NORTHWESTERN BUNCHGRASS PRAIRIE MONITORING SITES DATABASES

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Front Cover

Photo was taken by D. Damiran in the northwestern native bunchgrass communities at the Nature Conservancy's Zumwalt Prairie Preserve, Oregon in June of 2006. The prairie has been grazed for over 100 years and in the past >50 years has been used as spring/summer pasture for cattle. Native ungulates (*Odocoileus hemionus*, *Cervus elaphus*) and Belding's ground squirrels (*Spermophilus beldingi*) are common.

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Northwestern Bunchgrass Prairie Monitoring Sites Databases

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Summary

There were 576 rangeland monitoring sites established at The Nature Conservancy's Zumwalt Prairie Preserve, which is the largest remnant of the northwest bunchgrass ecosystem. This document provides data of the first soil surface and vegetation surveys conducted on the prairie during the summer of 2006, from mid June to late July, on the given points. Information spread on about 32,000 rows x 5-6 columns was included in this document. Data on soil surface characteristics, vegetation visual obstruction measurements, botanical composition, plant canopy cover and standing crop, and a list of plant species occurred throughout the monitoring sites during this sampling period are presented in Table 1, 2, 3, 4, 5 and 6, respectively. This information is intended to provide a reference material and benchmark of this rangeland for future investigators and managers. When disturbances occur, either natural or human-induced, these permanent sites and databases on them will provide a good opportunity to re-visit, re-sample, and evaluate the changes resulted from the disturbances at a given point in time.

Key words: Biomass, Bunchgrass Community, Rangelands Monitoring, Time Series Analysis

Study Area and Techniques Employed for the Monitoring Survey

Monitoring Area

The area selected for our study was within The Nature Conservancy's (**TNC**) Zumwalt Prairie Preserve which is located near the city of Enterprise in the northeast of Oregon (Figure 1). The Zumwalt Prairie is the largest remnant of the northwest bunchgrass ecosystem type (Tisdale, 1982). The area is on a basalt plateau at an elevation of 1340 to 1460 m with little relief (mean slope = 7%) and receives around 330 mm of precipitation annually (30-year average) with a distinct dry period in July and August. Precipitation is bimodal, falling in spring as localized thunderstorms and in winter as snow. Long-term average annual temperature (30-year average) is 6.4°C, and ranged from -2.8°C (December) to 17.1°C (July). Precipitation and temperature data (NOAA, 1957-1987) were from the Enterprise, Ore. weather station at 1163 m elevation located northwest (<30 km) of the study area. Soils are mostly shallow to moderate deep silt loams with patchy influence of loess. Small areas of shallow and very shallow rocky soils occur on ridgetops and upper hillslopes (USDA, NRCS, TNC, unpublished data). The study area has been grazed for over 100 yr and in the past >50 yr has been used as spring/summer pasture for cattle (P. Shephard, personal communication). Other common herbivores include native ungulates (*Odocoileus hemionus*, *Cervus elaphus*) and Belding's ground squirrels (*Spermophilus beldingi*).

Establishing Monitoring Sites

Monitoring sites established and survey was conducted from mid June to late July of 2006. The monitoring sites were established as a part of a larger, multi-disciplinary study examining the effects of livestock stocking rates on the grassland food web. In the

databases, all monitoring sites are marked with the geographical positions which makes possible for investigators to use them as long term permanent monitoring sites, as well as for short and mid term research purposes. There were four blocks of land 160 ha in size, and within each block, four contiguous paddocks were partitioned, each 40 ha in size (Figure 2). Three grazing treatments (low, medium, and high) and control were assigned randomly to each block. Within each paddock, we established a set of 36 monitoring sites which were uniformly distributed along a grid of 6 north (**N**)-south (**S**) transects (columns) and 6 east (**E**) - west (**W**) transects (rows) that traversed each paddock. Transects were approximately 90 m apart. Monitoring sites were then located 1.5 m from the intersection of each N-S and E-W transects. Each monitoring site has been assigned a unique identifier and permanently marked using stake whiskers and with numbered metal tag. This resulted in 144 monitoring sites for each paddock, for a total of 576 monitoring sites available for clipping and 1152 – for estimating canopy cover.

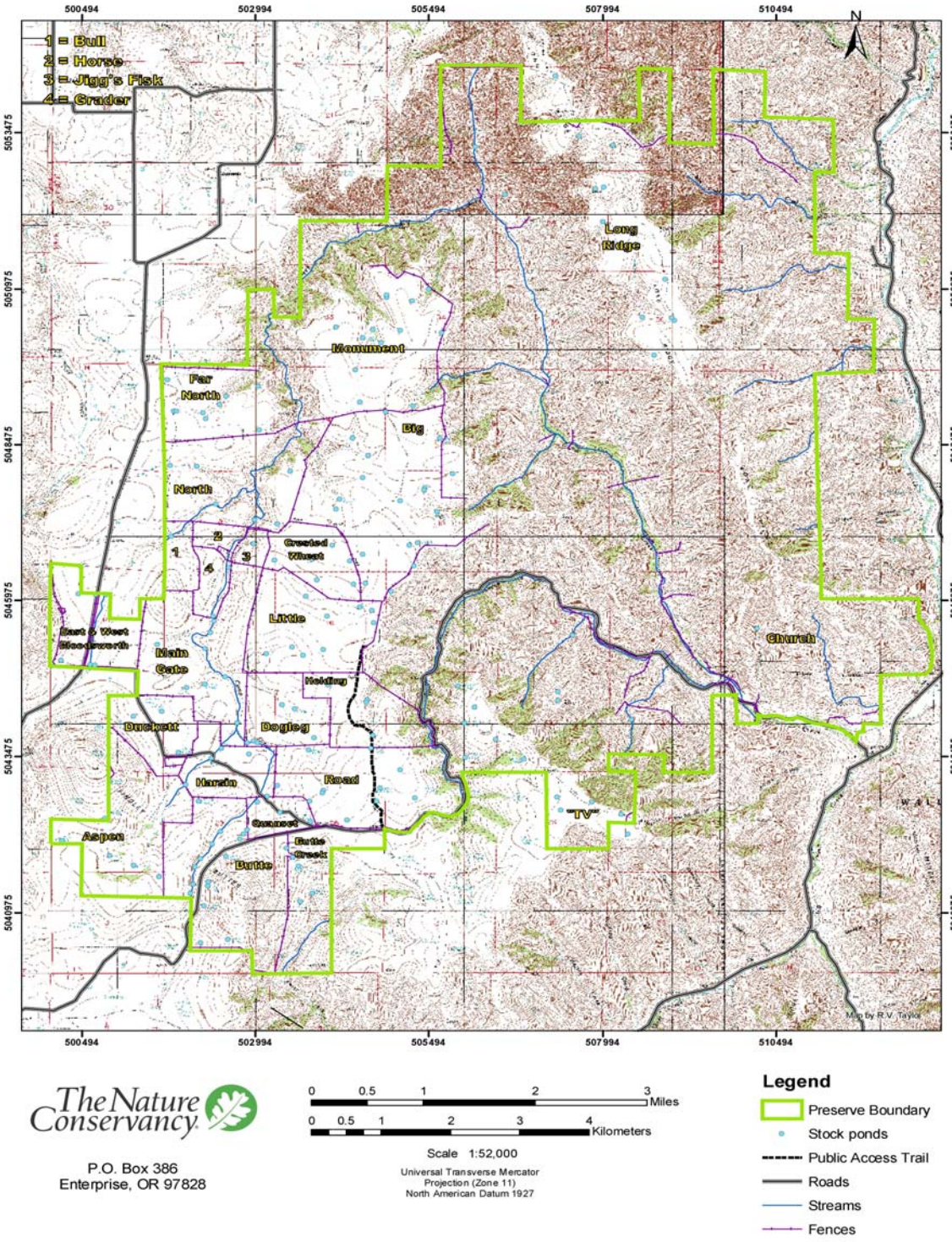


Figure 1. The area selected for our study was within The Nature Conservancy's Zumwalt Prairie Preserve which is located near the city of Enterprise in the northeast of Oregon

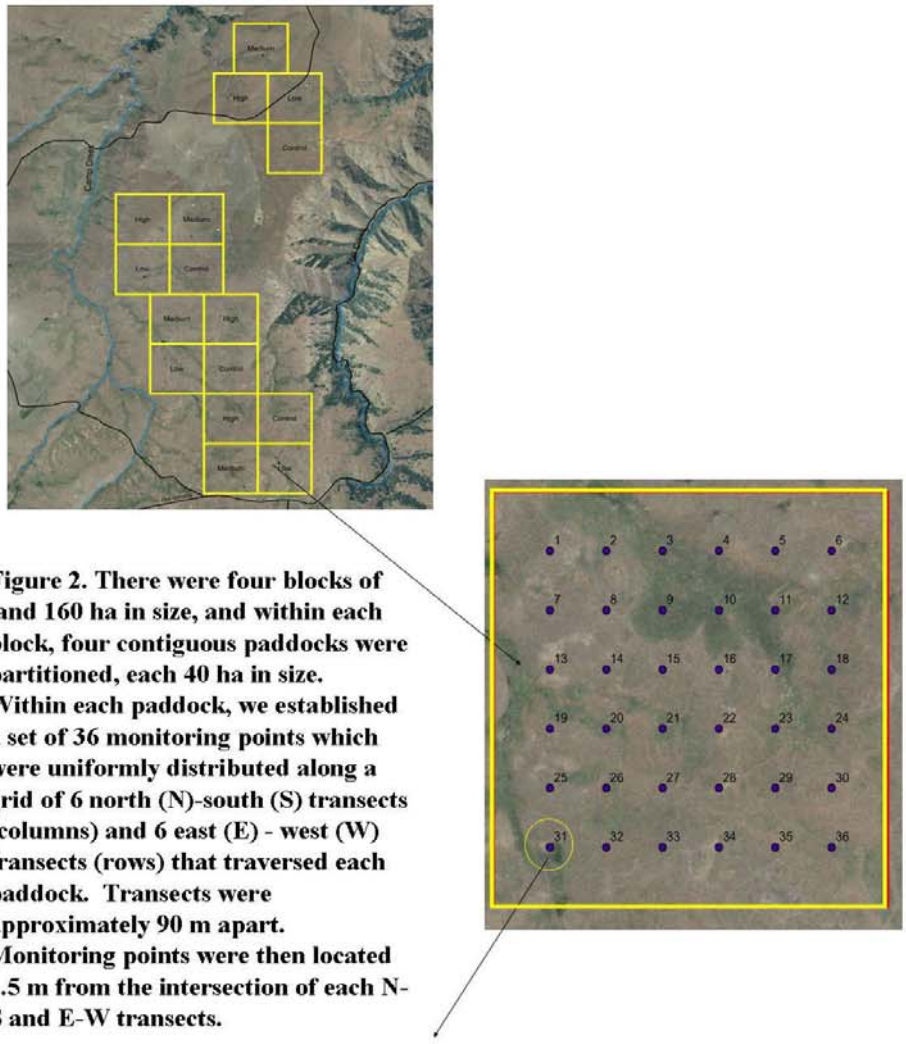
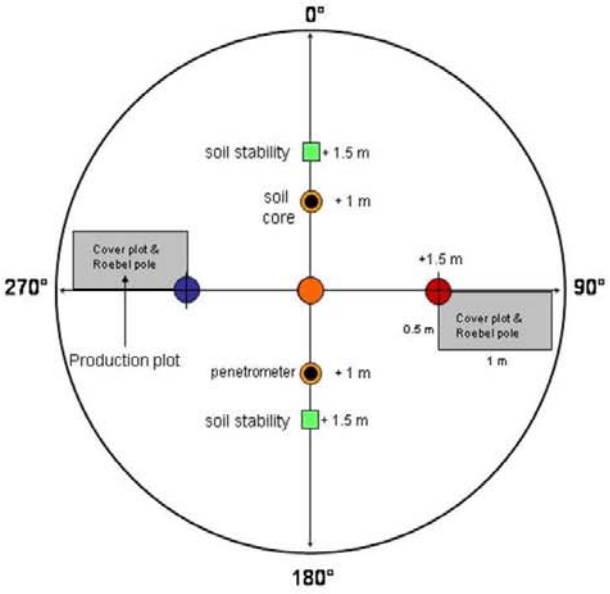


Figure 2. There were four blocks of land 160 ha in size, and within each block, four contiguous paddocks were partitioned, each 40 ha in size. Within each paddock, we established a set of 36 monitoring points which were uniformly distributed along a grid of 6 north (N)-south (S) transects (columns) and 6 east (E) - west (W) transects (rows) that traversed each paddock. Transects were approximately 90 m apart. Monitoring points were then located 1.5 m from the intersection of each N-S and E-W transects.



Visual Obstruction

Visual obstruction (VO) measurement data were collected from each monitoring site in mid June to late July of 2006. Two 2-person teams carried out the field work of this study. The approach described by Robel et al. (1970) was used to measure VO and to clip and harvest standing crop a 0.5 m^2 (0.5 × 1 m) rectangular frame or plot was used. Equipment used for VO measurement was similar in design to that used by Robel et al. (1970) and consisted of 2 poles (60 and 100 cm, reading and sighting poles, respectively) that were connected by a 4-m nylon cord attached to the top of each pole. The reading pole was painted in white and marked at each decimeter, with 0.5-dm increments in red. The bands were numbered in ascending order beginning with 1 dm at the bottom. One person positioned the reading pole vertically in the center of a 0.5 m^2 (0.5 × 1 m) rectangular frame. Second person, the observer, would place the sighting pole at a distance of 4 m from the center of the frame. Looking from a height of 1 m, the observer would read the number of the lowest band not obstructed by vegetation (Damiran et al., 2007). At each monitoring site, 4 VO measurements were recorded, 1 for each cardinal direction. The four VO measurements were averaged for each monitoring site and multiplied by 10 to convert to centimeters. Every 3 days of the fieldwork, observers rotated between their duties to minimize potential individual observer's biases.

Percent Cover

Canopy cover was measured in a rectangular frame (0.5 × 1 m, 0.5 m^2) on 1152 plots (2 plots set at each monitoring site) by ocular estimation (Daubenmire, 1959). Cover classes were: 0 = 0%, 1 = 0.01-1%, 2 = 1.1-5%, 3 = 5.1-25%, 4 = 25.1-50%, 5 = 50.1-75%, 6 = 75.1-95%, 7 = 95.1-99%, and 8 = 99.1-100%, which later converted to the

midpoint percentage of the estimate. Canopy cover was estimated for each vascular plant species having canopy within plot boundaries. We also estimated the amount of the soil surface falling into the following 7 categories: bare ground, herbaceous litter, woody litter (>5 mm diameter), rock fragment (>5 mm), bedrock, bryophyte, and lichen or other biological soil crust (Darambazar et al. 2007).

Standing Crop

After VO measurement, all vegetation within the rectangular frame was clipped at ground level. All clipped samples were separated by live and dead materials, the latter of which was discarded. Live material (standing crop) further separated by botanical species, was oven dried at 60°C for 48 h, weighed, and expressed in $kg \cdot ha^{-1}$. Total standing crop of a monitoring site was determined by summing the aboveground biomass of all species removed from each plot. Plant species nomenclature and separating plants by growth form, life span, and origin throughout this paper follow the recommendations of the USDA Natural Resources Conservation Service (USDA, NRCS, 2007).

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