

Scotts Bluff National Monument

Scott's Spring Prescribed Fire Monitoring Report

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Introduction

The Scott's Spring burn unit is a 618-acre unit of predominantly mixed grass prairie. It includes areas of native grassland and disturbed areas where fire is part of the restoration management plan. Ignition occurred on April 26 and May 4, 2002. Approximately 40 acres of the unit was burned on April 26 before winds exceeded the prescription and ignition ceased. The remainder of the unit burned on May 4.

Overhead personnel for the Scott's Spring burn consisted of Burn Boss Bill Gabbert with Eric Allen acting as Burn Boss Trainee, ignition specialist Edward Hiatt, and Steve Ipswitch as holding specialist. Holding forces included four Type 6 Engines, one ATV, a 7 person holding squad, and one structural engine. Resources included personnel from the National Park Service, the US Forest Service, US Fish and Wildlife and the Gering and Scottsbluff fire departments.

Objectives

Primary resource objectives for the burn:

- Reduce herbaceous fuel loading in native prairie areas by 30 % immediate postburn
- Decrease non-native herbaceous relative cover by at least 20% 2 years postburn
- Reduce brush density and relative cover by at least 30% 2 years postburn.

Summary of Events

Prior to the day of the burn, Scotts Bluff staff prepared for the burn by mowing a line along the east boundary and near the visitor center buildings. A short hoselay with portable pump was established in a perimeter area that was inaccessible to engines .

Five long-term fire effects monitoring plots were installed in 3 different vegetation types within the burn unit in the summer of 2000. Fuel and soil moisture samples were collected within the monitoring plots the day before the burn.

A briefing was conducted for all personnel on the morning of the burn. A National Weather Service spot forecast and on-site weather observations were obtained to assess compliance with prescription parameters. On April 25 ignition commenced at 0910 in the northwest corner of the unit and ceased at approximately 1130 due to strong winds. On May 4, ignition began at 1050 along the north boundary and ceased at 1715 in the southeast corner of the unit. Post-burn evaluations on the fire effects monitoring plots were completed on May 9.

Weather Observations

Monitoring of weather conditions for the Scott's Spring Prescribed Fire began on site the evening before ignition and continued through the day after ignition ceased. Observations were taken every hour during ignition and broadcast over the radio on the command channel. On April 25 winds were recorded at 10-15 miles per hour with gusts to 19. These winds were outside of prescription and ignition ceased for the day. On May 4, temperatures ranged from 50-72° F, with relative humidity from 59% to 27%, and winds were predominantly southeast 4-10 mph with a highest gust of 17 mph. Observed and predicted weather conditions are summarized in Table 1.

Table 1, Weather Conditions Observed on April 25 2002

| Condition | Temperature | Relative Humidity | Wind Speed (mph) | Wind Direction |
|--------------|-------------|-------------------|------------------------|----------------|
| Prescription | 35-95° | 20-60% | 2-10 | N,NE,E,SE,S |
| Predicted | 50-55° F | Min 20-25% | 10-15 Gusts to 20 | Southeast |
| Observed | Max 58° F | Min 27% | 5-15 SE Gusts to 19 | Southeast |

Table 1, Weather Conditions Observed on May 4, 2002

| Condition | Temperature | Relative Humidity | Wind Speed (mph) | Wind Direction |
|--------------|-------------|-------------------|----------------------------------|-----------------|
| Prescription | 35-95° | 20-60% | 2-10 | N,NE,E,SE,S |
| Predicted | Max 66° F | Min 33% | light a.m. 8-13 p.m. | N becoming SE |
| Observed | Max 72° F | Min 34% | 2-5 a.m. 4-10 gust to 17 p.m. | SE W t-storm |

Ignition Pattern

Ignition began on April 25 with a test in the northwest corner of the burn unit. The ignition teams worked in a badlands area that also contained a cottonwood and willow bottomland. Ignition moved to the south and east along the base of Saddle Rock. Strong winds shut down the firing for the day with approximately 30 acres burned. On May 4, the ignition team began igniting northwest to southeast flanking strips from the north boundary through the old golf course restoration area. By 1420, the ignition team had reached a mowline that bisected the unit. The ignition team then moved to the west boundary of the unit just north of the visitor center and fired along the base of Scotts Bluff from west to east. A second ignition team worked around the visitor center and moved east along Highway 92. Much of the southeast portion of the unit burned as head and flanking fires resulting from the Highway 92 ignition. The final portion of the unit included some deep ravines in the extreme southeast corner with ignition ceasing at about 1800. (See attached fire progression map)

Fire Behavior Observations

Fire behavior observations were taken regularly during ignition on May 4 on different aspects and in different fuel types. Active fire behavior occurred as soon as ignition began and continued past sunset. For backing fire, flame lengths ranged between 4 and 8 inches. Rates of spread for backing fire ranged from 0.4 to 0.7 chains per hour. Head fire rates of spread ranged from 0.8 to 40 chains per hour. Flame lengths for head fire ranged from 6 inches to 3 feet, with flame zone depths of up to 2 feet. Fire behavior observations are summarized in Table 2.

Table 2, Fire Behavior Observed on 11/15/01

| Time | Fuel Model | Fire Type | Rate of Spread (ch/hr) | Flame Length | Flame Zone Depth | Comments |
|------|-----------------|------------|------------------------|--------------|------------------|-------------------------------------|
| 1149 | Bromus tectorum | backing | 3 ch/hr | 4-6" | 4-6" | Plot brome 1 |
| | " | flank | 4 ch/hr | 6-12" | 8" | Plot brome 1 |
| 1218 | Bromus tectorum | Flank/back | N/a | 2-4" | Variable 0-2" | Plot brome 2 incomplete consumption |
| | " | head | 30-40 ch/hr | 3' | 2'-3' | Plot brome 2 |
| 1255 | Agropyron | head | 120 ch/hr | 4" | 4" | 10 mph wind |
| 1500 | Mixed grass | Back | 2 ½ ch/hr | 12" | 6" | |
| 1725 | Stipa/bromus | Flank | 2 ½ ch/hr | 6"-18" | 6"-12" | Near plot stipa 8 |

Biomass, Fuel and Soil Moisture Measurements

Biomass samples were collected from 4 grass plots in this burn unit. Total grass and forb biomass ranged from 1.3 to 2.1 tons per acre and averaged 1.7 tons per acre. Soils were sampled at 3 plots on April 24, the day before the first ignition, and moisture averaged 7.4% moisture. One plot was sampled May 3, the day before the second day of ignition, and had soil moisture of 21.8%. The May 3 value is likely more representative of soil moisture when most of the unit burned.

Smoke Monitoring

On both days of ignition, southeast winds predominated so most of the smoke traveled in a northwesterly direction. Therefore smoke did not impact the towns of Gering or Scottsbluff. More smoke was produced on May 4 where the column rose between 400' and 1500' with some smoke staying near the ground as it moved northwest. Overall smoke volume was light to moderate.

Fire Monitoring

Five long-term fire-monitoring plots are located within the Scott's Spring burn unit. Two plots are located in the non-native prairie dominated by cheatgrass (*Bromus tectorum*), 2 plots are in a mixed native grass area, and one plot is in a snowberry (*Symphoricarpos* spp.) shrubland community. These plots were read 5 days post-burn to determine burn severity of vegetation and substrate (litter and soil). The grassland plots showed a lightly burned vegetation and a scorched substrate. The one shrub plot showed a moderately burned vegetation component and a scorched substrate. They will be read 1, 2, 5, and 10 years after treatment of fire to determine the immediate, short, and long term ecological and vegetative effect fire had on this burn unit.

Conclusions

The long-term health of ecosystems is the focus of the prescribed burning program in the Northern Great Plains and at Scotts Bluff National Monument, therefore certain criteria need to be assessed. Some objectives are immediately measurable such as burn severity immediate post-burn. Other quantifiable objectives need to be viewed over the course of several years before results can be determined. With a long-term ecological monitoring program in place, a quantifiable assessment of the specific objectives for this prescribed fire can be made in the future.

| Resource Objective | Monitoring Status |
|--|--|
| Reduce herbaceous fuels by 30% immediate postburn | Immediate post-burn measurements showed a scorched to light burn |
| Decrease non-native herbaceous relative cover by at least 20% 2 years postburn | Four grassland plots will be read 1, 2, 5, and 10 years post burn to quantify this objective |
| Reduce brush density and relative cover by at least 30% 2 years postburn | One shrub plot will be read 1, 2, 5, and 10 years post burn to quantify this objective |