FIELD COLLECTION OF FUEL LOAD AND VEGETATION CHARACTERISTICS WILDFIRE RISK ASSESSMENT MODELING: 2002 FIELD SAMPLING REPORT

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ABSTRACT

Fuel load and vegetation characteristics were collected at 370 sample points across sagebrush-steppe regions in southeast Idaho. We collected visual estimations of fuel load (tons/acre), percent cover of major ground cover types (shrub, grass, litter/duff, bare ground, and cheatgrass), and basal stem measurements of big sagebrush (Artemisia tridentata spp.). These data were collected to validate fuel load and wildfire risk models created following the 2001 field season and to refine and rebuild these models in order to improve upon their accuracies. These data will also be used in other projects conducted at the GIS Training and Research Center including fuzzy classification of sagebrush-steppe vegetation, modeling of invasive weed distribution and density, and other wildfire research conducted as part of the NASA-funded Wildfire Effects on Rangeland Ecosystems and Livestock Grazing project.

Keywords: Grazing, Snake River Plain, Sagebrush-Steppe

INTRODUCTION

Field measurements and observations collected during the summer of 2001 were used to create a series of models (e.g. fuel load, comprehensive wildfire risk, etc.) for the NASA-funded *Wildfire Effects on Rangeland Ecosystems and Livestock Grazing* project. During the 2002 summer field season, additional data was collected to determine the accuracy of these models. These data were also used to refine and rebuild the fuel load and wildfire risk models, and to create new components for a comprehensive wildfire risk assessment (cf. chapter 8).

Study Area

This study was conducted on land managed by the United States Department of the Interior Bureau of Land Management (USDI BLM) in the Upper Snake River Plain, Southeast Idaho. Sampling sites were located in Burley and Idaho Falls BLM Districts, and had a spatial extent of approximately 110 x 115 km (min x: 520000, max x: 630000, min y: 170000 max y: 285000, Idaho Transverse Mercator, GCS: NAD27, Datum: NAD27, Clarke's 1866). This area is a sagebrush-steppe semi-desert bordered by large, relatively recent lava formations to the south and west and irrigated agricultural lands to the north, south, and east, and has a history of livestock grazing and wildfire occurrence.

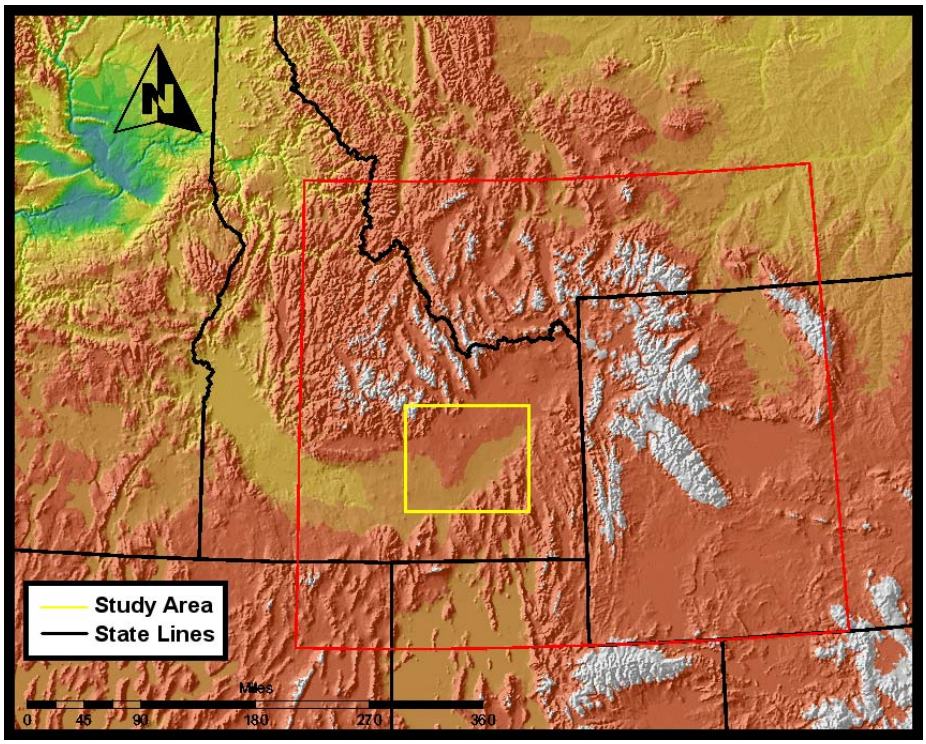

Figure 1. Study Area for NASA Wildfire Livestock (NWL) interactions project shown in yellow (light gray), Area Of Concern (AOC) for the ISU GIS Training & Research center shown in red (dark gray).

METHODS

Traditional methods of quantifying vegetation cover are time intensive and may not reliably represent the patterns necessary for use in landscape scale remote sensing analyses. We collected data at our sample points (n = 370) that better represents how large-scale remote sensing platforms image the landscape (e.g. Landsat ETM7+, 30m pixels, ~150km x 150km extent). We gathered ocular estimates of fuel load, vegetation type and percent cover, and dominant shrub species/height within an area representing approximately four Landsat pixels (~3600m^2 (60x60m)).

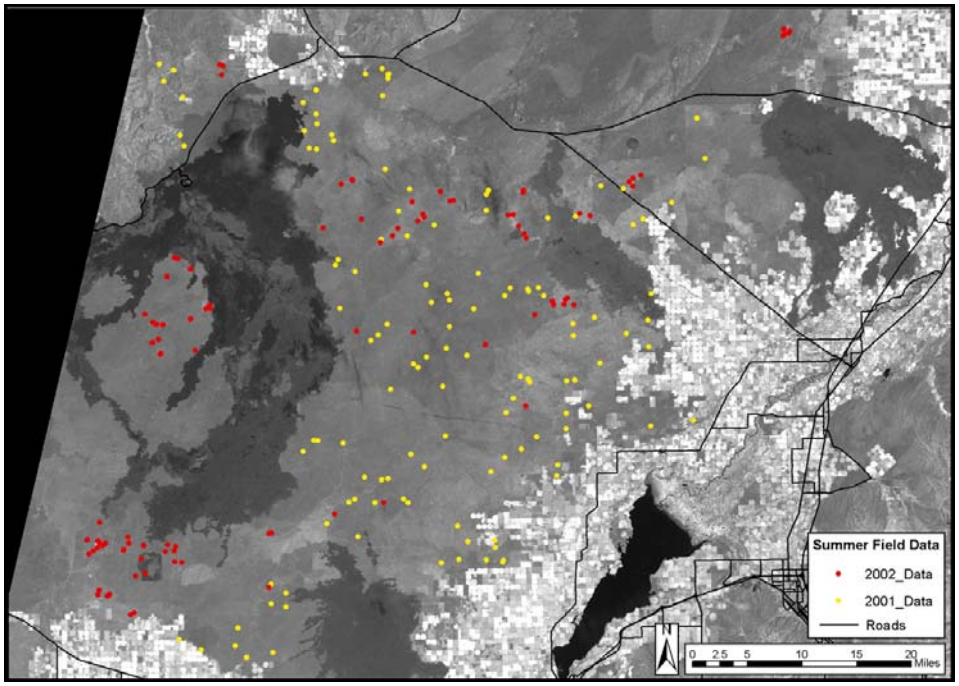

Figure 2. Sample points for summer 2001 field season (n = 128) (yellow/light gray) and 2002 summer field season (n = 370) (red/dark gray).

Fuel Load Estimation

Fuel load was estimated based on the same five categories of fuel load found in this area during the 2001 field season (cf. chapter 1). These categories were 0.74 tons/acre, 1.0 tons/acre, 2.0 tons/acre, 4.0 tons/acre, and 6.0 tons/acre. We stratified our sample point collection so that each fuel load category in the fuel load model would have at least 25 points for validation. Note: following USDA-USFS fuel load identification guidelines (Anderson 1982), only three fuel load/fire behavior categories are applicable to this area (0.74 tons/acre, 4.0 tons/acre, and 6.0 tons/acre). In order to increase the number of fuel load types available for modeling, technicians created two intermediate categories (1.0 tons/acre and 2.0 tons/acre) to better account for the continuum of fuel load levels between 0.74 tons/acre and 4.0 tons/acre.

Vegetation Estimation

We estimated ground cover immediately adjacent to each sample point for five general cover types (shrub, grass, cheatgrass (a dominant invasive weed found in the study area and included within the grass cover estimation as well), litter and duff, and bare ground). Percent cover for each of these vegetation types were estimated using categorical breaks of 0%, 1-5%, 6-15%, 16-

25%, 26-35%, 36-50%, 51-75%, 76-95%, and 96-100%. For each sample, the dominant shrub species (e.g., sagebrush, rabbitbrush, other, or none) and mean shrub height category (0-50cm, 51-100cm, 101-150cm, >150cm, or none) was also recorded.

Big Sagebrush (*Artemisia tridentata* spp.) Age Estimation

Maximum basal stem diameter (+/- 1 mm) of big sagebrush plants was measured (within the first 25 cm of stem height). Four samples were taken at each sample point, one within each quadrant (northwest, southeast, southwest, and northwest) centered over the sample point. The big sagebrush plant nearest the plot center in each quadrant was measured. If no big sagebrush plant was within 30 meters of the sample point, a null measurement was recorded. The age of each big sagebrush plant was estimated using a modified linear regression model (6.1003 + 0.5769 * [diameter]) (Perryman and Olson, 2000).

Photo Points

Digital photos were taken using an Olympus D-360L in each of 4 cardinal directions (north, east, south, and west) from the sample point.

RESULTS AND DISCUSSION

Sample points were collected in order to validate our existing fuel load model (created following the 2001 summer field season) and produce an improved model. Points were stratified by treatment (fire and grazing, Table 1). As a result, sample points were spatially clustered (Figure 3). Inferences drawn from observed differences in vegetation should take into consideration the distribution of sampling used for this study.

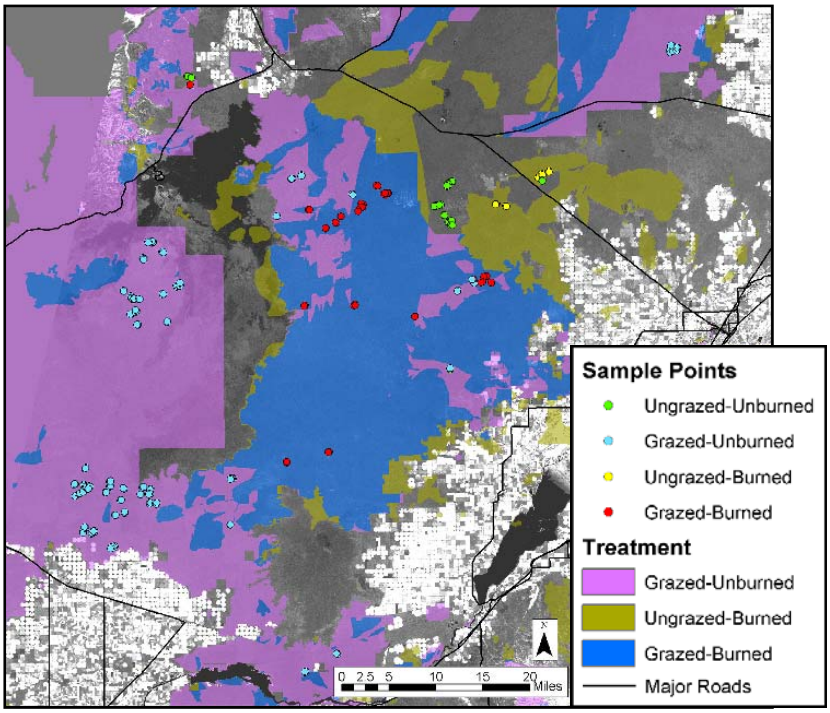

Figure 3. Sample points symbolized by treatment. Spatial extent of the treatment types is also displayed.

Table 1. Stratification of treatments.

	Fires			
Treatment	**0**	**1**	**>1**	**Total**
Grazing	211	6	3	220
No grazing	74	55	21	150
Total	285	61	24	370

The mean fuel load was 2.3 tons/acre (std. dev. = 1.31, *n* = 370) and the median fuel load class was 2.0 tons/acre (skewness = 0.31). The vegetation found at these sites is perhaps best characterized using mode since categorical data was recorded (Table 2). Shrub and grass cover was most commonly estimated in the 16-25% category, with big sagebrush (*Artemesia tridentata*) being the most common shrub species. Cheatgrass (*Bromus tectorum*) was found at most sample locations with a mean, median, and mode cover class in the 1-5% category. Litter cover was typically 16-25% and bare ground comprised 26-35% of all sample locations.

Field samples recorded in 2001 yielded similar results for several of the sampled parameters. Bareground was typically estimated in the 26-50% category (note: modified categories were implemented in 2002 so direct comparisons are not possible) while litter was estimated at <25%. In contrast however, is the fact that grass cover was most commonly estimated at 26-50% in 2001 compared to 16-25% in 2002. This is primarily due to the presence and abundance of cheatgrass in 2001, which in many cases comprised all grassy cover at sample locations.

Big Sagebrush Age Estimation

The mean age of big sagebrush plants sampled in the region was 25.4 Years (std. dev = 10.9, minimum 10.7, maximum 75.9, *n* = 187). Further analysis of the sagebrush age study can be found in chapter 5.

CONCLUSIONS

The 2002 field season was successful in many ways. First, data were gathered to support a reliable validation of preliminary fuel load models developed using 2001 field data. Second, many (*n* = 370) vegetation samples were recorded that add either directly or indirectly to our knowledge base regarding the ecological dynamics acting on rangelands in the Intermountain West.

ACKNOWLEDGEMENTS

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LITERATURE CITED

Perryman, B.L., and Olson, R.A. 2000. Age-Stem Diameter Relationships of Big Sagebrush and Their Management Implications. Journal of Range Management, v53 pp342-346, May 2000.