

Wind Cave National Park
Highland Creek Prescribed Fire Monitoring Report
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Introduction

The Highland Creek prescribed fire is a 1506 acre unit comprised of 70% both native and non-native mixed grass prairie with 30% ponderosa pine forest. The burn unit is located in the north central portion (above the keyhole) of Wind Cave National Park. The burn unit is divided into two blocks (Block A and Block B). Block A is the 383.5 acre western section of the unit. Block B is the 1222.5 acre eastern section of the burn unit. This prescribed burn was expected to take two days. Only Block A of the Highland Creek prescribed fire burned. Block B was not completed due to unacceptable weather conditions. The burn unit boundaries for Block A are the NPS 5 road to the north, Highland Creek Trail to the east, and Highland Creek to the west. A 20,000 foot hose-lay was on the north section of the west boundary and Highland Creek was on the south section of the west boundary. The eastern and western boundaries met at the southern portion of the burn unit, so there is no south boundary. Ignition of Block A occurred at the northern tip of Block A (see attached map) at 1020, May 5th, 2002 following a successful test burn in the same area. Ignition ceased at 1710 of the same operational period.

Overhead personnel for the Highland Creek burn consisted of Burn Boss Denny Ziemann, Dan Morford as Safety Officer, Andy Thorstenson as Lead Prescribed Fire Monitor, Steve Ipswitch as Holding Boss, Shaun Larson as Ignition Specialist, Kevin Merrill as Crew Strike Team Leader, Scott Lopez as Engine Strike Team Leader. Holding resources included five Type VI engines and four twenty-person handcrews. Ignition resources included ten Type II firefighters and three Ignition Team Leaders.

Objectives

Primary resource objectives for the burn:

- Reduce non-native cover by 50-90%; increase native perennial grass cover by 50-90%; increase native forb cover by at least 50% within 5 years post-burn.
- Achieve greater than 50% mortality in ponderosa pine regeneration (<2.5 cm DBH) within 2 years post-burn.
- Reduce dead and down (1, 10, and 100 hr.) fuels by 30-50% immediate post-burn.
- Reduce total biomass in prairie areas by greater than 60% immediate post-burn.
- Accomplish a “patchy” burn within drainages where hardwoods occur, to reduce the number of junipers and save some hardwoods.
- Reduce number of ponderosa pines up-slope from hardwood by 50%.

Summary of Events

In preparation for the burn, Wind Cave staff established a mowline and 20,000 foot hose lay along Segment A, posted “Segment Break” signs, prepared drip torch mix, removed fuel accumulations near the planned perimeter and collected and calculated fuel moisture samples. Portable tanks and pumps were established strategically around the perimeter of the burn unit. Wind Cave staff checked for and cleared the unit boundaries of dead and down fuel in timbered sections. A portable weather station was set up at the Bison Corrals.

Northern Great Plains Fire Monitors installed 2 long-term fire effects monitoring plots in the burn unit. Biomass, fuel and soil moistures were collected and calculated from the monitoring plots prior to the burn.

The Highland Creek burn briefing was conducted at 0800 on the morning of the burn. After evaluating the spot forecast from the National Weather Service, the portable weather station observations and the on-site weather observations, it was determined that the weather was compliant with the burn prescription. Following a successful test burn, ignition of the burn unit commenced at 1020 and ceased at 1710 the same day.

Weather Observations

On-site weather monitoring for the Highland Creek Prescribed Fire began at 0800. Weather observations prior to 0800 were taken from the portable weather station. The spot weather forecast was obtained using the portable weather station observations. Observations were taken and broadcast on the command radio frequency every hour, on the hour, (beginning at 0800) until ignition was completed at 1710. On 5 May 2002 the temperatures during ignition ranged from 60 to 63 degrees Fahrenheit.

The spot weather forecast predicted 20-foot winds to be northeast at 8 to 15 miles per hour turning southeast in the afternoon. During briefing, weather observations taken by the fire monitors recorded variable winds well within the prescription parameters. Winds observed throughout the burn period were held fairly steady between east and southeast at 5 to 10 with occasional gusts to 14 miles per hour. A thunderstorm moved in shortly after ignition ceased. Precipitation began at 1815. Observed and predicted weather conditions are summarized in Table 1.

Table 1, Weather Conditions Observed on 05/05/02

Conditions	Prescription	May 5 Forecast	May 5 Observed
Max Temperature (F)	90	70	63
Min Relative Humidity	20%	27%	38%
Wind Speed (mph)	2-10	8-15 (20-foot)	6-10 gusts-14 (eye-level)
Wind Direction	any	NE changing to SE in afternoon	E/ NE changing to E/ SE late morning

Ignition Pattern

Following a successful test burn, ignition on the Highland Creek Prescribed burn began at 1020 at the northern tip of Block A. Two ignition teams began lighting in opposite directions along the Segment A boundary with the West-Side team igniting before the East-Side team to compensate for the easterly component in the south winds. By 1300 the East-Side ignition team tied in to the Segment A/C break. By 1310 the West-Side ignition team tied in to the Segment A/B break. The two ignition teams continued this strategy throughout the ignition period. At 1400 ATV's started lighting strips from west to east across the interior of Block A. The first ATV strip was laid down a little south of DP-8 and subsequent strips were laid to the south. Very pistols were occasionally used to ignite the interior of the unit. The East-Side and West-Side ignition teams tied into each other at 1710 and ignition ceased. (See attached map, unless this is forwarded electronically.)

Fire Behavior Observations

Fire behavior observations were taken in various areas of Block A in both Fuel Models 1 and 2. The highest intensity burning occurred between the hours of 1100 and 1700. The fire backed and flanked through most of Block A.

In Fuel Model 1 (both native and non-native mixed-grass prairie), observed flame lengths for backing and flanking fire ranged between 2 inches and 8 feet. Rates of spread for backing and flanking fire in Fuel Model 1 ranged from .044 to 4 chains an hour.

In Fuel Model 2 (ponderosa pine), observed flame lengths for backing/ flanking fire ranged from 6 to 12 inches with rates of spread at 1 chain per hour. In Fuel Model 2, observed flame lengths for head/flanking fire ranged from 6 inches to 30 feet. Isolated torching of small ponderosa pine pockets occurred during the burn with some crown to crown spread.

Fire behavior observations are summarized in Table 2.

Table 2, Fire Behavior Observed on 05/05/02

Time	Fuel Model	Fire Type	Rate of Spread (ch/hr)	Flame Length	Flame Zone Depth	Comments
10:40	1	backing	0.44 ch/ hr	2"-4"	2"	
11:15	1	flanking	0.44 ch/ hr	6"-8'	3"-4"	
11:20	1	backing & flanking	1.3 ch/ hr	4'	8'	
15:00	2	backing & flanking	1ch/ hr	6-12"	6"	rate of spread estimated
15:15	2	head & flanking	Not taken	30'	10-12'	isolated torching of small pockets; some crown to crown spread
15:35	1	flanking	4 ch/ hr	8-18"	2'	cross slope wind
15:50	1	backing & flanking	1.2 ch/ hr	8-12"	Not taken	cross slope wind
16:15	1	backing & flanking	2 ch/ hr	4-18"	8"-1'	varied fuel loading; zig-zag/ variable burn pattern

Biomass, Soil and Fuel Moisture Measurements

There was no biomass or soil sampled in Block A as there are no long-term monitoring plots in that section of the burn unit. Two Fuel Model 1 biomass and soil samples from long-term monitoring plots in Block B were collected on May 6, 2002. Biomass was clipped and oven-dried to determine fuel loading in tons per acre. The samples varied from 2.28 to 3.96 tons/acre giving an average fuel loading of 3.12 tons per acre.

Two soil moisture samples were taken from the same place as the biomass samples. The samples were weighed and oven-dried. The averages for the two samples were 39.15% and 15.08%.

Fuel moisture samples were collected on May 3, 2002 just south of Lone Pine Point in Block B of the Highland Creek burn unit. All samples were weighed before and after being oven-dried to calculate the average fuel moisture contents. Average fuel moisture contents are summarized in Table 3:

Table 3, Fuel Moisture Samples

Live Ponderosa Pine needles	88.32%	Litter	11.58%
1000 Hour Fuels	29.08%	Duff	58.24%
10 Hour Fuels	10.63%		

Fire Monitoring

No long-term fire monitoring plots are within Block A of the Highland Creek burn unit. Two long-term fire monitoring plots are within Block B. Both plots are native mixed-grass prairie with a grass understory. Since Block B did not burn, there were no fire monitoring plots available to determine the immediate, short, and long term ecological and vegetative effects fire had on this Block A of the burn unit.

Conclusions

None of the long term monitoring plots burned, therefore it is not possible to statistically measure if we have met our resource objectives. Only if the remaining area of the Highland Creek burn unit burns in the future, will we be able to assess whether we met our resource objectives. We have no way to quantifiably measure short term or long term objectives at this time.