Jewel Cave National Monument
Hilltop Prescribed Fire
October 30, 2008
Prepared by Jon Freeman and andy thorstenson

Burn Unit Summary

The Hilltop prescribed fire was completed in one operational period on October 30th, 2008. It consisted of 313 fairly steep acres adjacent to Hell Canyon. Much of this area had burned as a crown fire in the Jasper fire in 2000, leaving a significant load of dead and down 1000-hour fuels. The understory consists mainly of a mix of native perennial and non-native annual grass. The Hilltop prescribed fire is noteworthy in that it is the first reintroduction of fire anywhere in the Jasper fire area.


Ignition operations near the historic cabin

Objectives

- Achieve 70%-90% consumption of dead and down material.
- Limit mortality in overstory ponderosa pine (>8" dbh) to less than 20%within two years post-burn.


Fire activity in dead and down fuels

Personnel

Burn Boss: Sonya Feaster
Firing Boss: Rod Skalsky
Holding (southeast): Eric Allen
Holding (northwest): Jason Devcich, Toby Nettifee (trainee)
Fire Monitors: Dan Swanson, Jon Freeman
Safety Officer: Jim McMahill
Information Officer: Mike Johnson
5 Type 6 Engines
1 20-person Type II IA handcrew
2 ATV's
1 Water Tender

Weather conditions

The National Weather Service in Rapid City predicted that an upper level ridge of high pressure would bring warm and dry conditions to the area throughout the day and through the weekend with light winds out of the west/northwest. We found the Spot forecast to be quite accurate, and weather conditions to be favorable for fire behavior and smoke dispersal.

Weather Observations

Time	Temp.	RH	Wind Speed	Wind Direction	Comments
0615	51	39	1-2	Var.	
0815	49	42	2-3	NE	Down-slope winds

Time	Temp.	RH	Wind Speed	Wind Direction	Comments
1000	59	34	5 G8	W/NW	
1100	62	29	4 G10	W	1130 cirrus clouds from NW
1220	62	29	4 G8	NW	
1300	64	28	4 G7	NW	
1400	63	30	4 G6	NW	
1500	64	22	4 G8	W/NW	
1615	64	24	4 G6	W/NW	
1705	61	24	4 G7	W/NW	
1800	52	30	4 G7	N	down-slope and down-valley winds, drainages cooling

Wind speed in miles per hour, Temperature in degrees Fahrenheit

Fire Behavior

Fire behavior was driven by primarily by terrain while patchy fuel loading contributed to reduced activity in areas with limited fine fuels. Rates of spread throughout the day were moderate but consistent as wind and slope allowed fire to carry in grass, needlecast, and to a limited extent in down logs. Areas of continuous cured native perennial grass and mixed annual Brome grass allowed extensive flanking and head fires to cross the prescribed fire area. Consumption of large dead and down 1000-hour logs varied depending on adjacent fuel loading and continuity. Where grass was limited by soil type or aspect, little to no consumption of heavy fuels was observed. In other locations where grassy fuels were abundant, we observed significant consumption of heavy fuels.

Fire Behavior Observations

Time	Location	Fire Type	ROS	FL	Comments
1045	Plot F&F1	H	2	6”	Carrying through needlecast
1045	Plot F&F1	F	1	1’	Carrying through needlecast
1125	East of “P”	F	1	6”-1’	
1200	Point “C”	F	1	1’	
1200	Point “C”	H	20	2’	Carrying through grass much faster
1213	Plot FFV 1	F	2	1’-2’	Spot ignitions N of plot
1213	Plot FFV 1	B	1	6”-1’	
1245	South of “P”	B	1/2	3”-6”	
1252	S of boneyard	B	1	4”-8”	Backing upslope, into wind
1300	Point “E”	H	20	3’	
1300	Point “E”	B	½-1	6”	Fuel model 2, mostly needlecast
1400	Plot FFV 3	F	1	1’	Heavy dead and down timber
1425	North of “O”	H	7	1’-2’	
1438	Point “O”	B	1	6”-1’	
1500	Unit 1	F	1/2	6”-1’	
1530	Unit 1	F	1	6”-1’	
1545	Point “G”	B	2	2’	
1555	Point “M”	F	5	4’-8’	Significant behavior in 1000 hr fuels
1655	Historic cabin	H	18	12’-18’	Wind and slope driven effects

B=backing fire; F=flanking fire; H=head fire

ROS = rate of spread measured in chains per hour (1 chain = 66 feet or ≈ 20 meters)

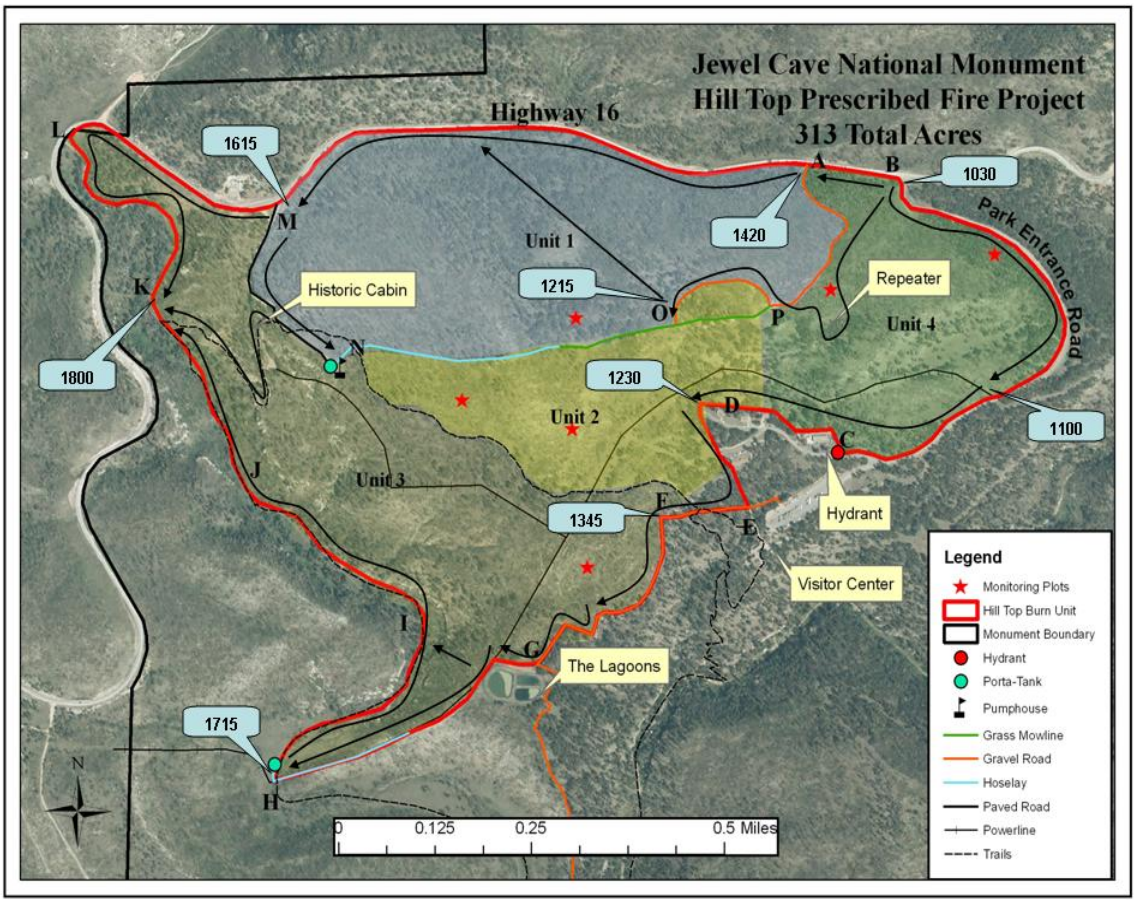
Fire Progression

With northwest winds, a test fire was ignited at point "B" at 1030. Two teams began perimeter ignition on Unit 4. At approximately 1200 it was determined that conditions were adequate to burn all four units at once, rather than taking each unit separately (see map). Igniters carried fire south and west towards the lagoons, and eventually the Lower Hell Canyon Road while a second team continued west along Highway 16. Interior ignition teams fired around the park's repeater, power poles, the historic cabin, and the water reservoir. Additional interior ignition continued firing from ridgetop working downslope and in remnant ponderosa stands. The perimeter teams continued working towards each other along the Lower Hell Canyon Road, with the firing operation completed at point "K" at approximately 1800. (see map).

Smoke Monitoring

The National Weather Service forecast predicted "poor" smoke dispersal in the morning, increasing to "fair" by afternoon, with mixing heights at 4500 feet above ground level. With wind direction primarily west-northwest during ignition, smoke moved exclusively to the southeast. Initially, smoke did not rise significantly, gaining an elevation of 500-750 feet AGL before sinking back to ground level and mixing with the smoke from the US Forest Service Martin prescribed fire to the southeast. At approximately 1630, smoke dispersal improved, with smoke rising 1000-2000 feet AGL and mixing and dispersing rather than falling back to ground level. Smoke production was significant at times, Light smoke impacted Highway 16 occasionally as ignition progressed along the highway.

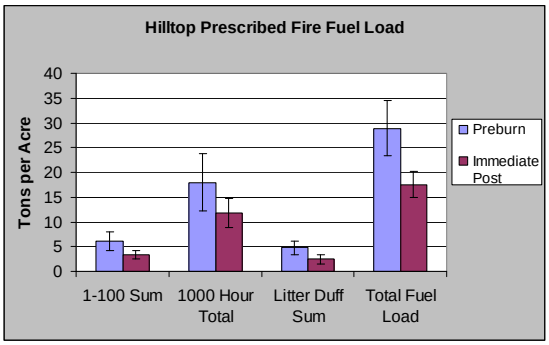
Fire Progression Map



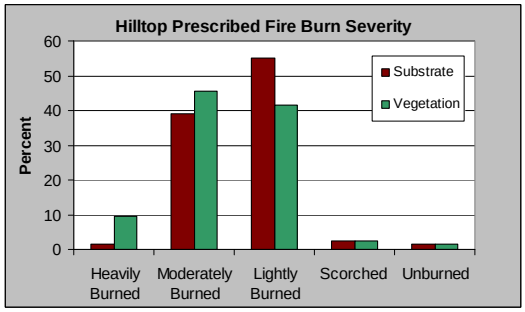
Fire Effects Monitoring

Six fire monitoring plots lay within the boundaries of the Hilltop prescribed fire. Immediate postfire fuel load change and burn severity was assessed 3 weeks after the fire. Monitoring will continue at 1, 2, 5 and 10 years to track changes fuel loading, vegetation composition and ground cover.

The most significant component of the fuel load in the Hilltop is in the large diameter downed woody fuel. Monitoring showed a 35% reduction in this size class. Litter and duff reduction was 49%; smaller woody fuels 47%, and the total fuel load was reduced by 39%. Though this did not meet the objective of 70-90% reduction stated in the burn plan, the Hilltop fire represents a step toward the goal of reducing fuel loading at Jewel Cave.



Severity measure on 6 plots showed the fire severity mostly in the Moderately and Lightly Burned categories. Heavily burned areas occurred immediately adjacent to consumed 1000-Hour fuels.



Conclusions

The weather and fuel conditions for the Hilltop Prescribed Fire were favorable on October 30. Fire behavior throughout the day was consistent with expectations. The main objective of removing large diameter woody debris was not met. Fuel load reduction was likely limited by a lack of fine (grass) fuels on many of the drier aspects. As the first prescribed fire in the area of the 2000 Jasper Fire, the Hilltop can be used as an example for future projects.

Fire activity at forest monitoring plot 2