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Using Forest Knowledge

How silviculture can benefit from ecological knowledge systems about beargrass harvesting sites

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Cover photo: Beargrass flowering in Glacier National Park, David Restivo, National Park Service, 2008.

Managing National Forests

a Role for Silviculture

Sustaining the health, diversity, and productivity of national forests and grasslands is the mission of the U.S. Department of Agriculture (USDA) Forest Service. Yet managing these lands is challenging because people hold different expectations for them. Public uses can include:

- Recreation (scenery, trails, bicycle and snowmobile routes)
- Timber (structural, decorative, manufactured wood products) and wood-based energy (biomass)
- Nontimber forest products (foods, fibers, medicines)
- Sustaining or restoring natural processes (water, nutrient cycles)
- Preserving cultural and natural history (archaeological or other sites)

In mixed-conifer forests of the three Pacific coast states, some public uses may benefit from changes to the existing structure of living and dead trees arrayed on a site or in an area.

Silviculture—a practice derived from the Latin word for forest—focuses on how to distribute the growing space for trees within an area. It is one method federal and other foresters use to manage land for desired beneficial uses.

One way of deciding among silvicultural options for a specific place is by identifying forest conditions consistent with several management objectives. An accepted practice is using general structural and compositional knowledge of a given forest type and then supplementing or refining it with site-specific information. Scientific research generates knowledge that can be generalized and applied across similar conditions while site-specific information often comes from observations of a given place. In particular, the relationship people have to a place can offer insights into how it changes over a range of growing seasons and conditions. Such a two-tiered approach provides forest managers with flexibility within local ecological "sideboards." By tailoring silviculture to a specific place, multiple objectives can be achieved over the long term.

This booklet describes how knowledge gained from a tri-state study of good harvesting sites of a popular forest understory plant can contribute to local silvicultural decisions about tree density and levels of down wood.

The Significance of Beargrass

Beargrass (*Xerophyllum tenax*) (cover photo) is an ecologically, economically, and culturally important plant. It is a long-lived perennial that reproduces by flowering or by sprouting, and grows in habitats from coastal to montane mixed-conifer forests, meadows, and clearings and on various soil types. Beargrass provides:

- Food for insects and mammals
- Protective habitat for invertebrate species
- Nutrient-rich pollen for bees, beetles, and flies

The majority of beargrass harvested from federal lands in California, Oregon, and Washington is for the multi-million-dollar floral greens industry. American Indians also harvest beargrass for use in basketry and regalia, and for medicinal and decorative purposes (fig. 1). While the industry mainly exports the plant for use as decoration, for many American Indian tribes, beargrass is a key fiber in traditional weaving. Beargrass leaves are particularly valued for adding design and structure to twined and coiled baskets.

The U.S. government has a trust responsibility to American Indians and, for the USDA Forest Service, this means sustaining natural and cultural resources like beargrass on ancestral lands now under federal jurisdiction and management.

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Figure 1— The basal leaves of beargrass are harvested for traditional weaving.

Understanding Beargrass in the National Forests

Researchers with the USDA Forest Service Pacific Northwest and Southwest Research Stations sought to learn what forest conditions relate to harvest site quality for tribal basketry. Their study blended traditional ecological knowledge (TEK) with quantitative and qualitative methods for generating scientific ecological knowledge (SEK). Results, therefore, reflect blended ecological knowledge systems and experiences.

Six expert weavers, members of the Grand Ronde, Karuk, Siletz, and Yakama Tribes, volunteered to cooperate, and they visited study sites in California, Oregon, and Washington with a Forest Service researcher (Karuk descendant) and assistant (Penobscot). The sites covered a range of potential harvest conditions, some sites had a history of beargrass harvesting, and other considerations included accessibility to a road, terrain, and location on tribal ancestral lands. The weavers classified the sites at the time of this study as good, marginal, or poor according to their personal observations and harvesting experience.

On 72 sample plots at each classified site, Forest Service staff measured variables that they thought might affect beargrass leaf quality. Variables included:

- Number and diameter of all trees
- Amount and size of dead, down wood
- Color of beargrass leaves

Analysis of the field data revealed statistically significant differences in good harvest sites and poor harvest sites across the three states and the two weaving styles represented by the tribal weavers.

How Studying Beargrass Can Guide Silviculture

Silviculture is considered both an art and a science because it involves incorporating knowledge from various sources into written prescriptions that can include different treatments. What the beargrass study showed is that a combination of TEK and SEK yielded general knowledge about good harvest-site conditions. Silviculturists can draw upon this information to write site-specific prescriptions when local objectives include sustaining culturally important plant populations and forest resilience to disturbance. On average, "good" beargrass harvesting sites had

- Total surface wood and litter averaging 14 tons/acre
- Down wood (>3 inches) averaging 12 tons/acre
- An average of 127 trees per acre
- A basal area of 197 square feet/acre

This general knowledge may be incorporated in several ways depending upon management objectives and forest type (table 1). For example, the study found that higher levels of down wood (particularly large logs with limbs) diminished the quality of the site for harvesting (fig. 2). When walking is difficult, harvest efficiency drops. This was one tribal criterion the study revealed. In contrast,

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Figure 2—This study plot illustrates higher levels of down surface wood, more trees with smaller diameters, and lower densities of beargrass plants associated with poor harvesting sites for traditional weaving.

Table 1—Scaled knowledge systems

Management targets (variables)	Field measurements (metrics)	Tribal concerns (criteria)	Silvicultural treatments (options)
Fuel loads	Surface wood and litter (volume and size) Ladder fuels (ground to crown ratio)	Site mobility (ease of walking)	Fuels reduction (mechanical or manual, including wildland fire)
Stand density	Trees per acre Basal area per acre Canopy closure or canopy bulk density	Site mobility Number of beargrass plants Color of beargrass leaves	Density reduction (tree harvest); tree/slash removal; wildland fire
Tree size	Height Diameter	Understory light Harvester mobility	Thinning to manage tree number and growth
Beargrass quality and quantity	Plant density (number per area) Density of whorls (new growth)	Leaf color and abundance	Density management, (thinning, wildland fire)

Note: Geographic scale and knowledge system affect terminology but share treatment options.

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Figure 3—This study plot shows lower levels of down surface wood, fewer trees with larger diameters, and higher densities of beargrass plants associated with good harvesting sites for traditional weaving.

other research shows that some surface wood (mostly large logs, without protruding limbs) contributes positively to habitat for mammals, amphibians, and invertebrates, and for cycling water and nutrients. A range of 0 to 12 tons/acre of down wood was found on good beargrass harvesting sites (figs. 3 and 4). In stands where there are known or potential harvesting areas, silviculturists could prescribe lower levels of down wood to allow for easier mobility while still meeting habitat or other objectives.

Sites with basal area distributed on fewer, larger trees (fig. 5) were considered good for harvesting, because the beargrass leaves were of the desired color and quality for weaving. A range of 0 to 127 trees per acre was associated with these good harvesting sites. Prescriptions that reduce tree density within this range, whether to alter fire behavior or reduce competitive stress, would also be consistent with good beargrass harvesting sites for weaving. In contrast, other research suggests that shadier sites produce commercial-quality beargrass leaves. Because beargrass harvesting sites are associated with a range of tree stocking densities, silviculturists can adjust prescriptions accordingly depending on harvester preference. Dry sites, for example, could be candidates for lower numbers of trees per acre where an objective is to sustain beargrass for tribal weaving.

Road access adjacent to gathering sites was another tribal harvesting criterion. Study sites were chosen to be accessible from roads owing to preferences expressed by participant tribal weavers. However, if a management goal is to sustain good beargrass harvesting sites wherever the plant grows, attention to less-accessible sites may benefit youthful and future generations of traditional weavers.

Figure 4—Average trees per acre and basal area (ft^2/acre) by quality of harvesting site. The knowledge used by weavers to classify harvesting sites as good, marginal, or poor was matched by statistically significant differences in trees per acre between good and poor harvesting sites.

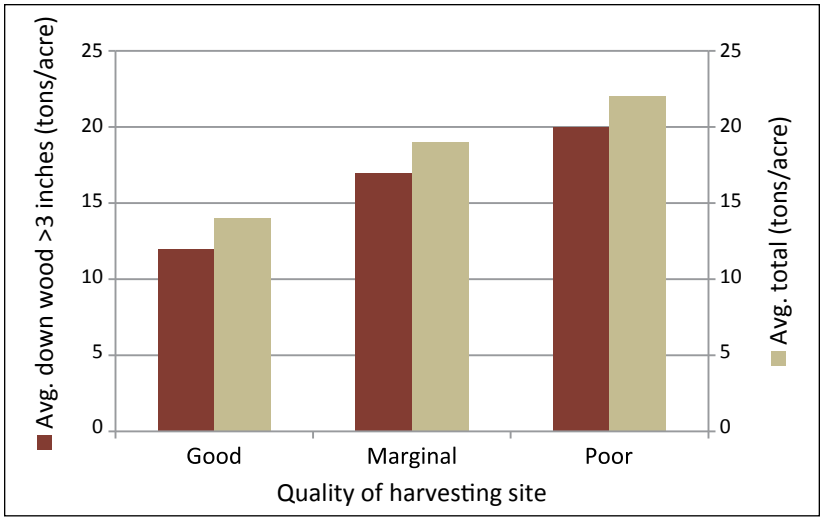

Figure 5—Average down wood (tons/acre) by quality of harvesting site. Down wood was significantly different between good and poor harvesting sites. The combination of traditional ecological knowledge and scientific ecological knowledge provided general knowledge and interpretations of data useful for land managers.

Future Management Considerations Beyond Beargrass

Silviculture is one management tool for sustaining good beargrass harvesting sites because it can affect leaf properties and weaver mobility. Another tool for sustaining weaving traditions is accessibility to good harvesting sites. During the study, Forest Service staff heard about access difficulties, whether because of closed gates or perceived requirements for obtaining permits. These issues were not universal across the study area, however. In California, federal and state agencies collaborated on standardized guidelines to help tribal weavers access sites with minimal difficulty and cost. A similar protocol for Oregon and Washington will require cooperation between agency staff and tribal members. Mutual respect and listening are essential.

"It is important for tribal weavers to communicate with people who have decision-making authority over our lands."

~ Bud Lane, president
Northwest Native American Basketry Association, 2014

The Food, Conservation and Energy Act (2008 Farm Bill) provides guidance to federal managers about authorizing access and use of forest resources for traditional cultural purposes by federally recognized American Indians.

References

Food, Conservation, and Energy Act of 2008; Public Law 110-234, Cultural and Heritage Cooperation Authority, SEC. 8105.

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