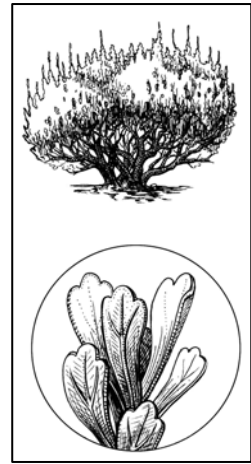


Upper Columbia Basin Network Sagebrush-steppe Vegetation Protocol Development Summary

(August 2007)



Protocol: Sagebrush-steppe Vegetation

Parks Where Protocol will be Implemented: CIRO, CRMO, HAFO, JODA, and LARO

Justification/Issues being addressed:

The sagebrush-steppe region has undergone radical and extensive changes during the last 150 years (USFS 1996; West and Young 2000; BLM 2002; Reid et al. 2002). Prior to European colonization, sagebrush-steppe covered approximately 44 million hectares of the intermountain west (West and Young 2000). Significant portions of the region have since been converted to agriculture and heavily grazed rangeland (West and Young 2000; Bunting et al. 2002). Much of the remaining sagebrush-steppe has been degraded through altered fire regimes and invasion of introduced plants (Reid et al. 2002). These changes have had significant impacts on the ecological condition of the sagebrush-steppe, including a decline in native flora and fauna, decreased soil stability, and reduced hydrologic function (Mack and D'Antonio 1998; Wisdom et al. 2000; Keane et al. 2002).

In the UCBN, sagebrush-steppe is the most extensive ecosystem type, occupying over 50% of land cover in CIRO, HAFO, and JODA. At CRMO, where bare lava rock comprises 81% of the total land cover, sagebrush-steppe represents over 90% of existing vegetation cover. Sagebrush-steppe covers most of the southern half of LARO. The degradation of sagebrush-steppe resulting from biological invasion, altered fire regimes, and other stressors so widespread throughout the intermountain west has also occurred within UCBN parks. Historic and current land use practices both within and adjacent to the parks continue to fragment and alter steppe ecosystems, and predicted climate change scenarios for the region will likely exacerbate these stressors (Smith et al. 2000; Wagner et al. 2003). Long-term vegetation trends from the INL near CRMO provide substantial evidence of the importance of climate patterns on sagebrush-steppe vegetation dynamics (Anderson and Inouye 2001). Monitoring on the INL has demonstrated a multi-decadal plant community response to prolonged drought during the mid- 20th century that has important implications for management within the context of a changing climate.

The heterogeneity of sagebrush community types (i.e., alliances and associations defined by *Artemisia* subtaxa) presents management challenges because community response to fire and drought, vulnerability to invasion, and potential for restoration and recovery can differ significantly (Reid et al. 2002; BLM 2002). Understanding these differences at the park level is critical for effective management strategies to be developed. This underscores the need for a long-term monitoring program that provides for periodic evaluation of the status of steppe communities and for identification of trends over time both within parks and across the Network.

Tying network monitoring objectives to park management objectives is important to ensure the monitoring program provides relevant information to managers. Specific management objectives related to sage-steppe plant communities have not been explicitly articulated at this time. However, all parks addressed by this protocol share a common overarching management goal to maintain and restore native ecosystems and ecological processes. Plant invasion and shifting community composition and species abundance is the overarching concern for UCBN park managers. This protocol will be focused on this concern and will provide managers with information necessary to evaluate progress in activities related to maintaining and restoring native plant communities. However, it is equally important to recognize that shifting park management priorities and unanticipated ecological change over the life of the monitoring program require a generalized and flexible protocol with an accommodating design. This protocol will attempt to balance these potentially competing short-term and long-term needs.

Specific Monitoring Questions and Objectives to be Addressed by the Protocol:

Monitoring questions addressed by this protocol include:

- What are the trends in abundance and composition of species and horizontal strata (i.e. perennial grass, shrub, etc.) in UCBN sagebrush-steppe plant communities?
- Do trends differ among community types, as defined by *Artemisia* subtaxa?
- What are the trends in abundance and composition of invasive plant species in UCBN sagebrush-steppe communities?
- Are trends observed in sagebrush-steppe vegetation significantly correlated with trends in weather and climate?

Monitoring objectives addressed by this protocol include:

- 1) Estimate status and trends in the abundance of targeted plant species, groups (e.g. *Artemisia spp.*) and horizontal strata (e.g., perennial grass, shrub, etc.) in UCBN sagebrush-steppe communities.

Justification: Sagebrush-steppe ecosystems are some of the most threatened in the intermountain west. Biological invasions, altered fire regimes, and other stressors continue to cause major, possibly irreversible, changes in steppe ecosystem structure and function and create difficult challenges for UCBN land managers. Determining trends in sagebrush-steppe communities is essential for understanding the Network's ecosystems and conducting effective adaptive management.

- 2) Estimate the status and trends in diversity and species composition of UCBN sagebrush-steppe communities.

Justification: Sagebrush-steppe ecosystems are some of the most threatened in the intermountain west. Biological invasions, altered fire regimes, and other stressors continue to cause major, possibly irreversible, changes in steppe ecosystem structure and function and create difficult challenges for UCBN land managers. Determining trends in sagebrush-steppe communities is essential for understanding the Network's ecosystems and conducting effective adaptive management.

Basic Approach:

No existing sagebrush-steppe monitoring protocol is currently available for adoption from the NPS or other relevant organizations. The UCBN sagebrush-steppe vegetation monitoring protocol will be developed following NPS I&M standards as outlined by Oakley et al. (2003). A probabilistic sampling design will be developed, balancing the need for maximum scope of inference and statistical power with logistical and financial efficiency. Sampling methods will be adopted that support these criteria, following techniques established in the literature, such as line and point intercept sampling for cover estimation (Herrick et al. 2005; Elzinga et al. 2001). We will also draw upon relevant information from the coordinated NCPN/SCPN integrated upland monitoring protocol development effort as it becomes available. We are currently drawing excellent information from an evaluation of field methods conducted by Miller et al. (2006) for the NCPN. Effort will be made to ensure UCBN sagebrush-steppe vegetation sampling methods produce results comparable with those used by INL, BLM, NPS Fire Effects Monitoring Program, and other monitoring projects in the region to increase regional application of UCBN monitoring data. Power analysis and sample size requirements will be calculated *a priori* with data available from INL, NPS Fire Effects Monitoring Program, and other partners with suitable data sets, including the PI's previous research at CRMO. Lessons learned from long-term monitoring at the INL and other programs underscore the need for an efficient and flexible protocol that will accommodate revisions and adjustments necessary to sustain this program over many decades. It is expected that the protocol sampling design and field methods will be refined during several years of implementation and protocol testing following peer-review. A cooperative task agreement between the UCBN and Idaho State University, issued through the Great Basin Cooperative Ecosystem Studies Unit, has been written to support the development of this protocol.

Principal Investigators and NPS Lead:

Principal Investigator: Dr. Nancy Huntly, Idaho State University, 208-282-2149; NPS ATR: Tom Rodhouse, UCBN Ecologist, 541-312-8101.

Development Schedule, Budget, and Expected Interim Products:

The PI and NPS UCBN staff will produce a draft monitoring protocol ready for external peer review by September 2007. We anticipate implementing the protocol in 2008. We have budgeted \$30,000 for protocol development in FY 2006 and which will sustain protocol developments through 2007.

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