Development of a Protocol for the Ecological Assessment of a Special Species

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Abstract— *Developing consistent inventory and assessment protocols is important to people working on aspen issues in California and Nevada. Efforts have focused on identifying key indicators of ecological condition within aspen stands. The protocols have incorporated a range of factors that create or affect those indicators. Resulting ecological assessments conducted through the protocols describe stand structure, indicate unique stand management conditions, and record factors that might be putting stands at risk. Protocols for determining ecological condition were developed and field-tested by review groups in 2002. To date, units from seven state and federal agencies have collected data using the same protocols and field form.*

Overview

There has been heightened interest in aspen issues in the Far West as governmental mandates like the Sierra Nevada Forest Plan Amendment (U.S. Forest Service 2001) have increasingly directed land managers to protect the biodiversity of native flora and fauna. Many sub-units of management agencies have been inventorying, assessing, and treating aspen stands throughout their range, but prior to 2002 these efforts were not coordinated (U.S. Forest Service, Region 5, Aspen Survey Summary, May 2002).

The Aspen Delineation Project—a collaborative effort of the U.S. Forest Service's Pacific Southwest Region, California Department of Fish and Game, and the California Office of Bureau of Land Management—has began to develop a consistent approach for collecting data about ecological condition of aspen stands on agency lands. During workshops and field seminars co-sponsored by the Aspen Delineation Project, resource managers from multiple agencies and scientific disciplines identified the importance of developing and integrating consistent inventory, assessment, monitoring, and research protocols. The overriding objectives of this package of protocols were threefold: (1) to improve the scientific basis of management decisions, (2) to share data more easily within and between agencies, and (3) to produce more consistent evaluation of management practices, thus resulting in more effective adaptive management.

Because there was no consistency in how agencies were collecting data on location and condition of aspen stands, agency biologists and ecologists decided that the Aspen Delineation Project should initially develop a standardized protocol for (1) reconnaissance of the location of aspen stands and (2) assessment of a stand's ecological condition. Participants working on this project recognized that they would have to work fast due to time and budgeting constraints. It was agreed that the information gained using this protocol could lay the groundwork for establishing specific management

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objectives later on and be used as the foundation for decisions regarding more quantitative inventory or monitoring efforts.

A protocol and a data entry program were developed and field-tested by review groups during the summer of 2002. To date, sub-units from seven state and federal agencies—Forest Service, BLM, California F&G, California State Parks, California Tahoe Conservancy, Nevada State Parks, and Tahoe Regional Planning Agency—have collected data using the same protocol, field form, and data entry program.

Protocol for Establishing the Ecological Condition of Aspen Stands

Because the desired condition for aspen habitats across the Western landscape has been defined as fully functional, structurally diverse aspen stands (U.S. Forest Service 1994, U.S. Forest Service 2001), the principal objective of this protocol is to determine whether the age class, structural diversity, composition, and cover of individual aspen stands are within the desired range of natural variability for the vegetative community.

The range of naturally viable, fully functional aspen ecosystems does not express itself in any single simple form. Research has shown that aspen naturally expresses itself through the relationships between its reproduction processes; clones generating suckers off lateral roots; responses to natural environmental events; shade intolerance; growth hormonal balance mechanism; and disturbance dependency (Schier and others 1985).

However, there are a number of historic and current land management factors that have affected the natural viability of Western aspen habitats (Bartos 2001). The protocols focus on three thoroughly researched processes that have been shown to affect the natural viability of aspen: (1) effects of increased conifer encroachment caused by prolonged fire suppression, (2) failure of successful regeneration stemming from poor livestock management or unnatural wildlife stocking numbers, and (3) combinations of these factors. In order to see how these historic and current factors may have affected the current viability of individual stands, the protocol focuses on three key indicators of stand condition: overall stand structure, unique stand management issues, and a ranking of factors that might be putting stands at risk.

Stand Structure

The first key indicator in analyzing a stand's ecological condition is delineating its structure. The protocol's foundation is the use of a definition of "stand" (California Native Plant Society 2001) that calls for separating aspen units into units that are compositionally and structurally similar, i.e., if the mix of all species within the stand has structural and compositional integrity, it meets this definition (figure 1). This delineation of structure should establish not only the presence and condition of aspen age cohorts but also establish the relationship of those cohorts to the two most significant factors affecting stand viability: conifer encroachment and effects of browsing by wild and domestic ungulates.

The protocol divides the stand structure into three classes: overstory canopy cover (aspens and conifers >8 inches DBH), mid-level canopy cover (aspens and conifers 1 inch DBH to 8 inches DBH), and understory (aspens and conifers <1 inch DBH). The standard of 8 inches DBH was selected as

Figure 1—Structurally diverse stand with multiple age cohorts.

a candidate for the separation of overstory and mid-level classes after field-testing established that stems with 8 inches DBH were consistently shorter than the average height of the range of all larger DBH aged cohorts in the overstory. The first two classes—overstory and midlevel—focus on the presence or absence of aspen and conifer species and quantify their percentage presence and ratio to each other. The third class—understory—focuses on aspen regeneration and factors affecting its success. The protocol proceeds from class to class establishing a picture of the current structure of a stand and factors contributing to its functional condition.

The first step of the protocol is to identify what the actual percent of canopy cover is in the overstory and calls for five classes into which that percentage can be placed: 100-85 percent, 84-51 percent, 50-16 percent, 15-1 percent, and 0 percent. Then, the ratio of conifer:aspen is established within the canopy cover that does exist (figures 2, 3, 4). The classes for conifer: aspen ratio are 10:0, 8:2, 6:4, 5:5, 4:6, 2:8, and 0:10. The ratio establishes the dominance or co-dominance relationships between aspen and conifer and provides both an indication of current condition of the overstory canopy and hints of potential future conditions.

Next, after the actual overstory canopy cover is determined, the protocol calls for establishing the presence and condition of the actual mid-level canopy cover. As in the overstory, the protocol calls for establishing the presence or absence of a mid-level canopy cover (1 inch DBH to 8 inches DBH). If present, the actual percent of canopy cover in the mid-level canopy and the ratio of conifer:aspen in the mid-level canopy are established using the same size classes that were used in evaluating the overstory.

Finally, in the third class—the understory(<1 inch DBH)—the protocol calls for establishing the presence or absence of regeneration and identifying the presence or absence of browsing. Greater than 500 stems per acre is the class size used for signifying the presence of a distinctive regeneration stem aspen class. Five hundred stems per acre are used because it is believed that fewer stems per acre will not provide enough stems to establish a fully stocked stand (Mueggler 1989).

The protocol then calls for indicating the presence of significant browse on current year's terminal growth. Browse of 20 percent of current terminal

Figure 2—100-85 percent canopy cover and a ratio of conifer:aspen of 0:10. No other aspen or conifer age cohorts present.

Figure 3—85-51 percent overstory canopy cover and a conifer:aspen ratio of 0:10 present. A midlevel canopy cover of 100-85 percent with a ratio of conifer:aspen of 10:0.

leader growth was selected because it is the current browse standard for woody stem vegetation found in the SNFPA (USDA Forest Service 2001) as well as in the standard used by the Bureau of Land Management in California (BLM—California State Office 2002).

A final note regarding stand structure: the protocol has an indicator for establishing the presence of a "decadent stand." Decadent stands are qualitatively described in this protocol as stands that have more dead or down aspen stems than living stems.

Management Issues

The second key indicator of a stand's ecological condition is delineation of any special stand management issues that provide clues to factors playing a role in the current status of the stand, a potential role in the future condition of the stand, or a role in potential stand management options. Included in the management issues are:

- location of stands within or adjacent to biologically sensitive habitats like meadows, riparian corridors, or springs;
- location of stands within or adjacent to geological refugia—environments conducive to stand

Figure 4—Two age cohorts with an overstory canopy cover of 85-51 percent and a ratio of conifer:aspen of 2:8 with an understory age cohort of >500 stems per acre.

continuation because of protection from browsing pressures or conifer encroachment or because of location on a site with particular geological characteristics such as lava flow, talus slope, rock outcrop, or moraine material;

- indication of significant (>20 percent) insect or disease damage;
- presence of significant human impacts such as regulated or non-regulated camping or structures;
- indication of signs of recent wildfires within or adjacent to the stand;
- indication of prior management treatment such as conifer removal within a stand or prescribed burns;
- indication of the presence or historic effect of beaver populations.

Risk Loss Analysis

The third key step in indicating a stand's ecological condition is evaluating combinations of factors observed in a stand and rating its potential for being lost. This procedure, which appears in the protocol as "Stand Loss Risk Factor," was initially set forth in a prioritized key for risk factors developed by Bob Campbell, Fish Lake NF, and Dale Bartos, RMRS (2001). The process, as it appears in the protocol, is the result of adaptation of the Campbell and Bartos work by the Eagle Lake Ranger District, Lassen National Forest and extensive field-testing of the end product.

Five classes of risk loss are found in the protocol:

Figure 5—Risk to stand is "Highest." This stand is being lost from above and not being replaced from below.

Highest: The clone is being lost from above and is not being replaced from below (figure 5).

- Conifer crowns have overtopped the aspen crowns, (primary risk factor), and conifer species comprise at least half the canopy (primary risk factor), *and*
- Regeneration is absent or unsuccessful because of excessive browsing or shading from conifer encroachment (primary risk factor).

High: The clone is being lost from above or is not being replaced from below (figure 6).

Moderate: One or more risk factors are present, but the clone is not in immediate danger. This class may include one or more of the factors below:

- conifer closure >25 percent, but <50 percent (if >50 percent, rating is High or Highest)
- aspen cover <40 percent
- dominant aspen are decadent
- aspen regeneration 5-15 feet tall is <500 stems per acre
- regeneration is excessively shaded by conifers
- browsing is limiting extent and numbers of successful (>5 feet tall) regeneration

Figure 6—Risk to stand is "High." This stand is being lost from below through conifer encroachment.

Figure 7—Risk to stand is "Low." Multiple age cohorts are present and few risk factors (<15 percent) exist.

Low: The clone is essentially healthy, containing mature trees and/or healthy and vigorous regeneration; there are no obvious signs that the clone has receded; and <15 percent of the clone is affected by risk factors (figure 7).

None: None of the above risk factors are present. Mature trees are vigorous, and regeneration 5-15 feet tall ≥500 stems per acre.

Support Material

To date, the Aspen Delineation Project has developed three support programs for facilitating effective and efficient use of the protocol:

- A Data Entry Program to simplify the process of moving hard copy (field form) data into GIS shape files as well as providing a vehicle for merging interagency aspen data into some centralized data source.
- A field crew training program to help crews understand and interpret goals and objectives of the assessment process and develop consistent interpretations of stand conditions.
- A CD containing PDF copies of the protocol and field form, a copy of the Data Entry Program, and an interactive guide to the protocol.

Copies of the CD or details about the protocol and the Aspen Delineation Project's field crew training program can be obtained by contacting peregrines@prodigy.net or the Aspen Delineation Project, P.O. Box 348, Penryn, CA 95663.

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