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**Local Ecological Knowledge and Management of Salal
(*Gaultheria shallon*) by Mobile Forest Workers in Olympic
Peninsula, Washington, USA**

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Abstract

Challenging many assumptions about what constitutes “local knowledge”, immigrant Latino and Southeast Asian harvesters of non-timber forest products on the Olympic Peninsula, Washington possess extensive ecological knowledge of overstory-understory relationships and how forestry practices affect understory biological and commercial production. Specifically, harvesters of salal (*Gaultheria shallon*), an understory shrub in used in the multi-million dollar floral greens industry, possess different kinds of resource management knowledge depending on whether they are longer-term resident harvesters or more recent newcomers to the area. Harvesters who have lived and worked in the area for many years often have more ecological process knowledge, whereas newcomers who have arrived more recently often have identification and harvest knowledge only. An added layer of complexity emerges because although many harvesters working in the floral greens industry are considered to be mobile workers, many return year after year to the same forests. Interviews conducted with salal harvesters in 2001 – 2003 reveal that the differences in kinds of ecological knowledge may also correlate with differences in intensity of harvesting practices and, consequently, sustainability of the resource. Understanding how resource management knowledge differs between long-term and new harvesters can inform public and private forest land managers in their efforts to develop appropriate access and permitting policies for floral greens and other non-timber forest resources in the Pacific Northwest of the United States. Harvester ecological knowledge is also an untapped resource for forest managers working toward co-management of timber and non-timber products from private and public lands.

Introduction

As U.S. public land management agencies increasingly promote the inclusion of “stakeholders” and “public participation”, questions of who falls into the categories of “local”, “community”, and “stakeholder” become ever more tangible and pressing. Simultaneously, land managers are increasingly expected to manage for conservation values as well as multiple-use sustainable resource extraction. Migrant forest workers, particularly non-timber forest product harvesters, have consequently found themselves at the intersection of both social justice and natural resource management concerns. Harvesters of non-timber forest products (NTFP’s) in the Pacific Northwest, who are predominantly undocumented migrants from Latin America and immigrants from Southeast Asia, are particularly subject to exclusion from resource management decisions, even when the “public participation” is taken into consideration. This type of exclusion is not limited to policy arenas. Natural resource management is increasingly touted as relying heavily on science: scientific principles, scientific methods, and scientific research (Kohm and Franklin 1997). Hence, migrant forest workers who are not considered part of the local community are not only excluded from policy arenas, but also from the scientific research and knowledge production that shape resource policy, management, and access. However, many NTFP harvesters, with extensive ecological knowledge of both the harvested species and their ecological context, are precisely the people most experienced and equipped for forest understory management. By examining the local ecological knowledge (LEK) of harvesters who are often not considered “local”, we not only reveal an untapped resource for forest managers, but also enable scientists

and managers to take a step closer to a more valid and democratic union of academic and civil science.

This paper attempts to document some of the ecological knowledge of several NTFP harvesters working on the Olympic Peninsula, Washington focusing on one species, salal (*Gaultheria shallon*). Based on recent discussions of the role of local ecological knowledge in not necessarily traditional but locally-evolved resource management systems and their integration into more formal adaptive management programs (Berkes et al 2000, Huntington 2000, Nyhaus et al 2003, Olsson and Folke 2001, Shindler and Cheek 1999), responses to semi-structured interviews were then analyzed with respect to the number of years respondents have been harvesting salal to examine differences in types of ecological knowledge and in harvest practices. These interviews were part of a study of how land access and resource tenure institutions affect harvester management practices and the subsequent effects on the resource itself. Hence, an analysis of how resource management knowledge differs between more experienced and new harvesters can inform public and private forest land managers in their efforts to develop appropriate access and permitting policies for floral greens and other non-timber forest resources in the Pacific Northwest of the United States.

Floral Greens: An Emerging Industry

In the Pacific Northwest, many communities, land managers and scientists are increasingly interested in the social, ecological, economic and cultural effects of the rapid rise in the commercial non-timber forest products (NTFP's) industry (Kohm and Franklin 1997; Savage 1995; Schlosser et al 1991). These include edible mushrooms, edible

berries, medicinal plants, and the shrubs and ferns used as greenery in floral bouquets (floral greens). NTFP species in the Pacific Northwest forest ecosystems are ecologically important for the habitat and nutrients they supply to a variety of plant and animal species (Molina et al 1998); they have also become a more than hundred-million dollar industry employing over ten thousand people in the states of Washington, Oregon, and parts of northern California (Schlosser et al 1991). Among the most lucrative of these special forest products are the floral greens, which are generally native understory shrub species that grow naturally in managed or unmanaged forests. The floral greens industry is a case example of the effects of globalization, experiencing both increasing flows of labor from Southeast Asia and Latin America and increasing scales of commodities distribution to broader and broader markets.

Floral Greens Harvesters

Floral greens harvesters are not often represented in public, private, or non-governmental “participatory” management strategies. They are predominantly from the lowest socioeconomic levels of U.S. society, are ethnically diverse, are rapidly increasing in number in the region (Schlosser et al 1991, Von Hagan and Fight 1999), and rely heavily on the industry for employment (Love et al 1998). Many harvesters generally have limited educational backgrounds, speak very little English, and are often excluded from venues that would give them a “voice” in the development of management approaches for public and private lands. In the early 20th century when the industry first emerged, harvesters were primarily European-Americans who needed a little extra income in economic hard times, or simply wanted to work in the woods. Not until the 1970’s did the influx of labor, in the form of refugees of war in Southeast Asia, begin

from outside the U.S., at that time primarily from Cambodia and Laos (Hansis 2002). Then in the late 1980's and 1990's, immigrants from Mexico and other Latin American countries discovered floral greens harvest as an alternative to agricultural work in either California or Oregon and Washington's eastern fruit orchards (Hansis 2002). These influxes have resulted in the current demographics, wherein the majority of floral greens harvesters are from Latin America, with a smaller proportion of Southeast Asian immigrants and European-Americans making up the workforce.

Control of Access and Use

In western Washington and Oregon, floral greens grow in abundance on a variety of land ownership types: public lands including National and State Forests, National and State Parks, and city and regional forest lands, and private lands, including small private lands, large non-industrial timber lands, and large industrial timber company lands. Rarely is a landowner interested in personally harvesting the NTFP's on his or her own land. Hence, an industry has developed that relies on landless harvesters who gain access to the land via permits or leases for the rights to pick one or more of non-timber forest products. Harvesters then sell their product at piece-rate to wholesalers that ship it both domestically and internationally. With little regulation within the industry, each land manager, public or private, has a different policy for selling and enforcing their permits.

On Washington's Olympic Peninsula, for example, some public land managers attempt to fit non-timber forest product management into either their recreational system of one-time use permitting or the timber contract system. Private timber companies' approaches range from short-term leases with individual harvesters to long-term contracts with floral greens wholesalers, who then supply permits to harvesters who must sell the

product back to that wholesaler. Some permits are short-term, lasting only two weeks, while other land owners require a three year lease. Some permits only cost \$20, while a lease might cost \$10,000. Some permits are sold to an unlimited number of people for a given area, others are specified for only one family. Some land managers only require a Mexican driver's license as identification, others require a business license, contractor's license, and proof of insurance.

Harvesters can feasibly make a good income if they have their own transportation into the forest and can negotiate with landowners for permits and for good prices from buyers. However, many end up paying for transportation from a driver, paying an inflated price for a permit, and giving a percentage of the day's product to a "patron" or unofficial liaison with the buyer. Given these conditions, "stealing" or unpermitted harvesting occurs regularly on both private and public lands, often overwhelming any planned management practices on the part of land managers and harvesters with permits. In this case of increasing resource demand without well-enforced, consistent tenure regimes, this de facto open-access system is likely to foster unsustainable levels of harvest and eventual system collapse (Bromley 1994; Ostrom 1990). It is this management context in which harvesters make decisions about where, how much and how to harvest floral greens on the Olympic Peninsula.

Local Ecological Knowledge of Migrant Resource Users

The evolving literature on the integration of traditional ecological knowledge (TEK) with more conventional resource management systems (Berkes et al 1995, Berkes and Folke 2000, Huntington 2000, Mallory et al 2003) has begun to examine the potential

role of local ecological knowledge (LEK) of groups who may not have the historical and cultural continuity of resource use found in TEK (Berkes and Folke 2000, Olsson and Folke 2001). Specifically, however, as communities around the world are displaced and migrate to new landscapes, the potential value of the LEK of migrant communities in the management of these new landscapes is understudied. Local ecological knowledge is defined here as “knowledge held by a specific group of people about their local ecosystems...and concerns the interplay among organisms and their environment” (Olsson and Folke 2001). Integrating the LEK of these migrant communities, which is not based on generations of learning and experimentation as TEK is, it is conjectured, may or may not improve conventional management and conservation practices (Nyhaus et al 2003). Nyhaus et al (2003) examined the wildlife knowledge of migrant communities recently settled in Sumatra to evaluate the conservation value of this LEK for protected area management. Finding differences in wildlife knowledge based on gender, age, years of residence in the area and direct experience with the target species, they recommend examining closely the local knowledge of migrant and non-migrant communities to most effectively incorporate this knowledge into more conventional scientific and management activities.

De-emphasizing a focus solely on traditional systems for examination of ecological knowledge, Berkes and Folke (2000) suggest that “the important aspect is whether or not there exists local knowledge that helps monitor, interpret, and respond to dynamic changes in ecosystems and the resources and services that they generate.” As a contribution to this discussion, and to examine both the patterns and potential application to conventional resource management, the responses of migrant and non-migrant salal

harvesters on the Olympic Peninsula, Washington were analyzed for differences in ecological knowledge and management practices based on years of residence and experience harvesting salal. As federal and state land managers are looking for ways to incorporate harvester input into their management of the public forests, understanding who may have valuable resource management knowledge is crucial.

Salal Harvester Local Ecological Knowledge and Management Practices

As part of a participatory research approach to studying the impact of harvest intensity on salal (*Gaultheria shallon*) (Ballard et al 2002), participant observation and semi-structured interviews were conducted in the summers of 2001-2003 on the Olympic Peninsula with 20 harvesters of salal (*Gaultheria shallon*). Key informants and snowball sampling were used to identify subjects for interviews and subsequent participation in the research process. Though this was not a statistical sample, harvesters were from a variety of backgrounds, including males and females, Latino, Southeast Asian and Anglo, and ranged in harvest experience from 3 months to 25 years. Interview responses were then coded for differences and similarities in ecological knowledge of the target species, its ecology, sustainability of specific harvest practices and particular management practices used.

At the outset, harvester responses showed a range of knowledge of not only plant identification and harvest techniques for salal, but also more ecological relationship knowledge of the effects of stand conditions, both biological and environmental, on understory species. Nearly all harvesters described in either vague or specific terms the

stand conditions, amount of canopy closure, and light conditions required for commercial salal;

- “you can tell where it’s good salal...because there needs to be spaces for light to get to the ground...”
- “I look for timber that is 40-60 years old, depending on the size of the trees”
- “(I look for) lowlands, where Douglas fir grows; some lands have a lot of maple trees but salal doesn’t grow under maples.”

In addition, many harvesters, regardless of experience, described other physical characteristics such as elevation, soil moisture and other soil conditions as important factors for salal growth. All respondents also described several different fungal diseases that afflict the plant, including hypotheses on what conditions cause the spread of different diseases; the commercial quality of the plant depends on the quality of the leaves, so any rust and other marks on the leaves are of great concern to most harvesters. Finally, many harvesters expressed relationships between understory species, noting that salal is found in association with some other shrub species but not others;

- “Good tall salal grows in the middle of green huck (*Vaccinium ovatum*), it grows good with huck.”

Differences Between More Experienced and Less Experienced Harvesters

Differences appeared in the interview responses with respect to knowledge of successional processes and, in this intensive timber management context, silvicultural activities and their effects on the forest. Many harvesters in the study made observations about what conditions are best for good commercial-quality salal, however, more harvesters with eight years or more experience harvesting salal had distinctly more detailed answers. There were eight harvesters with less than eight years experience and twelve harvesters interviewed with eight or more years experience. The experienced

harvesters described in detail how a variety of NTFP species change in abundance and quality over the life of a forest stand. As ecological succession occurred and timber management practices were applied, these more experienced harvesters explained how the NTFP species responded and were affected by these changes.

- “When trees get 8 –12 ft. tall, when they’re spaced close together – there is good brush. As soon as the trees get approximately 15 ft. tall, the branches touch and the light is too little, too dark, the brush stops growing.”
- “As the trees grow, the salal grows too”

In most cases, however, harvester responses did not express a distinction between natural successional processes and management of those processes for timber production. For example, several experienced harvesters explained that salal responds positively to the silvicultural thinning of trees because thinning opens up the canopy and allows light to penetrate to the forest understory, stimulating growth of the salal and other floral green species.

- Some companies do a 50% timber cut – selective (cut) – the sun hits the ground more, it kills the big brush, but 2 –3 yrs later the brush is 3 times more production, brush is so thick. The sun and the logging activity makes it grow more; also the planting makes it grow more. Compared to a clearcut, (when they) take 100% of the trees, it takes 10-15 years to get good brush, when trees tall enough.”
- “Sometimes when (the timber company) sprays fertilizer, the salal uses it first.”
- Very seldom did harvesters describe changes in the forest stand that did not involve human silvicultural activities. Considering that nearly all land harvesters have access to is managed intensively for timber, or has been until recently (US National Forests have greatly reduced timber harvest in recent years), silvicultural activities are the predominant resource management context in which harvesters are operating.

Notably, only those harvesters with eight years of experience or more described these long-term changes in a forest stand; those with less experience focused their description more immediate characteristics such as avoiding areas with fungal disease and issues of access to the resource itself. Differences in harvester responses are summarized in Table 1.

Table 1. More and Less Experienced Harvester Ecological Knowledge

Ecological Knowledge Held by Majority of Harvesters Interviewed Included Effects on Salal of:	Ecological Knowledge Held Only by Harvesters Interviewed with 8 Years Experience or More Included Effects on Salal of:
Light and Canopy cover	Clear-cut timber harvest
Elevation	Pre-commercial thinning
Soil characteristics	Commercial thinning
Moisture	Planting and spacing of trees
Disease	Fertilizer
Associations with other species	Pruning

Harvest Practices, Management Practices and Experience

More important than simply documenting and exploring differences in harvester ecological knowledge based on experience is to examine the way this knowledge is applied to resource management practices (Folke et al 1998, Berkes et al 2000). Through participant observation and detailed descriptions by harvesters of their harvest practices, the dichotomy between more experienced and less experienced harvesters was again apparent. Harvesters with less than eight years of experience demonstrated harvest methods that removed proportionally more biomass than more experienced harvesters, harvesting more intensively in a large area and with respect to a single plant. All harvesters answer questions about how it will grow back the next year and how the area will look in several years time, however, harvesters with eight years of experience or more described the way they pick salal in terms of a resource that they can pick for many years:

- “I pick for high quality, most people pick now for volume. I won’t pick it if has any bug chew, so next year it’ll be thicker and might shoot out more stems.”
- “I cut into the green (stem) only, only two years of growth; it’s wood after that. In the old wood you can see there’s no buds that will grow.”
- “When you pick higher up on the plant, the little bumps below grow to new stems next year.”

Significantly, most harvesters, more and less experienced, described their harvest practices in relation to their security of resource tenure. They specified the way they harvested as a consequence of whose land they were picking on and what kind of permit or access system was in place. In many cases, more experienced harvesters described the way they used to pick salal when they had a short term lease of only two weeks at a time and described a different method of picking that they use on longer-term leases, in some cases three years or more. For example, one harvester said,

- “I know I have my lease for next year so I can leave it to grow, but other people with (short term) permits take it all, they don’t care about it growing back.”

Another remarked,

- “I always see in the future, if we leave something, next year we’ll have it. If we cut it all, it’s done; next year maybe there’s nothing.”

In other cases, several harvesters who regularly use short-term permits explained that they know the way they harvest “hurts the plant,” but that if they had an exclusive lease of their own for several years they would use a less intensive harvest method.

Finally, to examine how harvester ecological knowledge and resource management practices interact, interviews were analyzed using several key management practices based on ecological knowledge found in local and traditional societies identified by Berkes et al (2000) (and based on Folke et al 1998). These range from practices found in both conventional and local / traditional societies, mainly in conventional and mainly in local / traditional societies. Results show that not only do the harvesters interviewed have many management practices found in conventional resource management, but some harvesters also use practices largely abandoned by conventional management but still found in some local and traditional societies; these are the focus of the results below. Specifically, responses that included explanations of 1) Multiple species management, 2)

Resource rotation and 3) Succession management (Berkes et al 2000) were found only from harvesters with 8 years of harvest experience or more.

1) Multiple Species Management

The majority of permitting systems on the Olympic Peninsula specify that only one species or a category of species (eg. “floral greens”) can be harvested by one person on one permit. However, many harvesters remarked that rather than being required to travel to many areas to pick the same species, they would prefer to stay in one area and harvest a variety of species, including a variety of mushroom and floral green species, in order to manage the area for multiple species. One harvester remarked,

“The...best way...(is when) you can pick fern (*Polystichum munitum*), huck (*Vaccinium ovatum*), brush (*Gaultheria shallon*). In other companies you can’t pick the other things. You have to get a different permit for mushrooms, too.”

This emphasis on multiple species management is similar to that found in agroecology systems and *milpas* in Mexico (Berkes et al 2000), the country of origin for many of the migrant harvesters in the Pacific Northwest. Whereas managing for multiple species may serve the purpose of maintaining biodiversity and ecosystem functions, more so than the strictly timber management of the conventional management systems in the area, harvesters did not mention this as the reason for their recommendations. Instead, they pointed out that a major concern for them is year-round work, and diversifying the products they can pick throughout the year enables them to work year-round.

2) Resource rotation

The most common management system that more experienced harvesters recommended was a resource rotation system. Resource rotation systems are one of the

most common tools used in traditional and local societies throughout the world (Berkes et al 2000). Experienced harvesters consistently suggested a “fallow period” for harvested areas that allow it to “rest” and recover for one season at least. A small sample of these comments follow:

- “I’d use a 4 year system, I’d quarter the area off...I’d section it so I’d only harvest certain times...I’m make sure one quarter got a break.”
- “...the brush needs to rest...should let an area rest after picking it for 2-3 years. We had an area...we picked for 5 or 6 years (in a row) and the brush became less and less.”
- “I think the best way to do it is to pick 100% (of available product) and let it rest; it’s better for the brush that picking 33% every year.”

In addition to suggesting a rotation system, harvester responses were again intimately tied to comments about security of tenure, primarily because most harvesters do not have access to the same piece of land for more than one harvest season to which they could apply this system. However, in many cases, harvesters suggested this system without being able to implement it due to their short-term access. Some harvesters described “experiments” that they conducted by allowing an area “to rest” that was inaccessible to most other harvesters.

- “When I came last season there wasn’t a lot of brush, so much was stolen. I let a lot of it row up because now I’ll have a lot of brush this year.”

In most cases, harvesters explained that it is very difficult for both harvesters and forest managers to enforce leases; so even if one has a long-term lease, it is very likely that the salal that is allowed to “rest” will be harvested illegally by someone else before it reaches another growing season. The nearly unanimous consensus regarding a rest-rotation system amongst experienced harvesters interviewed suggests that harvester knowledge and management practices could significantly inform forest management both in terms of permitting policies and in terms of strategies for enforcement of those policies.

3) Succession management

Succession management, though exemplified by the shifting cultivation system often used in the tropics (Folke et al 1998), could also be said to be described by some experience NTFP harvesters interviewed here. As described above, experienced harvesters interviewed exhibited detailed knowledge of how silvicultural practices, which at their core are human manipulations of forest dynamics and successional processes to achieve particular management goals, affect salal growth and commercial quality. Further, some few experienced harvesters described how different species of NTFP are abundant and of commercial quality at different stages of forest development within a timber managed forest, and if managed could provide income to many harvesters throughout the life of the stand. One very experienced harvester described a timeline for exactly when commercial salal is available in the life of a forest stand, all according to the timber management practices typically used in the region:

- “(Trees) one to 15 years (of age), there’ll be no commercial salal. Fifteen to 20 years old, there’ll be some commercial salal, and if they pre-commercially thin it could be good salal if they got rid of slash but usually it’s no good for 10 years. Thirty to 40 years old you get good salal. Forty years old (they do a) commercial thin somewhere in here, then 40-70 years old you get good salal, if there’s a wide spacing of trees.”

This type of response from experienced harvesters suggests that over time, harvesters who remain the same area develop sophisticated knowledge that even forest managers do not have about long-term management of NTFPs.

Discussion and Conclusion

The analysis of the salal harvester interviews provide insight into harvester livelihood practices and ecological knowledge that could be valuable to public and

private land managers as well as ecologists. Results suggest that many experienced floral greens harvesters possess the knowledge and motivation to sustainably manage the resource on which their livelihoods depend. Unlike many types of seasonal work that only occur for a few months each year, floral greens harvesting occurs from July through April, so many harvesters work almost year-round in the same region. Many often return each year to the same towns and areas of the forest to pick salal. However, trends in the industry suggest that the majority of floral greens harvesters on the Olympic Peninsula are not in this more experienced category. Several of the more experienced harvesters described how they try to teach the new harvesters how to harvest salal sustainably:

- “I have to explain to everybody when we start and it’s hard because I have to watch everybody; they don’t take care of the brush. I teach my pickers because I know they’ll pick good quality (if I do).”

What are the implications for transmission and acquisition of ecological knowledge in harvester communities? Though not formally included in the interviews or analysis, most harvesters interviewed explained that they learned how to pick from a friend or relative who was already picking salal for a living. In many cases the inexperienced harvesters interviewed had learned from another relatively inexperienced harvester, possibly due to the structure of the industry in which new immigrants join crews of other newcomers to consolidate permits and product for sale to wholesalers. Hence, perhaps new harvesters who learn from other relatively inexperienced harvesters perpetuate unsustainable harvest practices. Alternatively, experienced harvesters who train newcomers and educate them about management practices such as a rotation system and multiple species management could be valuable resources within the community, and valuable resources for forest managers hoping to manage NTFPs sustainably.

There are several implications of these responses for forest management systems on the Olympic Peninsula. Weaving the management of NTFPs into the management of timber in the Pacific Northwest has been suggested by economists, ecologists and social scientists as a way to diversify income streams from the forest, enhance biodiversity and more equitably distribute the economic benefits from the forest (Schlosser et al 1991, Kerns et al 2003, Jones et al 2002). Not only do harvesters have a wide range of management practices and ecological knowledge that could be useful for forest managers and scientists in the region, but these knowledge and practices are found primarily in harvesters with several years of harvest experience. Understanding that there are experienced harvesters in the community who could collaborate or otherwise provide useful information and management recommendations would greatly aid forest managers trying to juggle timber and non-timber forest product management. Furthermore, understanding on the part of forest managers that the intensity of harvest practices used differs not only by how experienced a harvesters is, but also by how secure his or her access to the resource is, could significantly inform the access qualifications, policies and permitting systems they develop on federal, state, and private timber lands.

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