Knife River Indian Village National Historic Site
North Prairie & Big Hidatsa Prescribed Fire Report

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Burn Unit Summary

Two adjacent prescribed fire units, the North Prairie and Big Hidatsa, at Knife River were burned in one operational period on May 15th, 2009.

The North Prairie is a 178-acre unit consisting of mixed grass prairie with a few small pockets of green ash and snowberry thickets in the drainages. The unit is bounded by mowed lines to the south, a ridge that overlooks the Missouri River along the east side, and along the boundary fence on the north and west sides. The Big Hidatsa burn unit is 140 acres in size with the same mixed grass prairie and shrubs/trees in the drainages. The unit is bounded by mowed lines along a fence separating the unit from the private land and a public road to the north and west and a public road to the south, as well as mow lines near the woods to the east and through the shrubby-woody vegetation in the southeast corner. There are two cultural resource exclusions within the western half of the Big Hidatsa unit. Mowed lines were established around these exclusions.

Backing fire near ignition point, North Prairie.

Objectives

- Provide for public and firefighter safety.
- Achieve good consumption of 1 hr fuels and some consumption of 10 hr fuels.
- Reduce the current dominating non-native grass species (Kentucky bluegrass, *Poa pratensis* and smooth brome, *Bromus inermus*).

Personnel

Burn Boss: Rod Skalsky
Ignition: Sonya Feaster
Holding: Jason Devcich
Fire Monitors: Jon Freeman, Valena Hofman (trainee)
Holding Resources: 2 Type 6 engines, 2 UTVs, 1 squad
Ignition Resources: 2 ATV drip torch, 3 igniters

Weather conditions

The National Weather Service in Bismarck, ND issued a spot weather forecast with temperatures predicted to be 50-60˚F, partially sunny conditions and light winds from the south-southwest increasing 10 - 20mph around 1300 hours. The forecast also predicted a minimum relative humidity (RH) of 39%. Weather observations were collected on the hour and transmitted to all fire personnel.

The spot forecast was relatively accurate in respect to minimum RH but actual max temperature was higher than forecasted and winds were predominantly from the southeast. While burning the North Prairie unit the high temperature was 62˚ with a minimum RH of 44% at 1400 hours and light winds primarily from the south-southeast. Temperatures continued to rise after the completion of the North Prairie burn and throughout the Big Hidatsa burn. The days' max temperature of 65˚ at 1600 and 1700 hours and a minimum RH of 40% at 1600; winds were predominantly from the southeast. Table 1 contains weather observations for the entire day.

Weather conditions on the days prior to the burn was cool and wet.

Table 1. Weather Observations

Time	Temp.	RH	Wind Speed	Wind Direction	Comments
1030	48	60	3-4	SSE	Light cirrus clouds
1100	49	55	5 (7)	SE	Winds briefly from east
1200	49	49	6-8 (12)	SSE	Low level cirrus clouds moving in
North Prairie					
1300	55	55	7-9 (11)	SSE	Test fire; cirrus & stratus clouds
1400	62	44	7-10 (15)	SSE	Cirrus only, no stratus clouds
Big Hidatsa					
1500	62	42	8-10 (15)	SE	Skies clearing, some cirrus.
1600	65	40	11 (20)	S	At map point "T"
1700	65	44	10 (13)	SE	Skies mostly clear; altocumulus to west

Wind speed in miles per hour, Temperature in degrees Fahrenheit

Fire Behavior

The dominant fuel type of both North Prairie and Big Hidatsa areas consist of mixed grass prairie. The primary fire carrier was thatch and senesced standing smooth brome and Kentucky bluegrass (*Bromus inermus* [BRIN] and *Poa pratensis* [POPR]) with a strong component of green fuel. Fire behavior was predominantly driven by wind with secondary influences of topography and aspect. Head fires consumed most all dead and most green vegetation, while backing and flanking fires consumed most dead and about half of the green vegetation. In both units there were several small pockets of green ash *(Fraxinus pennsylvanica)* and snowberry shrubs (*Symphlocarpus occidentalis* [SYOC]). Fire in these areas was carried by grass fuels and exhibited decreased fire behavior, likely due to increased moisture and partial shading. Some pockets of heavier dead and down 100- hr fuels did catch but had low fire behavior. Observations for North Prairie are in Table 2-A and Big Hidatsa's are in Table 2-B.

Table 2-A. North Prairie Fire Behavior Observations

Time	Location	Fire Type	ROS	FL	Comments
1300	Map pt. A	B	1 c/h	6”-18”	Test Fire at 1255. Backing well in primarily BRIN (dead & live).
1310	Map pt. A	H	6 c/h	24”-36”	
1330	Map pt. A/G	F	2 c/h	12”-24”	Good consumption of fuels
1345	GFV 6	H	12 c/h	24”	Better lift, smoke column developing w/ more head fire
1400	GFV 7	H	6 c/h	24”-36”	Dense, matted down POPR thatch
1400	GFV 7	B	2 c/h	12”-18”	Dense, matted down POPR thatch
1420	GFV 4	H	-	24”	Dense matted POPR thatch
1425	Near GFV 4	H	-	6”	BRIN through SYOC

Table 2-B. Big Hidatsa Fire Behavior Observations

Time	Location	Fire Type	ROS	FL	Comments
1500	Map pt. M	B	2.1 c/h	6”	POPR thatch
1530	STCO5	H	15 c/h	2-3”	Heavy BRIN fuel bed, ≤12’ fuel bed depth
1530	Near STCO5	B	2 c/h	6”	Consuming thatch, singeing green
1600	STCO4	B	2 c/h	6”	Consuming all but green vegetation; influenced by wind and slope
1600	Near STCO4	H	80 c/h	24”	Consuming all; plot head fire
1610	STCO3	F	2 c/h	6-18”	

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)
FL = flame length

Smoke Monitoring

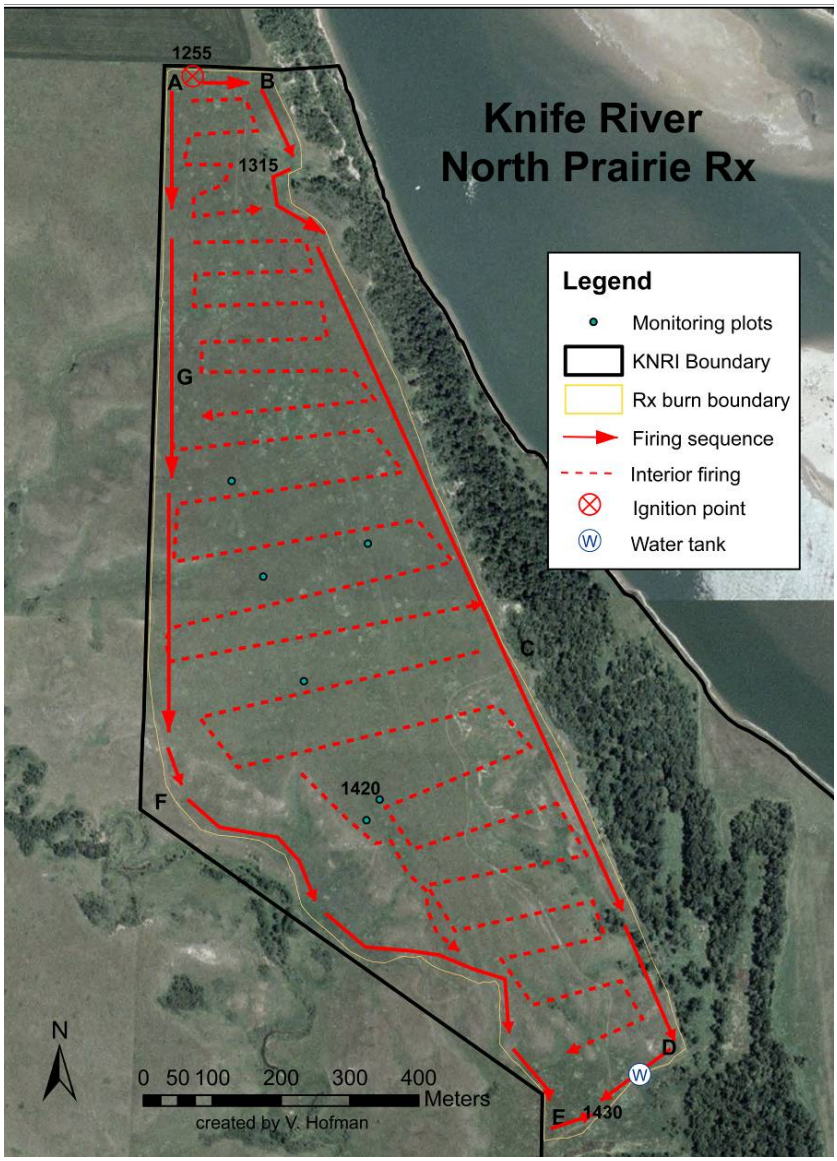
Predominantly south-southeast and southeast winds moved the smoke column northwest during the day. Smoke dispersal was forecast to be good at ignition, becoming poor by evening.

While existing cirrus clouds and max column height of 400 to 500 feet above ground level (agl) supported this forecast, predominant smoke dispersal was between 30 – 150’ agl, likely due to moderate fire behavior, green fuels and wind. Smoke dispersal appeared to be slightly better during the North Prairie burn. At 1305 hours, 15 minutes after the North Prairie ignition, the backing fire smoke was wind driven with smoke lofting to 30’; at 1345 a whitish-yellow column had developed with a height of 170’. The peak column height of 400-500’ was obtained at 1400 hours which coincided with larger head fire strips. Perimeter ignition was completed at 1430. At 1445, the final flame front moved upslope produced a 150’ column. During this burn, there were no reports of smoke impacts to roads or buildings. In contrast, during the Big Hidatsa, smoke began drifting onto state highway 31 and towards local housing, causing the prescribed fire to be halted early at 1630. During the burn at 1515, smoke only reached a height of 30’ and was primarily blown into the nearby valley; the column reached a height of 100’ while the fire was pulling in at 1530 only to drop again elevation with a backing fire. The greatest column height during the Big Hidatsa burn occurred at 1700, at the completion of perimeter ignition, when a yellow-brown slanted smoke column reached 200-300’, emanating from the western portion of the unit.

Fire Progression

The two units were burned consecutively, the North Prairie was burned first and upon completion resources were immediately moved to the Big Hidatsa unit.

Map 1. North Prairie Unit Fire Progression Map



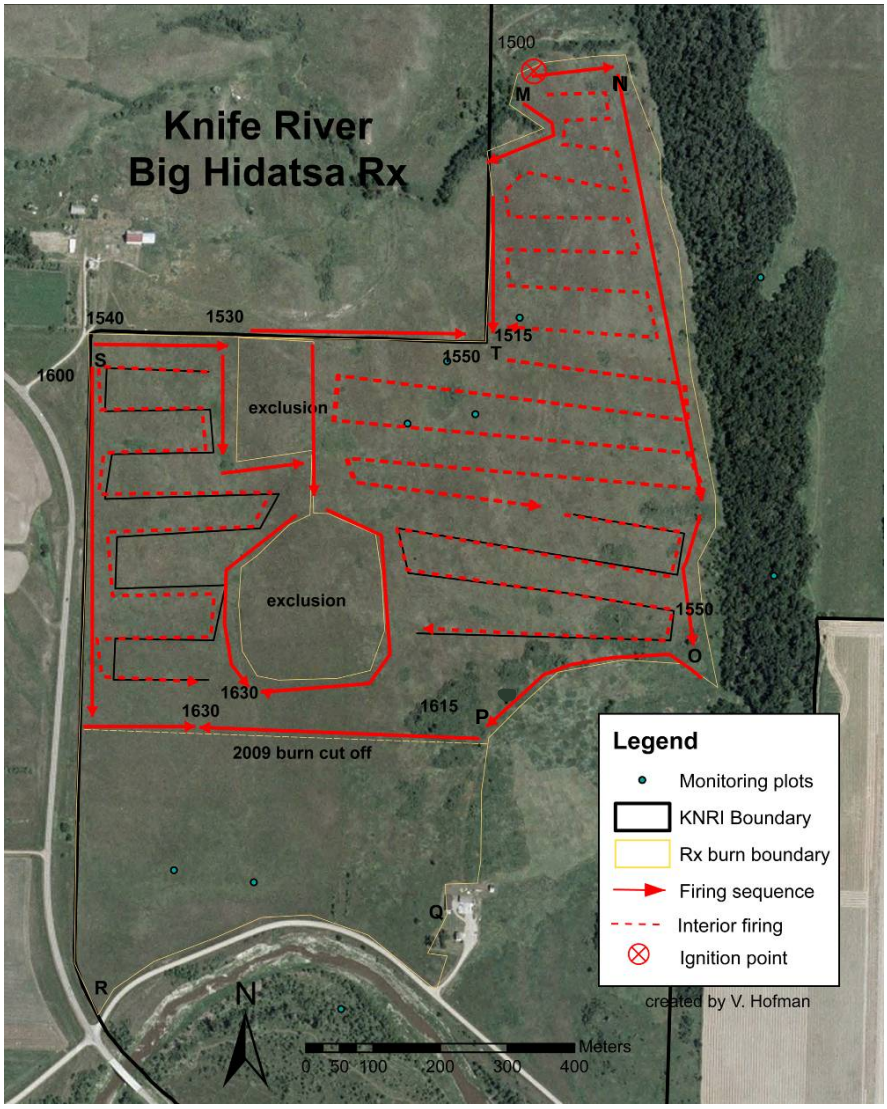
NORTH PRAIRIE

The North Prairie unit (see Map 1) was ignited at 1255 hours in the northwest corner of the unit at map point "A". Ignition progressed in two teams, one moving to the east and then south down the east line and the other team heading south down the west line. The interior was strip fired by a two-person team via ATVs throughout most of the unit. Ignition was completed at 1430 hours along the south line between map points "E" and "D". There were two fire effects monitors (one trainee) within the unit during operations. Three of the six monitoring plots were observed during the burn; the first plot, GFV 6, was burned at 1345 hours with a strip head fire, plot GFV 7 at 1400 hours with head and backing fires, and GFV 4 burned at 1420 with a head fire.

BIG HIDATSA

Ignition began at 1500 hours on the Big Hidatsa unit (see Map 2) in the northwest corner at map point “M”. Ignition progressed in two teams, one moving to the east towards the eastern line and the other along the west line. At 1515, the igniters along the west line reached map point “T” and held. Due to southeast winds, ignitions then bumped west to two locations along the line to the northwest corner of the northern exclusion (igniting at 1530) and map point “S” (igniting at 1540); both proceeded to light towards the east reaching map point “T” at 1550 hours. This team then moved and continued igniting south from map point “S” along the west line. The ignition team on the eastern side of the unit reached map point “O” and began burning towards map point “P”. Smoke impact on a nearby residence and highway was a concern due to southeast winds and poor smoke lofting. This along with sparse fuels in the southern portion of the unit resulted in the decision to exclude a portion of the unit, in effect cutting off the burn unit at map point “P” straight west to the

Map 2. Big Hidatsa Unit Fire Progression Map



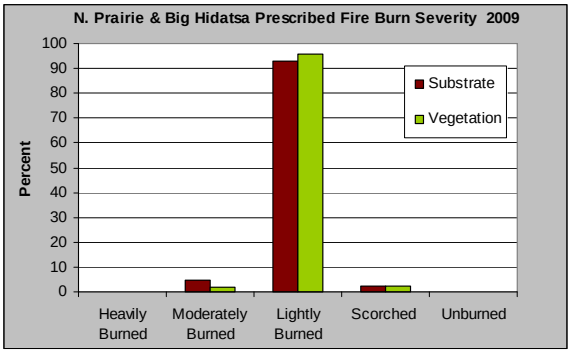
western line. The two ignition teams met in this area at 1630 hours. Holding teams extinguished the backing fire at 1650 hours just to the south of the exclusion zones (see Map 2). There were two cultural exclusions within the unit which were lit around and soft lines held starting around 1600 and completed by 1630. Interior ignition occurred throughout the unit, with a bulk of the unit receiving strip head fires as in the North Prairie. The fire effects monitors observed fire behavior in three of the four monitoring plots; plot STCO 5 was burned at 1530 with head fire, STCO 4 had backing and head fire at 1600 and STCO 3 burned with a flanking fire at 1610.


Head fire at STCO 5 plot, Big Hidatsa.

Fire Effects Monitoring

A total of four fuel load locations were sampled within the boundaries of the North Prairie and Big Hidatsa prescribed fire units in the morning prior to burning. Immediate post-fire burn severity was assessed the evening of the burn and the following morning at 10 plots; 6 in the North Prairie and the remaining in Big Hidatsa. Biomass loading in the North Prairie unit was higher than that in the Big Hidatsa unit. In the North Prairie biomass ranged from 3.10 – 5.01 tons/acre with an average of 3.80 tons/acre, whereas the Big Hidatsa biomass ranged from 0.99 – 2.37 tons/acre with an average of 1.48 tons/acre. This difference may have had influenced the burn severity within the two units. While very similar, the North Prairie unit did have slightly higher severity with 8.2% of substrate and 3.2% of vegetation recorded as "moderately burned" whereas the Big Hidatsa unit had no "moderately burned" results. Approximately 90% of all vegetation and substrate (litter, duff, and woody fuels) points sampled were of "lightly burned" severity. Graph 1 contains combined burn severity results for North Prairie and Big Hidatsa.

Graph 1. Burn Severity




Ignitions along west line, Big Hidatsa.

Conclusions

Goals achieved through the North Prairie and Big Hidatsa burns include firefighter and public safety as well as 1 hour fuel reduction. Some, but likely not substantial, 10 hour fuels were consumed. Change in cover of the non-native grass species will be assessed over the coming years as vegetation monitoring plots are remeasured.