

Don't tread on me: Effects of cattle trampling on burned archeological sites of the upper Greybull River, Wyoming

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Abstract

An improved understanding of the impacts domestic animal grazing on archeological sites needs to be developed for both land managers and archeologists to fully address the range of modifications that fire can have on the archeological record. The Greybull River Sustainable Landscape Ecology (GRSLE) project investigates a range of biological, physical and cultural impacts to archeological sites along the Greybull River drainage, which is located in the Shoshone National Forest of northwestern Wyoming. The 2006 Little Venus Fire opened a narrow window of opportunity for archeologists to investigate the effects of forest fires on archeology. Data collection for this project was conducted during the 2007 summer field season. Three hundred and twenty-eight square meters were surveyed for cattle footprints. Those footprints were then recorded in terms of location, maximum length, width and depth. A block sampling design covering 168 m² of burned mountain grassland was recorded and coupled with an adjacent plot covering 100 m² of unburned grassland. Neither block sample contained previously recorded archeological material. A linear transect sampling design was applied on two known sites. On one site, a 25 m² section was recorded and on the other, a 35 m² section was recorded. Approximately 25% of each transect was outside of the burned area. This research provides a basis for evaluating management strategies and working towards a more integrated approach for understanding the effects of cattle grazing and other post-fire impacts on recently burned archeological sites.

Recording data on TRP 121. Each flag represents an already recorded print.

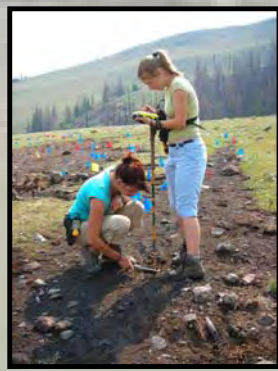


One of many cattle foot prints recorded on site TRP 139.

Methods

To measure the effects of cattle on burned archeological sites, a series of measurements were taken on three different sites, one of the sites containing no archeological material to be used as a control. Maximum length, width and depth was recorded for each footprint. After each print was recorded, a pin flag was placed on it in order to keep track of which prints had been recorded and which had not.

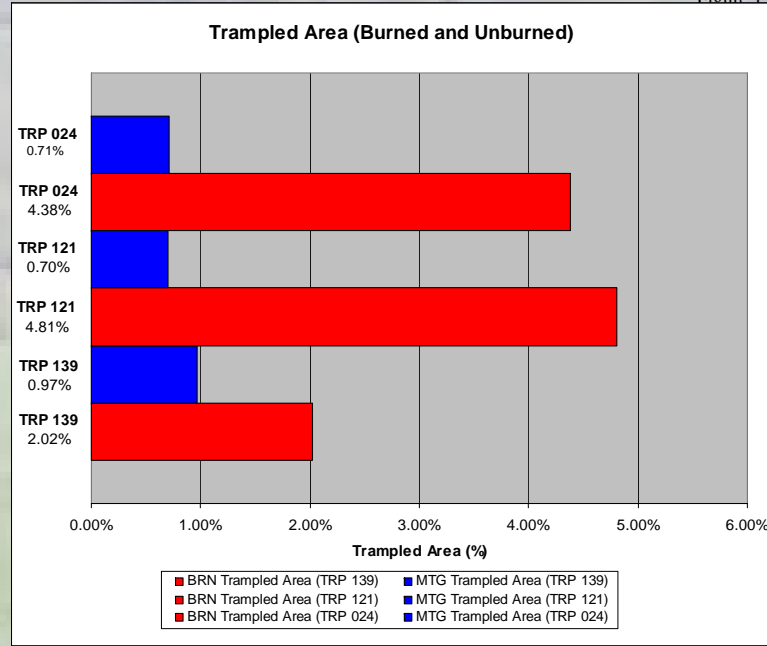
On site TRP 139, the control site, an area covering 168 m² of burned mountain grassland was recorded and coupled with an adjacent quadrat plot covering 100 m² of unburned grassland. Neither area contained previously recorded archeological material. A linear transect sampling design was applied on two known sites, TRP 121 and 024. On TRP 121, a 25 m² transect was recorded and on TRP 024, a 35 m² transect was recorded. Approximately 25% of each transect was outside of the burned area.



All Data collection was done in along Jack Creek, a tributary of the upper Greybull River, in Northwestern Wyoming

Materials

To record the location of each print, a Trimble Juno GPS system was used. The footprint was measured by hand using a set of calipers measuring in millimeters. Weather the print was in a burned (BRN) or mountain grassland (MTG) area was also recorded. Cow pies were measured and recoded in the same way.



A set of cattle foot prints recoded on site TRP 121.



A cow pie recorded on TRP 139.

Results

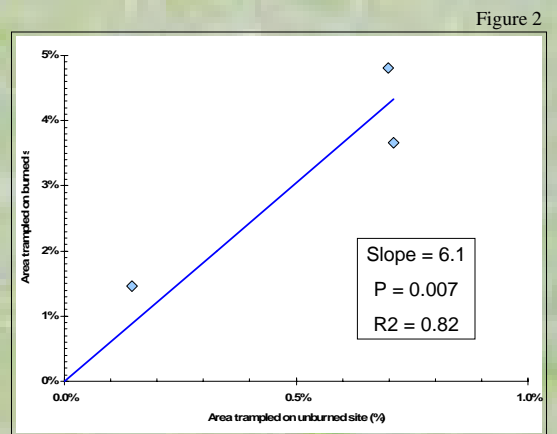
A regression of the proportion of area covered by prints in the burned versus the paired unburned control areas has a linear regression line with a slope of 6.1 (±0.72 SE) indicating that trampling on unburned areas is just under 6.1 times greater than on burned areas (Figure 2). The linear model fits the data well (R² = 0.82) and the slope coefficient is highly significant (p = 0.007). Therefore, the magnitude of the effect of the burn is large and the statistical confidence in the impact of the burn is very high. The average footprint depth for MTG areas was 12.44 mm. The average footprint depth for BRN areas was 18.37 mm. The depth of each footprint was an average of 5.92 mm deeper on burned sites than on unburned mountain grassland.

| BRN | | | |
|---------------------|---------|---------|---------|
| | TRP 024 | TRP 121 | TRP 139 |
| Average Length (mm) | 105.09 | 101.80 | 117.40 |
| Average Width (mm) | 94.84 | 93.25 | 108.80 |
| Average Depth (mm) | 13.95 | 19.36 | 21.80 |

| MTG | | | |
|---------------------|---------|---------|---------|
| | TRP 024 | TRP 121 | TRP 139 |
| Average Length (mm) | 124.31 | 93.57 | 112.36 |
| Average Width (mm) | 103.36 | 85.17 | 99.12 |
| Average Depth (mm) | 10.00 | 11.49 | 15.84 |

Discussion

The data show that the damage to archeological sites caused by cattle trampling increases significantly when cattle are allowed to graze on recently burned sites. After a large burn, the ground in a burned area becomes softer, which allows cattle's hooves to sink further into the ground. These deeper footprints can cause artifacts to become embedded in the soil, making them impossible to see. Cattle trampling also churns up the exposed soil on burn areas, allowing wind to shift the loose sediment, which buries and moves artifacts around the landscape, compromising the archeological record. In order to protect our archeological resources, land managers need to consider the effects of human, livestock and wildlife land use on these sites after a fire.



Recording date on TRP 139.



An example of the effects of cattle prints on a site. The bones in this picture have been crushed by cattle trampling.

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