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Putting the stewardship concept into practice: Commercial moss harvest in Northwestern Oregon, USA

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Abstract

Increased demand for non-timber forest products has spurred increased regulation of these resources as well as recognition of the need to include harvesters in monitoring efforts. The moss harvest monitoring program on the Siuslaw National Forest in the Pacific Northwest included a pilot stewardship program involving two 5-year leases of 890 ha parcels of mixed conifer-*Alnus* forest to a local commercial moss harvester under the condition that the harvester adhere to specific harvest guidelines and provide data on how much moss was removed. Across both lease areas, nearly 66,000 kg of tree-moss was harvested over a 48-month period, mostly during the dry summer season. The program provided for direct harvester participation, made the product available on a year-round basis, and improved patrol of illegal harvest in the lease area. In addition, three experiments were conducted to contrast moss abundance, species richness, and species composition using four levels of harvest intensity (Control in which harvest was prohibited, Low Intensity harvest approximating current standards and guidelines = ca. 34 kg/ha, High Intensity harvest approximating unregulated harvest levels = ca. 112 kg/ha, and ''No Rules'' harvest with no restrictions of any kind). Subsampling data indicated that cover on vine maple shrubs immediately following harvest was reduced by 5% and 16–20% for Low Intensity and High Intensity harvest treatments, respectively. These treatment differences remained for two years in riparian areas but were non-significant after one year in upland mixed forest. Species richness did not vary among harvest intensities and impacts to species composition, which were generally restricted to stems actually harvested, dissipated after one or two years. Because impacts restricted to harvested stems averaged out at the plot-level, plot-level surveys were less sensitive to harvest impacts than host-level subsampling. Due to the slow rate of recovery of this resource, future Stewardship Areas for moss harvest may be impractical, but this approach may be a viable option for non-timber forest products with shorter rotations.

Keywords: Non-timber forest product management; Pacific Northwest; Bryophyte; Epiphyte; Oregon; NTFP

1. Introduction

The non-timber forest product of tree-moss (a mixture of mosses and liverworts; Peck, 1997) is gathered wild in North America primarily from the mixed conifer-hardwood temperate rainforests in the Coast Range paralleling the Pacific Ocean (Midwest Research Institute, 1992). In the first three years of this decade, the annual legally permitted harvest in the region averaged over 122,000 kg/year, with total actual harvest (including harvest on lands that do not require permits and illegal harvest) estimated at well over 1 million kg/year (Muir, 2004). Commercially harvested moss is used as a packing material, soil conditioner, lining for hanging flower baskets, mushroom cultivation medium, and as a decorative in the floral industry (Peck, 2006). In recent decades, increased awareness of this industry has paralleled concerns over resource sustainability and ecosystem impacts. Recognizing the importance and economic potential of non-timber forest products (NTFPs) (Fellows, 1992), U.S. public landowners have promoted harvest within the ''limitations of ecosystem sustainability'' (USDA FS, 1989, 1993, 2001; von Hagen and Fight, 1999). Simultaneously, concerns over sustainability and rare species have been raised in response to federal mandates to protect rare species and species diversity and to maintain ecosystem function (Liegel, 1992; Lesher et al., 1994; USDA FS and USDI BLM, 1994). As a result, management plans including previously ignored NTFPs are becoming commonplace (e.g., USDI BLM, 1993, USDA FS, 1995).

For a long time NTFPs were marginalized because, compared to timber, their economic value to a given district

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was negligible. Low product values translated into low permit fees and these fees were fed back to the National Forest office rather than supplementing the budget of the local district (Chamberlain et al., 2002). Harvesters who purchase permits (e.g., for USFS 0.11 USD/kg or \$0.05 lb^{-1}) sell their moss for ca. 0.88 USD/kg (\$0.40 lb^{-1}) (Peck, 2006), initiating a multi-million dollar industry. Export values of mosses and lichens (they are reported together but moss volume greatly outweighs lichen volume) averaged over 6 million USD/year between 2000 and 2002 and domestic production was even higher (Muir, 2004). Often excluded from studies of the economic potential of NTFPs (e.g., Schlosser et al., 1992), tree-moss suffers from low comparative value among NTFPs: estimated purchase costs for moss in the Pacific Northwest in 1989 were less than a third of that for the floral greenery shrub species of salal (*Gaultheria shallon*) in the same year (with moss accounting for only 2 million USD worth of the 47 million USD in purchases costs for all non-timber forest products in 1989; Schlosser et al., 1991). None-the-less, permit revenues from moss harvest on federally owned land averaged 14,000 USD/year between 2000 and 2002 (Muir, 2004). These revenues are now being directed back to local Districts, but only on the condition that harvest is managed for sustainability (HR 2466, Title III, Sec. 339).

Proper management of non-timber forest products on public lands will require government agencies to reevaluate management practices, estimate the environmental impacts of harvest, predict the sustainability of the resource, and work with members of the industry to develop effective management programs (e.g., Liegel, 1992). These efforts, however, are hindered by the paucity of research upon which to base management, which should include baseline ecological conditions and the effects of differing NTFP harvest regimes (Newmann and Hirsch, 2000). In the case of tree-moss, three things need to be known: the biomass of tree-moss available for harvest (inventory), the rate of harvest, and the rate of recovery following harvest using different harvest methods and intensities. Some information is available on species and biomass inventory (Peck and McCune, 1998), methods of estimating biomass inventory (Peck and Muir, 2001a), and the rate and successional patterns of recovery on individual shrub hosts following harvest (Peck and Muir, 2001b; Peck, 2004). The rates of harvest and of tree-moss recovery under varying operational conditions, however, have not been quantified (Peck, 2006).

The result of this knowledge gap has been the development of management guidelines that fail to ensure sustainability or that are not appropriate in the field. Brochures at one agency indicated that tree-moss generally required three to five years to regrow (USDI BLM and USDA FS, 1993), which has since been shown to underestimate recovery rates by more than a decade (Peck, 2006). Other guidelines unrealistically stipulate that harvest areas should be determined by slope-corrected distances to streams or restricted to ‘‘every other’’ host (USDA FS, 1995). Many landowners have simply stopped allowing harvest of tree-moss; of the seven large public forest landowners in western Oregon, three no longer sell permits for commercial moss harvest at all. This trend toward increasing restrictions, however, reduces access for part-time harvesters (Lynch and McLain, 2003). Further, when harvest is prohibited on previously open areas and workable rules for legal harvest are lacking, the result is often illegal harvest (cf., Newmann and Hirsch, 2000), which has in fact become commonplace (Muir, 2004).

Public access, however, is an important component of U.S. public lands. Many agencies are mandated to provide for multiple resource use, including efforts to support local communities economically (USDI BLM, 1997), and have been encouraged to conduct inventories, monitoring, and research in conjunction with public outreach (USDI BLM, 1993). Due to a variety of complex factors, harvester practices and knowledge fail to be incorporated into management decisions (Love and Jones, 2001). Agencies have long recognized the need to increase public participation (e.g., Wickens, 1991), but involving the public in volunteer stewardship activities has been proposed more often than implemented (e.g., USFS and BLM, 1994; USFS, 1995; USDI BLM, 1997).

Given the lack of critical data on the rate of harvest and recovery, the Siuslaw National Forest in northwestern Oregon determined that the best way to obtain consistent and reliable data was to monitor harvest within the structure of a long-term lease contract on the Forest Service Ranger District from which the majority of Pacific Northwest moss is harvested (the Hebo District). Normally, harvesters purchase two-week permits for harvesting moss from any areas on the Hebo District in which it is allowed and pay up-front permit fees based on the anticipated weight of the moss they will harvest. Because the Hebo District regularly sells out its annual allotment of moss permits by June of each year, no permits are typically available during the driest part of the year. Operating largely on the honor system because of a lack of funding and law enforcement officers, illegal harvest is rampant. By involving a long-term local contractor responsible for specific Stewardship Areas, we hoped to address several of these issues. We report here on (1) the efficacy of using long-term moss contracts with respect to providing year-round access, enhancing local participation and ‘‘ownership’’ in the management process, and supplementing patrol for illegal harvesters, and (2) real world evaluations of the impact of different intensities of commercial moss harvest on the relative abundance, species richness, and species composition of tree-moss in riparian and upland mixed forests at both stand and host scales.

2. Methods

2.1. Sites

The two Stewardship Areas (SA) on the Hebo District were ~890 ha (2200 acre) in area (45°13.05′–45°6.35′, 123°55.45′–123°47.75′) and were chosen on the basis of (a) known suitability for non-timber forest product harvest based on past greenery permits, (b) adequate road access, (c) minimal forest fragmentation, and (d) single artery access to discourage