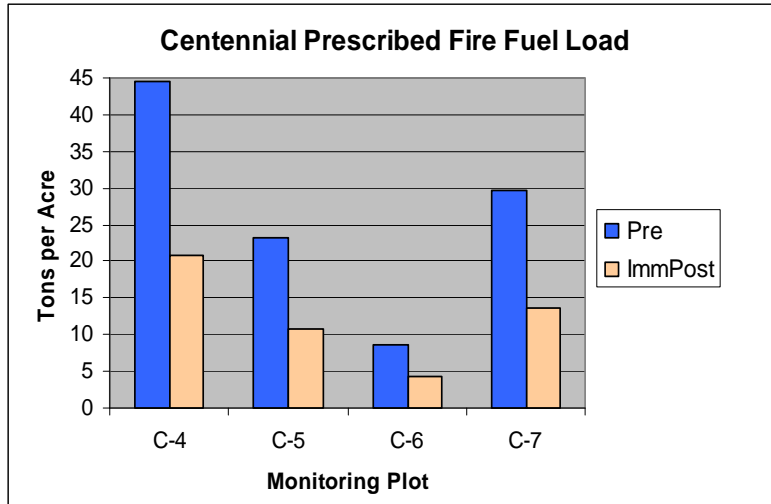
Table 3 Fuel Moisture

Date	Live Ponderosa	Duff	Litter	10-hour	1000-hr
11/1/2006	103%	14%	6%	7%	21%

Fuel Load

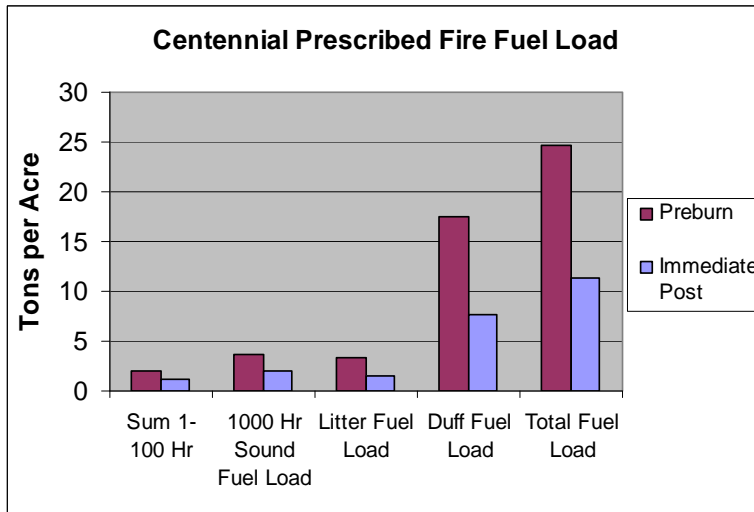
Fuel load reduction was fairly uniform across 4 monitoring plots with a mean reduction of 53% in 4 monitoring plots. Graph 2 shows the four plots with preburn fuel loads of 8.7 to 44.4 tons per acre. Immediate postburn loading ranged from 4.2 to 20.8 tons per acre.

Graph 2. Fuel load by plot



Monitoring on 4 plots indicated that most of the dead and down fuel load reduction occurred in the duff layer. Graph 3 illustrates these changes by category. Duff decreased from an average of 17.5 tons per acre to 7.6 tons per acre. Total fuel load decreased from an average of 24.6 tons per acre to 11.3 tons per acre.

Graph 3. Fuel load by fuel category



Conclusions

Immediate postburn results from the Centennial prescribed fire indicate that it met one objective of reducing fuel load and will likely meet other stated objectives of reducing ponderosa pine. It achieved other goals of providing for firefighter safety and re-introducing fire to a fire-adapted system that has been without fire for much of the history of Wind Cave National Park. It also confirmed that late-season (November) prescribed fires can be effective if fuel conditions are conducive. This fire also confirmed that prescribed fire can be successful in backcountry areas far from existing roads.