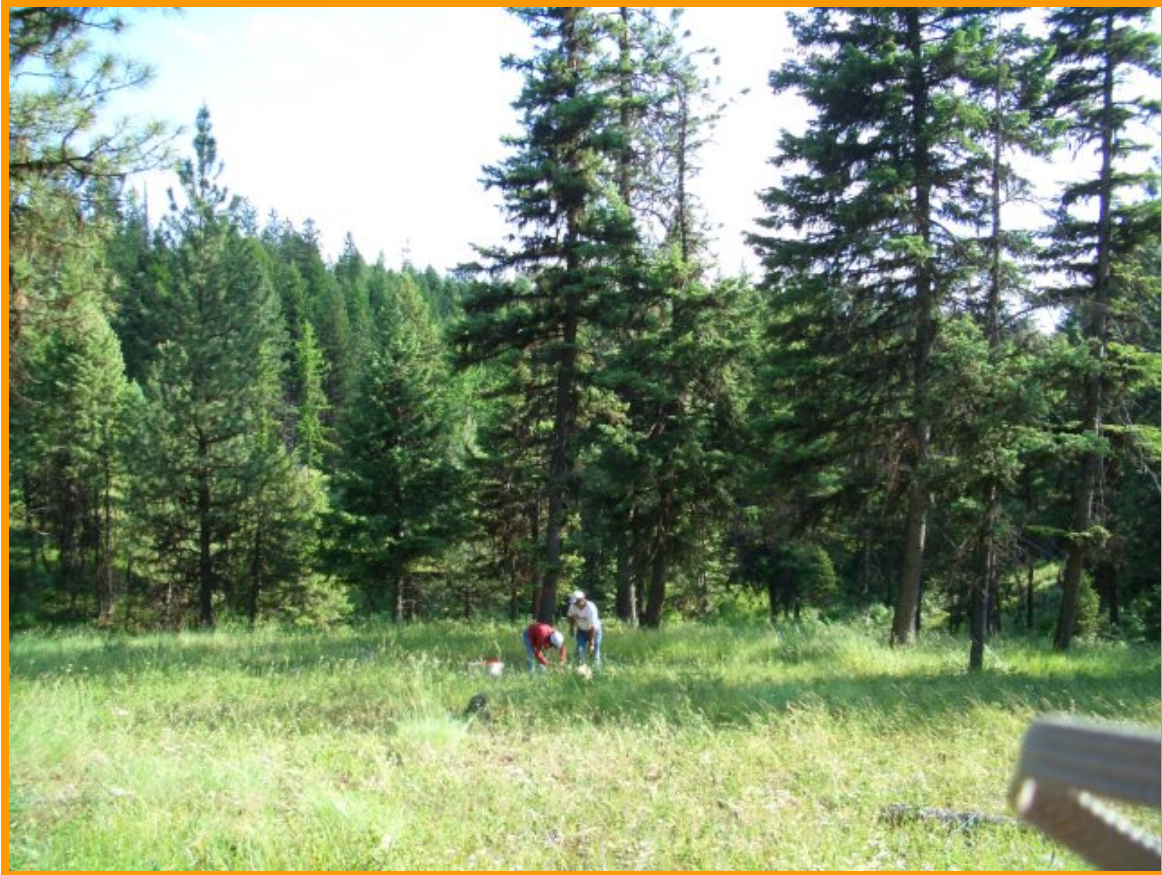


**MONITORING SITES DATABASES: TRANSITIONAL FORESTED  
RANGELANDS IN THE BLUE MOUNTAINS  
OF EASTERN OREGON**



**Eastern Oregon Agricultural Research Center  
Circular of Information No. 6  
May 2008**



Eastern Oregon Agricultural Research Center/Union Station  
Oregon State University, 372 South 10<sup>th</sup> Street, P.O. Box E, Union, Oregon 97883  
T 541-562-5129 | F 541-562-5348 | <http://oregonstate.edu/dept/eoarcunion/>

*Damiran, D., T. DelCurto, E. Darambazar, R. A. Riggs, M. Vavra, and J. G. Cook. 2008. Monitoring sites databases: Transitional forested rangelands in the Blue Mountains of Eastern Oregon.*

**Acknowledgements:**

The project was funded by Boise Cascade Corporation, and Oregon State University's Eastern Oregon Agricultural Research Center (EOARC). We thank Uranbileg Daalkhaijav, Amartuvshin Daalkhaijav, Abe Clark, Micah Wells, and other vegetation crew members for their assistance with working in the remote/rugged areas for extended hours, camping for weeks in the varying climatic conditions in order to accomplish this survey. Our gratitude extends to Ronney Slater, who contributed a great amount of time for site establishment.

**Suggested citation for this circular:**

Damiran, D., T. DelCurto, E. Darambazar, R. A. Riggs, M. Vavra, and J. G. Cook. 2008.

Monitoring sites databases: Transitional forested rangelands in the Blue Mountains of Eastern Oregon. Circular of information No. 6, Union, Oregon, USA: Eastern Oregon Agricultural Research Center, Oregon State University. ©EOARC, 2008

**Front cover photo:**

Sled Springs forested rangelands of Blue Mountains eco-region in late July (photo by Uranbileg Daalkhaijav).

## **MONITORING SITES DATABASES: TRANSITIONAL FORESTED RANGELANDS IN THE BLUE MOUNTAINS OF EASTERN OREGON EASTERN OREGON**

D. Damiran<sup>1</sup>, T. DelCurto<sup>1</sup>, E. Darambazar<sup>1</sup>, R. A. Riggs<sup>1</sup>, M. Vavra<sup>2</sup>, and J. G. Cook<sup>3</sup>

<sup>1</sup>*Eastern Oregon Agricultural Research Center, Union Station, Union, OR 97883*

<sup>2</sup>*USDA-FS Pacific Northwest Research Station, La Grande, OR 97850*

<sup>3</sup>*National Council for Air and Stream Improvement, La Grande, OR 97850*

### **Summary**

We established 493 rangeland monitoring sites to investigate long-term effects of overstory manipulation on understory vegetation in Sled Springs Wildlife Management Unit of Blue Mountains eco-region forests. These sites were dispersed on forty nine ecological land units, that included differing successional stages (stand age: sapling, pole, small saw, and saw log) and canopy cover (light and medium) in dry Grand Fir (*Abies grandis*), wet Grand Fir, dry Douglas Fir (*Pseudotsuga menziesii*), wet Douglas Fir, Ponderosa Pine (*Pinus ponderosa*) habitat types, and non-forested communities classified as Wet Meadow, Riparian Grass, Grassland, and Scabland, with 3 to 15 replicates per ecological land unit, over 3 consecutive years between 2003 and 2005. Archiving of collected information has been one of the critical tasks for rangeland monitoring surveys. We conducted the first vegetation survey in the area and determined the GPS locations for each monitoring site. This circular, therefore, documents the results of the first survey on the monitoring sites. Data on understory production by plant species and growth form, as well as a list of plant species occurred on the monitoring sites during the survey period are presented in Tables 1, 2 and 3, respectively. Following successional stages on the rangelands, or when disturbances occur, either natural or human-induced, these permanent monitoring sites and databases on them will provide a good opportunity to re-visit, re-sample, and re-evaluate the changes resulted from the disturbances at a given point in time.

**Key words:** Canopy Manipulation, Monitoring, Succession, Time Series Analysis

## **Study Area and Techniques Employed for the Survey**

### ***Monitoring Area***

The area selected for our study was Sled Springs Wildlife Management Unit of northeastern Oregon, which contains about 900 sq. km (Figure 1). Habitats in Sled Springs range from bunchgrass communities at 520 m elevation to mesic conifer forest at nearly 1520 m (Riggs et al. 2003). The study area contained multiple winter ranges and heterogeneous summer ranges extending from relatively dry Douglas fir communities to relatively cold and wet spruce (*Picea* spp.)-fir forest intermixed with mesic grasslands. Habitat conditions were representative of most elk country in the Blue Mountains Ecological Province, home of one of the largest meta-populations (60,000-80,000) of elk (*Cervus elaphus*) in the United States (Cook 2002). Diversity of forest communities was influenced by overstory manipulation with greater diversity in early successional stages (Darambazar et al. 2007a). Production ranged from 800 to 1051 kg·ha<sup>-1</sup> for forest communities and from 687 to 3535 in kg·ha<sup>-1</sup> for non-forest communities. Overstory manipulation changed understory vegetation by increasing portions of grasses and forbs in dry and wet environments of Grand Fir and in dry Douglas Fir communities, but did not influence other habitat types. In general, this study area contained intermediate levels of understory species richness (270 species) when compared to other eco-regions within the temperate coniferous forest major habitat types (Darambazar et al. 2007b; Table 1).

### ***Establishing Monitoring Sites***

Monitoring sites were established and this survey was conducted from mid May to late June of 2003 to 2005 as a part of a larger, multi-disciplinary study (Riggs et al. 2003) to clarify the relationship between forage resources and carrying capacity for elk in forest-dominated landscapes, quantitatively link carrying capacity dynamics to forest practices, and to develop

*Damiran, D., T. DelCurto, E. Darambazar, R. A. Riggs, M. Vavra, and J. G. Cook. 2008. Monitoring sites databases: Transitional forested rangelands in the Blue Mountains of Eastern Oregon.*

analytical tools that will enable managers to quantitatively evaluate the influences of competing forest-management strategies on elk production potential. Selection of monitoring sites was based on number of attributes. Attributes measured were primarily classification of habitat types, measuring tree diameter at breast height (DBH), overstory crown closure (or canopy cover) above the understory vegetation plots.

*Determining Habitat Type:* Habitat type classification followed by Johnson and Simon (1987).

*Determining Successional Stages of Trees:* We classified trees into the following 4 successional stages or stand ages, measuring the diameter at breast height (DBH): sapling (3-10 cm DBH), pole (12.5-37.5 cm DBH), small saw (37.5-50 cm DBH), and saw (50- 75 cm DBH). An attempt was made to distribute monitoring sites randomly across the resource management area.

*Measuring Overstory Canopy Cover:* Tree overstory vegetation canopy cover was determined using a spherical densiometer (Stickler 1959). We made four readings per site facing north, east, south, and west and averaged them to provide an estimate of canopy percent cover from a particular point. Using the variables of percent cover, we divided these data into the following 3 categories: low canopy (0-40%), medium canopy (40-60%), and high canopy cover (60-100%). We established monitoring points, however, only on the sites with low and medium canopy cover because if they were to satisfy other attributes, when overstory canopy cover is high, the related understory vegetation yield is typically low (Hedrick et al. 1969) to total forage resources in a giving area.

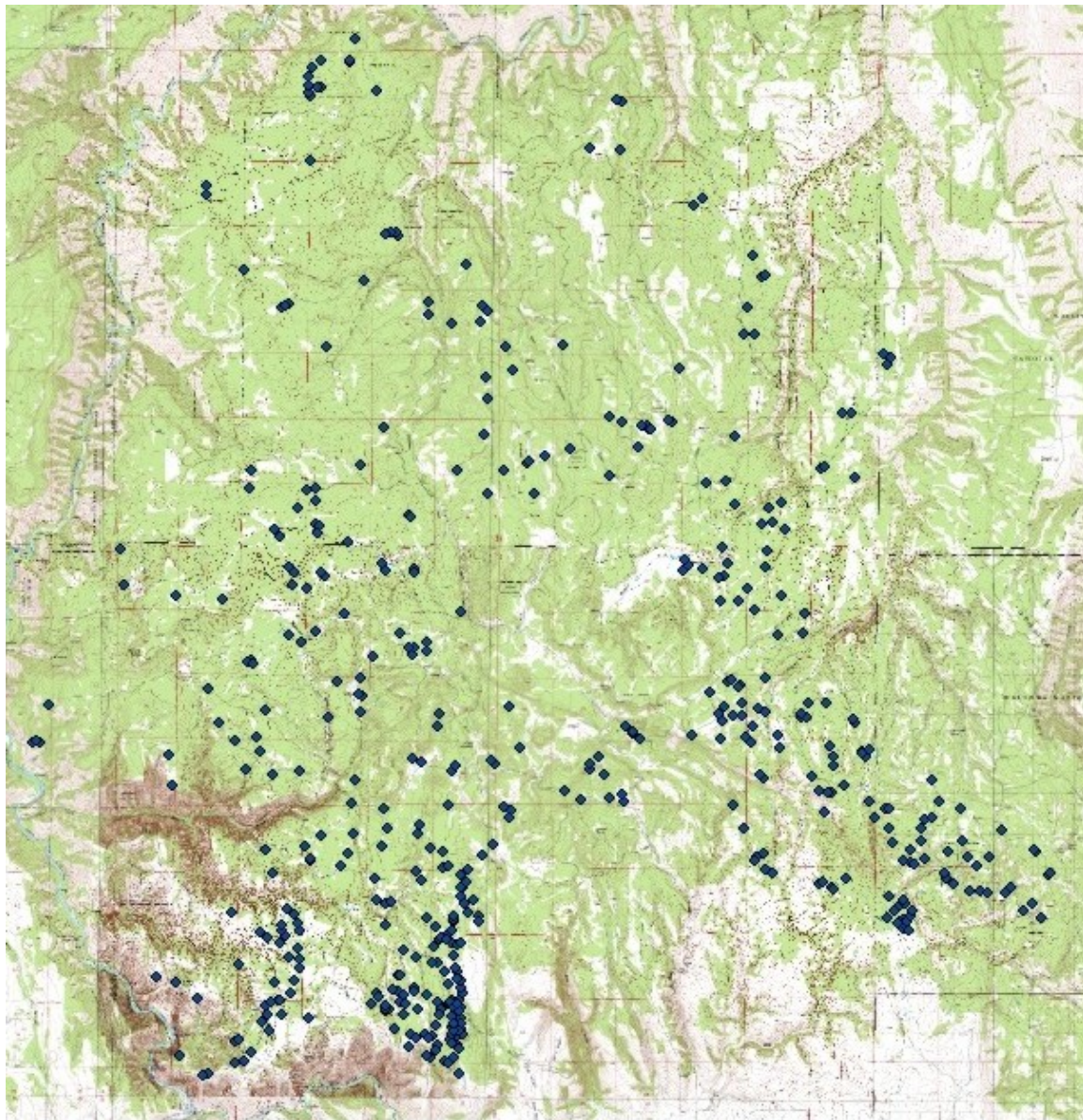
As a result, 49 ecological land units, including differing successional stages (or stand ages: sapling, pole, small saw, and saw log) and canopy cover (light and medium) in dry Grand Fir, wet Grand Fir, dry Douglas Fir, wet Douglas Fir, and Ponderosa Pine habitat types and in non-forest communities (Wet Meadow, Riparian Grass, Grassland, and Scabland) were set up with 3

*Damiran, D., T. DelCurto, E. Darambazar, R. A. Riggs, M. Vavra, and J. G. Cook. 2008. Monitoring sites databases: Transitional forested rangelands in the Blue Mountains of Eastern Oregon.*

to 15 replicates per ecological land unit. This resulted in established 493 rangeland monitoring sites that would be well designed monitoring points of its kind in the northwest of the United States. All monitoring sites were marked with the geographical positions making it possible for investigators to use them as long term permanent monitoring sites, as well as for short and mid term research purposes.

### ***Understory Production***

Understory vegetation within a circular plot (1.5 cm<sup>2</sup>) was clipped at ground level (Figure 2). All clipped samples were separated by live and dead materials, the latter of which was discarded. Live material (understory production) further identified and separated by botanical species (Table 2), oven dried at 60°C for 48 h, weighed, and production was expressed in kg·ha<sup>-1</sup>. Total understory production of a monitoring site was determined by summing the aboveground biomass of all plant species removed from each plot (Table 3).



0 2,500 5,000 10,000 Meters



**Figure 1.** The area selected for the study was within Sled Springs Wildlife Management Unit of the Blue Mountain eco-region forest. Blue dot represents location of the monitoring sites.



**Figure 2. Each monitoring site was marked by a numbered wooden stick and a circular plot with 1.5 m<sup>2</sup> diameter was established by steel poles raised and caged by fence wire. Before clipping a plot for understory production, the cage was removed and replaced with a cord of same diameter. All monitoring sites were marked with the geographical positions for quick and easy finding and access of them for future surveys. This particular plot represents the grassland habitat type (photo by D. Damiran).**

### Literature Cited

- Cook, J. G. 2002. Nutrition and food habits. *In*: D. E. Toweill and J. W. Thomas [EDS.]. North American elk: ecology and management. Washington and London: Smithsonian Institution Press. p. 259-351.
- Darambazar, E., D. Damiran, T. DelCurto, B. Riggs, M. Vavra, and J. Cook. 2007a. Species diversity in understory vegetation of transitional forested rangelands in the Blue Mountains of Eastern Oregon [abstract #109]. *In*: [Abstracts for the 60th Annual Meeting of the Society for Range Management](#), 10-16 February 2007, Reno/Sparks, NE.
- Darambazar, E., D. Damiran, T. DelCurto, B. Riggs, M. Vavra, and J. Cook. 2007b. Understory production of transitional forested rangelands in the Blue Mountains of Eastern Oregon [abstract #108]. *In*: [Abstracts for the 60th Annual Meeting of the Society for Range Management](#), 10-16 February 2007, Reno/Sparks, NE.
- Hedrick, D. W., B. R. Eller, J. A. B. McArthur, and R. D. Pettit 1969. Steer grazing on mixed coniferous forest rangelands in northeastern Oregon. *Journal of Range Management* 22:322-325.
- Hitchcock, C.L., A. Cronquist, M. Owenbey, and J.W. Thompson. 1969. Vascular plants of the Pacific Northwest. University of Washington Press, Seattle, Wash.
- Johnson, C.G. and S. A. Simon. 1987. Plant associations of the Wallowa-Snake Province. R-6 ECOL-TP-225B-86. USDA, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest.
- Riggs, R., G. Roloff, B. Johnson, V. Coggins, M. Henjum, P. Coe, M. Hansen, J. Cook, L. Irvin, R. Cook, T. DelCurto, M. Vavra, J. Kie, M. Wisdom, A. Ager, L. Bender, 2003. Predicting

*Damiran, D., T. DelCurto, E. Darambazar, R. A. Riggs, M. Vavra, and J. G. Cook. 2008. Monitoring sites databases: Transitional forested rangelands in the Blue Mountains of Eastern Oregon.*

the carrying capacity of forests in transition and relevance to restoring elk herds in the northwest. A Research program in the Blue Mountains 2001-2008. La Grande, OR

Strickler, G. S. 1959. Use of the densiometer to estimate density of forest canopy on permanent sample plots. Research Note No. 180. Portland, OR: USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station.